General Information

ACADEMIC CALENDAR
BOULDER CAMPUS

Summer Session 1982

June 4 (Fri.)—Registration for first 5-week, 8-week, and 10-week sessions.
June 7 (Mon.)—Classes begin (7:30 a.m.).
July 5 (Mon.)—Independence Day holiday.
July 8, 9 (Thurs., Fri.)—Final examinations for first 5-week term.
July 12 (Mon.)—Registration for second 5-week term. Ten-week classes meet.
July 13 (Tues.)—Classes begin for second 5-week term (7:30 a.m.).
Aug. 12, 13 (Thurs., Fri.)—Final examinations for 10-week and second 5-week terms.

Fall Semester 1982

Aug. 27 (Fri.)—Request analysis.
Aug. 30 (Mon.)—Class schedule distribution.
Aug. 31 (Tues.)—Drop/Add day.
Sept. 1 (Wed.)—Classes begin (8 a.m.).
Sept. 6 (Mon.)—Labor Day holiday.
Nov. 25, 26, 27 (Thurs., Fri., Sat.)—Thanksgiving holidays.
Nov. 29 (Mon.)—Classes resume (8 a.m.).
Dec. 1 (Wed.) through Dec. 3 (Fri.)—Preregistration for Boulder Campus degree students for spring 1983.
Dec. 11 (Sat.) through Dec. 17 (Fri.)—Final examination period of six days.
Dec. 18 (Sat.)—First day of winter vacation. Commencement.

Spring Semester 1983

Jan. 13 (Thurs.)—New student registration and orientation.
Jan. 14 (Fri.)—Request analysis.
Jan. 17 (Mon.)—Class schedule distribution.
Jan. 18 (Tues.)—Drop/Add day.
Jan. 19 (Wed.)—Classes begin (8 a.m.).
Mar. 21 (Mon.) through Mar. 26 (Sat.)—Spring vacation.
Mar. 28 (Mon.)—Classes resume (8 a.m.).
Apr. 27 (Wed.) through Apr. 29 (Fri.)—Preregistration for Boulder Campus degree students for fall 1983.
May 11 (Wed.) through May 17 (Tues.)—Final examination period of six days.
May 20 (Fri.)—Commencement.

Summer Session 1983

June 3 (Fri.)—Registration for first 5-week, 8-week, and 10-week sessions.
June 6 (Mon.)—Classes begin (7:30 a.m.).
July 4 (Mon.)—Independence Day holiday.
July 7, 8 (Thurs., Fri.)—Final examinations for first 5-week term.
July 11 (Mon.)—Registration for second 5-week term. Ten-week classes meet.
July 12 (Tues.)—Classes begin for second 5-week term (7:30 a.m.).
Aug. 11, 12 (Thurs., Fri.)—Final examinations for 10-week and second 5-week terms.
Aug. 13 (Sat.)—Commencement. Academic year of 1982-83 ends.

THE UNIVERSITY OF COLORADO

The University of Colorado includes four campuses: the main campus at Boulder, campuses at Colorado Springs and Denver, and the Health Sciences Center in Denver where the School of Dentistry, School of Medicine, and School of Nursing are located.

To meet present needs of its students and of the world in which they live, the University offers more than 120 fields of study through its 16 schools and colleges:

- College of Arts and Sciences
- College of Business and Administration
- Graduate School of Business Administration
- School of Dentistry
- School of Education
- College of Engineering and Applied Science
- College of Environmental Design
- Graduate School
- School of Journalism
- School of Law
- College of Letters, Arts and Sciences
  (Colorado Springs Campus)
- College of Liberal Arts and Sciences
  (Denver Campus)

1Calendars is tentative and subject to revision.
2The University Calendar Committee requests make-up time be provided to students who may have been absent for religious reasons.
School of Medicine
College of Music
School of Nursing
School of Pharmacy
Graduate School of Public Affairs (Colorado Springs,
Denver Campuses)

Enrollment on the Boulder Campus is approximately
20,000 and on all campuses of the University is nearly
35,000.

The Boulder Campus catalog may be ordered at
$2.50 per copy. To request the Boulder Campus catalog
and/or an application form the student should write to:

Registration Section
Office of Student Administrative Services
Campus Box B-7
University of Colorado
Boulder, Colorado 80309

Bulletins for the School of Dentistry, School of
Medicine, and School of Nursing may be ordered at $1
per copy from the Registration Section (address as
above) or from the Health Sciences Center in Denver at
the address below:

Admissions Office
University of Colorado Health Sciences Center
4200 E. 9th Avenue
Denver, Colorado 80262

Objectives and Stature

The basic objectives of the University of Colorado,
Boulder (UCB), are to carry out the mission of educa-
tion, to create knowledge through research and
scholarship, and to put that knowledge at the service
of the people.

Combined research and related instructional and
public service programs at the University presently in-
volve annual expenditures of approximately $80 million.

UCB is fully accredited by the North Central Asso-
ciation of Colleges and Secondary Schools and is a
member of the Association of American Universities.

Year-Round Operation

UCB operates a large-scale year-round program of in-
struction consisting of fall and spring semesters of 15
weeks each and a 10-week summer session. The program
is sufficiently comprehensive so that students may make progress toward degree programs in almost
all areas of study in any term.

Affirmative Action

The University of Colorado at Boulder is an affir-
mative action/equal opportunity employer and institu-
tion and does not discriminate on the basis of race, sex,
creed, color, age, national origin, or individual handi-
cap, or veteran status in any aspect of employment or
services. The institution's educational programs, ac-
tivities, and services offered to students and/or
employees are administered on a nondiscriminatory
basis subject to the provisions of all civil rights laws
and statutes. For information about these provisions or
equity, discrimination, or fairness, consult the Affir-
mative Action Office in Regent Administrative Center,
Room 207, or telephone 492-6706.

Location, Surroundings, Climate

Boulder is an attractive university community of
about 85,000 population. The city is northwest of
Denver and is linked to the Colorado capital by a 25-
mile Denver-Boulder turnpike.

A short drive from the 14,000-foot peaks of the Con-
tinental Divide, the Boulder Campus is within walking
distance of the foothills of the Rocky Mountains.

At an altitude of over 5,000 feet, the climate is
temperate, with pleasant days and cool evenings. On
the average, there are 360 days of sunshine each year,
making possible a variety of outdoor activities.

The teaching and research programs of the Boulder
Campus are closely integrated with other facilities in
the Boulder area: the National Center for Atmospheric
Research (including the High Altitude Observatory),
the Laboratory for Atmospheric and Space Physics,
National Oceanic and Atmospheric Administration,
and other Boulder institutions.

History

When Colorado was frontier land, an official terri-
torial government was formed. At its first session in
1861, the territorial legislature passed an act providing
for a university at Boulder. When Colorado became
the Centennial State in 1876, the new constitution
established the University under an elected board of
regents.

Fifty-two acres of pasture land were donated by three
Boulder residents—George A. Andrews, Anthony
Arnett, and Marinas G. Smith—as a site for the
University, and the cornerstone of Old Main, the first
building, was laid in 1875. Today the 590-acre Boulder
Campus includes 160 buildings in a setting of green
lawns and trees.

UNDERGRADUATE ADMISSION
REQUIREMENTS

For admission requirements to the Graduate School,
see the Graduate School section of this catalog.

The University of Colorado, Boulder (UCB), seeks to
identify applicants who have a high probability of suc-
cessful completion of their academic programs. Admis-
sion is selective and is based on evaluation of many
criteria. Among the most important are the following:

1. General level of academic performance before ad-
mission to the University, as indicated by the evalu-
aton of work taken at other educational institutions.

2. Evidence of scholarly ability and accomplishment
as indicated by scores on standardized tests of
scholastic aptitude.

3. Motivation and potential for academic growth
and ability to work in an academic community, as in-
dicated by trends in the student's record, by letters of
recommendation from teachers and others qualified to
evaluate the student, by accomplishments outside
academic work, and by other relevant evidence.
All credentials presented for admission to UCB become the property of the University and may not be returned to the applicant.

A student who is granted admission or readmission must reflect in a moral and ethical sense a personal background acceptable to the University. UCB reserves the right to deny admission to applicants whose total credentials reflect an inability to assume the obligations of performance and behavior deemed essential and relevant to any of its lawful missions, processes, and functions as an educational institution.

Admission to a particular school or college at UCB does not guarantee eligibility for future intraniversity transfer to another school or college within the University system. As an example, the prephysical therapy program on the Boulder Campus is designed to accommodate entering freshmen, with no assurance given for further admission to the physical therapy clinical year at the Health Sciences Center in Denver. Nonresidents of Colorado from states other than Alaska, Arizona, Hawaii, Idaho, Montana, Nevada, and Wyoming (states included by special arrangement in the Western Interstate Commission on Higher Education — WICHE) may attend the University of Colorado to take their prephysical therapy course work only. Non-Colorado residents from states other than those listed will not be considered for admission to the physical therapy clinical program. The professional physical therapy clinical program is extremely limited in enrollment and is reserved for residents of Colorado and, on a very limited and highly selective basis, to residents from those WICHE states listed above.

Important Information for Freshman and Undergraduate Transfer Applicants

Students from other countries should see the section on Foreign Students.

1. To be considered for admission, applicants must submit complete and official credentials as required by the University of Colorado. No part of any previous record may be disregarded. Credentials submitted for admission become the permanent property of the University.

2. To be granted admission, an applicant must reflect in a moral and ethical sense a personal background acceptable to the University. The University reserves the right to deny admission to any applicant whose total credentials reflect an inability to assume the obligations of performance and behavior deemed essential and relevant to any of its lawful missions, processes, and functions as an educational institution.

3. The University Board of Regents reserves the right to establish enrollment limitations for all academic areas.

4. Freshman and transfer applicants will receive mail notification of admission status. Applicants notified of "Admissions Eligibility" will be sent the appropriate forms to confirm their intent to enroll. "Admissions Eligibility" does not guarantee enrollment. Applicants should see Freshman Confirmation and Transfer Confirmation for information concerning deposits.

5. Admission to the University of Colorado does not constitute a guarantee that a student will have complete selection of courses, nor does it guarantee future transfer and admission into any other professional program, college, or school within the University system. For example, if the student’s educational goal is in an allied health field or a professional school, admission to a preprofessional area of study does not assure admission to a professional program such as child health associate, dental hygiene, journalism, medical technology, nursing, pharmacy, physical therapy, or teacher certification. As another example, if a student is admitted to a major in the College of Arts and Sciences and desires a transfer later to a high demand area such as the College of Business, College of Engineering, or College of Environmental Design, there is no guarantee that the transfer can be made. Also certain majors in the College of Arts and Sciences, such as geology, are extremely competitive. Freshman students are admitted to pregeology only.

A new and separate application must be submitted at the appropriate time for admission consideration to any professional program or for a change of college or school. The allied health fields, business, engineering, and environmental design are particularly limited in enrollment because of the great demand for admission. Quality of academic achievement, results of special qualifying examinations, state residency, and personal interviews (in some cases) may determine admission in these areas.

The University of Colorado, Boulder, offers elementary and secondary teacher certification programs. Each student seeking certification must have a major field either in the College of Arts and Sciences or in another school or college at the University which offers majors applicable to teaching at either the elementary school level or the secondary school level. After 1982-83, the School of Education will no longer award a B.S. degree in education but will continue to offer Colorado teacher certification in both elementary and secondary education programs.

Freshmen apply for one of the following colleges:

- College of Arts and Sciences
- College of Business and Administration
- College of Engineering and Applied Science
- College of Environmental Design (full term only)
- College of Music (audition required)

AUTOMATIC ADMISSION CRITERIA, TEST SCORES, AND CLASS RANK FOR ADMISSIONS CONSIDERATION

Students who do not meet the automatic admission criteria will be considered on an individual basis by the Admissions Committee. Consideration will be based on rank in class, quality and type of course work, and test scores. Supporting statements from mathematics and/or physics/chemistry teachers are not required, but desirable. Students with strong mathematics and verbal skills are encouraged to apply even though their test scores and/or ranks may vary from the automatic admission criteria.

1. College of Arts and Sciences: (a) Upper 50th percentile of the high school graduating class at the 6th, 7th, or final semester; and (b) a combined SAT
score of 1000 or above (with an expected minimum verbal score of 450) or a composite ACT score of 23 or above (with an expected minimum average score of 21 on the nonmathematics portion of the ACT—an average of the English, social science, and natural science portions); and (c) completion of all recommended high school units as follows:

<table>
<thead>
<tr>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English (including at least one year of college preparatory composition)</td>
</tr>
<tr>
<td>Foreign language (high school level proficiency in the same classical or modern language)</td>
</tr>
<tr>
<td>History</td>
</tr>
<tr>
<td>Mathematics (college preparatory)</td>
</tr>
<tr>
<td>Natural science</td>
</tr>
<tr>
<td>Social science (including additional history)</td>
</tr>
<tr>
<td>Academic electives</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

**Important Note.** In the College of Arts and Sciences, three college semesters of the same language are required for graduation with either the Bachelor of Arts or the Bachelor of Fine Arts degree. If three high school units of the same foreign language have been completed satisfactorily, or other acceptable evidence of Level III proficiency is established, no further language study will be required.

2. **College of Business and Administration:** (a) Upper 30th percentile of the high school graduating class at the end of the 6th, 7th, or final semester; and (b) a combined SAT score of 1050 and a SAT verbal score of 500 or above, and a SAT mathematics score of 550 or above, or a composite ACT score of 25 and an ACT mathematics score of 26 and a minimum average score of 25 on the non-mathematics portion of the ACT; and (c) completion of all suggested high school units as follows:

| English (Two units of composition are strongly recommended) | 4 |
| Mathematics (including at least two years of algebra and one of geometry) | 3 |
| Natural science (laboratory-science type course) | 2 |
| Social science (including history) | 2 |
| Academic electives (areas such as foreign languages, additional courses in English, mathematics, natural or social sciences. May include up to two credits in business areas) | 4 |
| Total | 15 |

All admissions are subject to College of Business enrollment limitations. Therefore, all students who are accepted are encouraged to confirm their intent to register as soon as possible.

3. **College of Environmental Design:** (a) Upper 30th percentile of the high school graduating class at the end of the 6th, 7th, or final semester; and (b) a combined SAT score of 1050 or a composite ACT score of 25 or above; and (c) completion of all suggested high school units as follows:

| English (literature, composition grammar) | 3 |
| Mathematics (college preparatory) | 3 |
| Physics | 3 |
| Biology | 1 |
| Social Studies | 1 |
| Foreign Language | 1 |
| History | 5 |
| Additional English | 4 |
| Academic Electives | 4 |
| Total | 16 |

**Important Note:** Because of the sequentially structured curriculum in Environmental Design, freshmen must begin this field of study during the fall semester.

4. **College of Engineering and Applied Science:** (a) Upper 20th percentile of the high school graduating class at the end of the 6th, 7th, or final semester; and (b) a combined SAT score of 1150 (Verbal 550, Mathematics 650) or above or ACT mathematics and composite scores of 28 or above; and (c) completion of all suggested high school units as follows:

| English (English composition, literature, grammar) | 4 |
| Algebra | 2 |
| Geometry | 1 |
| Trigonometry and solid geometry | 1 |
| Natural sciences (physics and chemistry recommended) | 2 |
| Social studies and humanities (foreign languages and additional units of English, history, and literature are included in the humanities) | 3 |
| Academic electives | 3 |
| Total | 16 |

All admissions are subject to College of Engineering enrollment limitations. Therefore, all students who are accepted are encouraged to confirm their intent to register as soon as possible.

**Important Note.** For those young men and women with an interest and aptitude in mathematics and science, a career in engineering offers opportunity, challenge, and reward. Planning for a career in engineering should start early, as it is one of the few professional school programs that students enter at the freshman level. A solid foundation in mathematics and science is essential to successful entry and progress. Freshman engineering students must be prepared to begin their college-level education in mathematics at the level of first-semester calculus and analytical geometry. Sound training in algebra, geometry, and trigonometry is critical for successful entry into the calculus and analytical geometry sequence.

5. **College of Music:** (a) Upper 50th percentile of the high school graduating class at the end of the 6th, 7th, or final semester; and (b) a combined SAT score of 1000 or above or a composite ACT score of 23 or above; and (c) achievement of a pass on the music audition; and (d) completion of all suggested high school units as follows:

| English | 3 |
| Mathematics, Foreign language, Social science, Physical science | 8 |
| Theoretical music | 3 |
| Academic electives | 4 |
| Total | 16 |

**Note.** It is expected that all music students will have had previous experience in an applied music area. Two years of piano training are recommended.

**INDIVIDUAL CONSIDERATION**

Students who do not meet the recommended consideration criteria will be considered on an *individual basis* by the Admissions Committee, which will evaluate their overall academic records, including the quality of the high school program of study and the level of college entrance test scores (SAT or ACT). All applicants whose records reflect innovative grading systems, unusual curricula, no rank in class, or a high school equivalency through the General Educational Development (GED) test will also be considered individually.

Freshman applicants are encouraged to attach to their applications a one-page statement about themselves—their educational aspirations, travel and work experience, creative talents, etc.—which may be of use and interest to the Admissions Committee. Letters of recommendation from high school teachers, counselors, and administrators are also encouraged. These materials must accompany the application and should be attached to it.

4 / General Information
NATIONAL SAT/ACT TESTING DATES, 1981-82

Scholastic Aptitude Test (SAT)
Saturday
November 7, 1981
December 5, 1981
January 23, 1982
April 3, 1982
May 1, 1982
June 5, 1982

American College Test (ACT)
Saturday
October 17, 1981
December 12, 1981
February 20, 1982
March 27, 1982
June 12, 1982

It is recommended that applicants take the college entrance test at the end of their junior year or early in their senior year. The University of Colorado accepts either the SAT or the ACT for admission. Applicants who are not satisfied with their first test score results are urged to retest at the earliest possible date. The University will consider the applicant's highest scores for admission. Achievement tests are not required. For further information regarding college entrance tests, applicants should see a high school counselor or write to the following:

College Entrance Examination Board (SAT)
P.O. Box 1025
Berkeley, California 94704

College Entrance Examination Board (SAT)
P.O. Box 592
Princeton, New Jersey 08540

American College Test (ACT)
Registration Department
P.O. Box 414
Iowa City, Iowa 52240

Freshman Admissions Processing

WHEN TO APPLY
All prospective new freshmen are encouraged to apply for admission soon after their senior year begins—as early as October—for any of the following terms. Notification will occur after December 1, 1982 for freshmen applicants applying for the spring/fall 1983.

Spring Semester
Spring enrollment is suggested for students who graduate from high school at midyear.

Enrolling in the spring semester is ideal for those who, for various reasons, delayed entering college the previous fall. Resident and nonresident freshmen may be considered for spring semester admission in the College of Arts and Sciences, College of Business and Administration, College of Engineering and Applied Science, and College of Music.

Summer Session
1. Some of the advantages for freshmen who begin in the summer term include an early campus orientation and the opportunity to accelerate and/or experiment academically.
2. Degree-seeking freshmen (residents and nonresidents) who are accepted and enrolled for the summer session may continue in the fall if summer academic work is satisfactory, preregistration has been accomplished, and appropriate deposits are paid by the proper deadline. There will be an opportunity to register for fall during the summer.

Fall Semester
The College of Arts and Sciences, College of Business and Administration, College of Engineering and Applied Science, College of Environmental Design, and College of Music accept new freshmen for the fall semester.

There is no established deadline for applying since it is not possible to predict from year to year when enrollment limitations for any given school or college will be reached. However, early application is critical for high demand and highly competitive colleges such as Business, Engineering, and Environmental Design. Past experience has shown that students who do not apply for these areas before January 15 may be denied admission because of enrollment limitations. Also, in the case of these high demand and highly selective colleges, the admission decision is often delayed for the respective admissions committees to select the best applicants.

Because of enrollment restrictions at the University of Colorado at Boulder, applications and/or credentials for admission submitted after May 1 for the following fall semester or November 1 for the spring semester are regarded as late applications and will be considered only on an individual, space-available basis.

HOW TO APPLY
1. The student should obtain an Application for Admission Form from the Office of Admissions at the Boulder Campus. Colorado residents may obtain this form from their high school counselors. (Students from other countries who are not citizens or permanent residents of the United States must request special application materials from the UCB Office of Admissions).
2. A complete application includes:
   a. Application for admission.
   b. The nonrefundable $20 application fee.
   c. A transcript of high school work completed, which must also include rank in class and courses in progress for the entire year.
   d. Required entrance test scores (SAT or ACT).
   e. Copies of GED test scores and a Certificate of High School Equivalency if the applicant is not a high school graduate.
   f. The required audition if the student is entering the College of Music.

*Test results will be received too late for applicants who wish to participate at the start of the 1982 summer session.
Applicants who are presently attending high school should give the completed applications to their counselors. The application must include the $20 fee, transcript, and rank-in-class information in a single mailing packet. An incomplete application packet may be returned to the high school.

3. The fact that college entrance test scores (SAT or ACT) are not available does not mean an applicant should delay sending the application and credentials. However, if final official test scores are available at the time of application, they may be posted on the official high school transcript in lieu of or in addition to being reported directly by the testing service.

FRESHMAN NOTIFICATION

If accepted, students will receive notification of eligibility for admission, housing information, and materials for completing their confirmation to enroll. Admission eligibility to the University of Colorado at Boulder does not constitute a guarantee of enrollment. Confirmation deposits received after enrollment limits are reached may be returned. Notification dates for admission decisions for the fall and summer terms will be as follows:

<table>
<thead>
<tr>
<th>Application Complete With Credits By</th>
<th>Notifications Mailed to Students</th>
</tr>
</thead>
<tbody>
<tr>
<td>November 15</td>
<td>No later than December 15</td>
</tr>
<tr>
<td>January 15</td>
<td>No later than March 15</td>
</tr>
<tr>
<td>After January 15</td>
<td>Processed on first-received basis</td>
</tr>
</tbody>
</table>

Those who are not selected for acceptance, but seem qualified for further consideration are notified that action on their applications has been postponed. Admissions committee action for the spring semester will be on a rolling notification basis beginning in early December.

FRESHMAN CONFIRMATION

Students who receive notification of admission eligibility are required to confirm their intent to enroll. Confirmation consists of returning the completed confirmation form and the designated nonrefundable deposit. The confirmation form and the designated deposit must be returned before the enrollment limitation for the applicant's program is reached. The required nonrefundable confirmation fee will be returned only in the event that it is received after the enrollment limitation is reached. Confirmation deposits are non-refundable.

STUDENTS NOT GRANTED ADMISSION

An applicant who is not granted admission as an entering freshman may wish to consider a transfer to the University after one or two years of study elsewhere (see transfer requirements section). In the best interest of students pursuing educational goals for which they may lack some academic preparation, the University Committee on Admissions often recommends that such applicants complete at least one full year of college-level course work at another college which will prepare the student for an eventual successful experience at the University of Colorado, Boulder.

Transfer Student Admission Guidelines

Applicants are considered transfer students if they have enrolled for any college-level course work, full time or part time, since graduation from high school. College-level course work taken while still in high school does not qualify an applicant as a transfer student. To be considered for admission, transfer students must be eligible to return to all collegiate institutions attended, and they must report all previous college work.

TRANSFER ADMISSION REQUIREMENTS

1. College of Arts and Sciences and College of Music. Transfer students who have attained a cumulative college grade-point average of 2.0 (2.0 = C) will be considered for admission on an individual basis. Work in progress at the time of application cannot be considered in computing the cumulative average. However, the admissions acceptance of transfer applicants is based on the provisions that course work in progress is completed satisfactorily and the cumulative grade-point average remains above a 2.0.

2. College of Business and Administration, College of Engineering and Applied Science, and College of Environmental Design. Resident transfer students who have attained a cumulative college grade-point average of 2.75 or better and nonresidents who have a cumulative college average of 3.0 or better will be considered for admission on an individual basis. Work in progress cannot be considered in computing the cumulative average.

Important Note. It is important to emphasize that transfer students are selected for admission on an individual basis. A good college grade-point average is not, by itself, a guarantee of admission because the courses a student has taken in college are as important as the grade-point average. Furthermore, grade-point average requirements may vary from term to term depending on the quality of the applicant pool and the number of transfer spaces available for a given college or school. Finally, certain schools and colleges have additional requirements, for example:

1. The College of Music requires an audition of all entering freshmen and undergraduate transfer students. Personal audition dates are February 6, 1982, February 27, 1982, and March 13, 1982. In lieu of the personal audition, applicants may substitute tape recordings (about 10 minutes in length on 71/2 ips monaural). Interested students should write to the College of Music on the Boulder Campus for audition applications.

2. The School of Pharmacy considers applications for the fall semester only. Applications must be submitted to the Office of Admissions with a $20 nonrefundable processing fee and official transcripts by March 1, 1982 for fall 1982 admission consideration. The Pharmacy College Admission Test (PCAT), which is optional, should be completed not later than February 1982 for fall 1982 admission. The PCAT test report must be mailed directly to the School of Pharmacy. For additional information contact the University of Colorado, School of Pharmacy, Ekeley W181 (Campus Box 297), Boulder, Colorado 80309.
3. The College of Engineering and the College of Environmental Design require a high school transcript and SAT or ACT test scores in addition to all college transcripts.

4. The College of Engineering expects a transfer applicant to have taken a curriculum in college which prepares one for advanced work in engineering. For example, it is expected that transfer students will have completed some college-level work in calculus, physics, chemistry, etc.

5. The College of Environmental Design expects that transfer students will have taken not more than 60 semester hours (including present course load) to include general physics and college calculus.

6. The School of Nursing at the University of Colorado Health Sciences Center, not the Office of Admissions in Boulder, considers all School of Nursing applicants who have or will have completed 60 semester (30 quarter) hours of appropriate prenursing college-level course work by the time they plan to enter the program. Students ready to enter the nursing program must apply directly to the School of Nursing, C-288, University of Colorado Health Sciences Center, 4200 East 9th Avenue, Denver, Colorado 80220.

Applicants interested in nursing who have less than the required college course work to enter the School of Nursing are considered for prenursing in the College of Arts and Sciences. Prenursing applicants apply to the Office of Admissions, University of Colorado, Boulder, Colorado 80309.

An applicant who is not admitted to nursing and who wishes to be considered for another field of study on the Boulder Campus must request that the application and credentials be forwarded to the Office of Admissions in Boulder with a request for a change of major.

All transfer students who have completed less than 24 hours of college work (or 36 quarter hours) must submit an official high school transcript, and all transfer students who have completed less than 12 semester hours of college work (or 18 quarter hours) must submit SAT or ACT scores in addition to a high school transcript. The College of Engineering and the College of Environmental Design require a high school transcript and SAT or ACT test scores regardless of the number of hours of college work completed. Students who are not high school graduates must also submit copies of a certificate of high school equivalency and G.E.D. scores in addition to the above documents.

Transfer students are urged to read application materials carefully to be certain they submit all necessary credentials. Failure to do so could delay or hinder admission.

TRANSFER OF COLLEGE LEVEL CREDIT

The Office of Admissions performs an initial evaluation of transfer credit after an applicant has been accepted and has confirmed his or her intent to enroll with the required confirmation deposit. A complete evaluation of transfer credit cannot be expected until all official credentials have been received. The deans' offices determine whether and how transfer credit applies to specific degree programs. Because graduation requirements vary from one school or college to another, no assurance can be given regarding the acceptance of transfer credit to any specific degree program.

College level credit is considered for transfer using the following guidelines:

1. Provided it has been earned at a college or university of recognized standing, or from approved subject examinations of the Advanced Placement Examinations, College Level Examination Program, or in military service or schooling as recommended by the Commission on Accreditation of Service Experiences of the American Council of Education.

2. If a grade of C or higher has been attained in a specific course.

3. The University may accept up to 72 semester hours from a two-year college.

4. Generally, no credit is allowed for vocational, technical, or remedial courses.

5. A maximum of 60 semester hours of extension and correspondence work (not to exceed more than 30 semester hours of correspondence) may be accepted if the above conditions are met.

WHEN TO APPLY

Transfer applicants may submit their applications as soon as they have registered for the last term which they intend to complete at their present school. All applicants (resident and nonresident) are required to pay a $20 processing fee. This fee, in the form of a check or money order made payable to the University of Colorado, Boulder, must accompany the application and is nonrefundable.

Because of enrollment restrictions at the University of Colorado, Boulder, applications and/or credentials for admission submitted after June 1 for the following fall semester or November 1 for the following spring semester are regarded as late applications and will be considered only on an individual, space-available basis.

CHECKLIST FOR TRANSFER APPLICANTS

A complete application should include the following required credentials:

1. Application for admission.
2. The nonrefundable $20 application fee.
3. Two official transcripts from each college or university attended.
4. Students who have completed less than 24 semester hours (or 36 quarter hours) of college work at the time they apply must submit an official high school transcript, or, if not a high school graduate, they must submit copies of their certificate of high school equivalency and GED scores, plus an official transcript of any high school work completed. Furthermore, students who have less than 12 semester hours (18 quarter hours) of college work at the time they apply, must also submit either SAT or ACT scores in addition to the above documents. (Important: College of Engineering and College of Environmental Design applicants must submit an official high school transcript and SAT or ACT test scores regardless of the number of hours of college course work.)
5. If applicable, copies of Certificate of High School Equivalency and GED test scores.

6. A student who is claiming exemption from the College of Arts and Sciences foreign language graduation requirement on the basis of satisfactory completion of Level III (third-year high school level) foreign language in high school must submit an official high school transcript to the College of Arts and Sciences dean’s office within the first year of residency in the college.

TRANSFER NOTIFICATION AND CONFIRMATION

Ten to twelve weeks after the Office of Admissions has received all required credentials, the applicant will be notified regarding eligibility for admission on a rolling admissions basis. If accepted, the applicant will receive a confirmation form and housing information and must return the confirmation form and required, nonrefundable confirmation deposit before the enrollment limits are reached. The confirmation form and the designated deposit must be returned before the enrollment limitation for the applicant’s program is reached. The required nonrefundable confirmation fee will be returned only in the event that it is received after the enrollment limitation is reached. Confirmation deposits are nontransferable.

Foreign Students

Foreign student applicants are required to contact the Office of International Student Admissions, Regent Administrative Center 125, before submitting an application. The foreign student must submit special application forms, follow special procedures, and observe specific deadlines. Please note that persons who have established permanent resident status in the United States and have alien registration numbers are not considered foreign students.

Readmission of Former Undergraduate Degree Students

A former degree-seeking University of Colorado undergraduate student who is in good standing and who has not attempted 12 or more semester hours (18 or more quarter hours) at another collegiate institution must complete an application form but does not need to pay the $30 processing fee. A transcript of any course work taken elsewhere that is not presently a part of the student’s record should be sent to the Boulder Campus. If the student is changing from a previous school or college, the change should be noted on the application; otherwise, it will be assumed that the student is returning to the same field of study. If a school change is requested for which the student is not eligible, the student will automatically be considered for his or her previous program.

A former student who is in good standing and who has attempted 12 or more semester hours (18 or more quarter hours) of course work at another institution since the last attendance at the University of Colorado must submit an application and a $20 fee. Official transcripts from each college or university attended for which the University has no record must also be sent.

The student should follow the instructions above if changing the former field of study.

After the Office of Admissions has received all required credentials, the applicant will be notified regarding eligibility for admission. If eligible, the applicant will receive a confirmation form and must return the form and designated nonrefundable confirmation deposit before the enrollment limits are reached or the deadline is passed. If the confirmation is accepted, the student will be sent information regarding registration and, if desired, on-campus housing. The confirmation deposit will then be applied to the first semester’s tuition and fees. Confirmation deposits received after enrollment limits are reached will be refunded.

It should be noted that enrollment limits apply to returning former students and that an application or confirmation received after the enrollment limit is reached cannot be accepted.

Intrauniversity Transfer

An undergraduate student who is enrolled on the Boulder Campus of the University and who wishes to transfer to a different school or college on the Boulder Campus must submit a completed Intrauniversity Transfer Application to the new school or college before enrollment limits are met or deadlines are passed for the desired term and field of study. The application should be obtained from the office of the school or college in which he or she is presently enrolled and submit it to the new college or school with a Dean’s Page (unofficial transcript).

Any student who fails to enroll in the new school for the term to which accepted must reapply for admission reconsideration for future enrollment. This includes students who choose to study abroad instead of attending the new colleges to which they have been admitted as intra-university transfers.

A graduate student wishing to change department or major must submit a new Part I and Part II of the graduate application to the new department or school and request the former department to forward recommendations and credentials.

Admission of Special Students

The special student classification has been established to meet the needs of those students who wish to take University courses but who do not presently intend to work toward a degree at the University of Colorado. Permission to register for specific courses is contingent upon the availability of space. Special students may have difficulty obtaining course space due to class enrollment limits. Special students are not permitted to enroll for courses in the College of Business and Administration except during the summer term.

The possibility exists that special students may be registered through the Division of Continuing Education in the event that Boulder Campus enrollment limits have been met. For further information, prospective special students for fall or spring semesters should contact the Division of Continuing Education. Prospective special students for the summer session should contact the Office of Admissions.
ADMISSION REQUIREMENTS

Special students must be 18 years of age or older in order to qualify for admission and must have a high school diploma or its equivalent.

Persons who have attended a college or university previously must be in good standing at all collegiate institutions attended.

FOREIGN STUDENTS

Students holding temporary visas may not gain admission as special students for fall or spring terms without special permission from the Division of Continuing Education. Summer applicants must contact the Office of Admissions. Foreign students who are not studying in the United States and therefore do not have temporary visas generally are not accepted to enter the University as special students for any term, including the summer session.

SPECIAL STUDENT PROVISIONS

Special students may register for courses on a pass/fail basis. However, such courses will be counted in the hours of pass/fail permitted according to the rules of the school or college to which the student is admitted if the student changes to a degree status.

Special students may not register concurrently on more than one campus of the University of Colorado.

SPECIAL STUDENT ELIGIBILITY

Once special students have attempted 6 hours of credit, they must maintain a 2.0 cumulative grade-point average. Failure to maintain the required average will result in suspension. Special students under scholastic suspension may register for summer session to raise grade-point averages. If the average is raised to a 2.0 or better, the student may petition the Division of Continuing Education to release the suspension to enroll for a subsequent term.

TRANSFER TO AN UNDERGRADUATE DEGREE PROGRAM AT UCB

The special student may apply for admission to an undergraduate degree program by submitting an undergraduate admission application, complete academic credentials, and the $20 nonrefundable application fee. Accepted students in any college may transfer up to 12 hours of special student work toward their baccalaureate degree programs with approval of the appropriate dean's office. (Acceptance of credit toward degrees at the University changed in fall 1970. Special students enrolled prior to that date may transfer credit in accordance with provisions in effect between January 1969 and August 1970.)

For information about changing from special to degree status at the undergraduate level, students should contact the Boulder Campus Office of Admissions.

TRANSFER TO A GRADUATE DEGREE PROGRAM AT UCB

A special student desiring to pursue a graduate degree at UCB is encouraged to submit the complete graduate application and supporting credentials to the graduate department they wish to enter.

A department may recommend to the graduate dean the acceptance of as much as 8 hours of credit toward the requirements for a master's degree for courses taken either as a student at another recognized graduate school, as a special student at this University, or both. In addition, the department may recommend to the graduate dean the acceptance of credit for courses taken as a special student at this University during the semester or summer session for which the student has applied for admission to the Graduate School.

RENEWAL OF TEACHER CERTIFICATION

A certified teacher with a baccalaureate degree who seeks only a renewal of the certificate currently held and who does not require institutional endorsement or recommendation may qualify for the University-wide special student classification as outlined above.

INITIAL TEACHER CERTIFICATION

A person who has a baccalaureate degree and who seeks initial teacher certification must submit an application for degree status to the Boulder Campus Office of Admissions and must also apply to the School of Education for the Teacher Education Program. Interested students should consult the Office of Teacher Education in the Education Building for application and deadline information.

TRANSFER OF CREDIT TO ANOTHER INSTITUTION

Although special students enroll in regular university courses, and an official transcript of credit is available, the acceptance of special student credit at other institutions of higher education is within the jurisdiction of the receiving institution.

Members of Faculty

No member of the faculty above the rank of instructor may receive an advanced degree from this University.

Auditors

Mature persons who wish to visit classes or lectures without examination or credit may register for an auditor's ticket for either fall or spring semester. The cost of an auditor's ticket is always the minimum tuition charge. Auditors' tickets are not issued during the summer session. A person who purchases an auditor's ticket may not also register for credit in other courses at any University of Colorado Campus. Regular degree, enrolled, graduate students may audit graduate courses for no charge, provided they have the permission of the instructor. The course will not appear on the transcript.

Auditors do not register for specific courses, and no record is kept of the classes attended. They are entitled to listen to the lectures and class discussion but they may not enter into the class discussion or participate in any other activities of the course. Auditors may not attend laboratory courses or any courses where University equipment is used.
SENIOR AUDITOR PROGRAM

The University of Colorado, Boulder, offers a Senior Auditor Program to residents of the area who are 60 years of age or over. Senior auditors attend classes on a tuition-free, space-available basis. No record is kept of attendance, no examinations are taken for credit, and class participation is at the discretion of the instructor. Senior auditor privileges include the use of the library.

Concurrent Enrollment

Degree-seeking students who wish to attend two University of Colorado campuses concurrently must contact their home campus Office of Admissions and Records or Office of Registrations (UCB).

Credit for Military Service and Schooling

If copies of discharge, separation papers, and a DD Form 295 (Application for the Evaluation of Educational Experience During Military Service) are submitted to the Boulder Campus Office of Admissions at the time of application, after acceptance and subsequent confirmation, an evaluation will be made and credit awarded as recommended by the Commission on Accreditation of Service Experiences of the American Council on Education to the extent that such credit is applicable to the degree sought at this university.

Credit will be allowed for college courses satisfactorily completed through the U.S. Armed Forces Institute, subject to the usual rules involving credit of this nature.

College-Level Examination Program (CLEP) Subject Examinations

By testing in University-approved Subject Examinations provided by the College-Level Examination Program (CLEP) of the College Board (CEEB), students may gain advanced standing and college-level credit to broaden their education, fulfill basic graduation requirements, and/or accelerate their program of study to graduate early.

College credit for approved CLEP examinations may be considered provided the scores are at the 67th percentile or above. Such credit will be treated as transfer credit without a grade and may be applied toward requirements at the discretion of the student’s dean’s office. Official test scores must be submitted to the Office of Admissions, Regent Administrative Center 125. For further information concerning University of Colorado credit by examination write to:

University of Colorado
Counseling Services, Testing
Campus Box 103
Boulder, Colorado 80309

Note: not all colleges accept CLEP credit in all subjects. Refer to the appropriate college dean’s office for the policy of that college.

Advanced Standing by Examination

Degree-seeking students have the opportunity to take examinations for credit. The fee for an advanced standing examination which is taken to pass a course without otherwise registering for or taking the course is assessed at the lowest resident tuition charge currently in effect for the Boulder Campus. Arrangements for the examinations are made through the Boulder Campus Office of Records. Interested students may contact this office for information on this program. The fees for the examinations are payable in advance and are nonrefundable.

Advanced Placement Program

The University of Colorado, Boulder, is a cooperating member of the Advanced Placement Program of the College Entrance Examination Board which provides able high school students, while still in high school, an opportunity to take work and be examined for credit on the college level.

Advanced placement and college credit may be granted on the basis of the College Entrance Examination Board's Advanced Placement Test. For students who achieve scores of 3, 4, or 5 on the CEEB Advanced Placement Examination, advanced placement as well as college credit may be granted. Official test scores must be submitted to the Office of Admissions, Regent Administrative Center 125. College credit granted will be treated as transfer credit without a grade but will count toward graduation and will meet other specific requirements for which it may be appropriate.

REGISTRATION

See Academic Calendar for time to report. There is a penalty for late registration which is explained fully under Fee Regulations.

Family Educational Rights and Privacy Act

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

A Directory of Records which lists all education records maintained on students by this institution may be found in the Office of the Chancellor on each campus.

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

Currently enrolled students may withhold disclosure of directory information under the Family Educational Rights and Privacy Act of 1974. To withhold disclosure, written notification must be received each term in the Records Office on the appropriate campus prior to the 11th day of classes. Forms requesting the withholding of directory information are available in the Records Office.

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.

Questions concerning the Family Educational Rights and Privacy Act may be referred to the Office of Admission and Records or Office of Records (UCB) of the student's home campus.

Boulder Campus Course Load Definitions

The following definitions classify students according to course load enrollment during the academic year.

Undergraduate. A full-time undergraduate student is one who is enrolled for and completes 12 or more credit hours per semester.

Graduate. Students are considered full-time by the Graduate School if they are enrolled for 6 semester hours in coursework numbered 500 or above, or at least 8 semester hours of other graduate work or thesis in a regular semester.

ATTENDANCE

Students should consult the college and school sections of this catalog for information concerning attendance rules.

UNIFORM GRADING SYSTEM AND PROCEDURES

The following grading system and procedures for pass/fail registration, dropping and adding courses, and withdrawal from the University were standardized for all schools and colleges of the University effective with the 1974-75 academic year.

Grade Symbols

The instructor is responsible for whatever grade symbol (A, B, C, D, F, IF, IW, or IP) is to be assigned. Special symbols (NC, W, and Y) are indications of registration or grade status and are not assigned by the instructor. Pass/fail designations are not assigned by the instructor but are automatically converted by the grade application system, explained under Pass/Fail Procedure.

A—superior/excellent—4 credit points per credit hour
B—good/better than average—3 credit points per credit hour
C—competent/average—2 credit points per credit hour
D—minimum passing—1 credit point per credit hour
F—failing—no credit points per credit hour

IF—incomplete—regarded as F if not completed within one year maximum
IW—incomplete—regarded as W if not completed within one year maximum
IP—in progress—thesis at the graduate level only
P/F—pass/fail—P grade is not included in the grade point average; the F grade is included; up to 16 hours of pass/fail course work may be credited toward a bachelor's degree; a letter grade of D or above is considered passing

SPECIAL SYMBOLS

NC—indicates registration on a no-credit basis
W—indicates withdrawal or drop without discredit
Y—indicates the final grade roster was not received by the time grades were processed

EXPLANATION OF IW AND IF

An IW or IF is an incomplete grade. Policies with respect to IW/IF grades are available in the individual college and school dean's offices.

Add Procedure

See Drop Procedure for information regarding adding courses.

Credit/No Credit

Students must register for credit or no credit by the census date, i.e., the 12th day of instruction in the semester. No changes in credit/no credit registration will be permitted after the census date. Students enrolled for no credit are expected to do all of the work of the course.

Pass/Fail Procedure

1. Any student who wishes to register for a course on a pass/fail basis should do so during regular registration procedures. (Up to 16 semester hours of regular course work may be taken on a pass/fail basis and credited toward the bachelor's degree.) Changes to or from a pass/fail basis may be effected only during the regular drop/add period (first 12 days of classes).
2. There are more stringent requirements in some colleges. The College of Engineering and Applied Science requires departmental approval before a student may enroll for any course on a pass/fail basis. Students should check with their dean's office to determine requirements.
3. The record of pass/fail registration is maintained by the Boulder Campus Records Office.
4. Academic deans and faculty will not be informed of pass/fail registration. All students who register on a pass/fail basis appear on the regular class roster and a normal letter grade is assigned by the professor. When grades are received in the Records Office, those registrations which require a pass/fail designation are automatically converted by the grade application system. Grades of D and above convert to grades of P.
5. Only 6 hours of course work may normally be P/F in any given semester.
6. Exception to the pass/fail regulations is permitted for certain specified courses offered by the School of
Education, the School of Law, the Division of Continuing Education, Study Abroad Programs, and Experimental Studies Program.

7. Graduate degree students can exercise the P/F option for undergraduate courses only. However, a grade of P will not be acceptable for graduate credit to satisfy any Graduate School requirement.

Drop Procedure Prior to Census Date

Students will be allowed to drop and add courses, including independent study and thesis credits, during the first 12 days of the semester with no signatures required on the Drop/Add form. Adds are not allowed after the first 12 days of classes. Individual schools and colleges may have further restrictions on this time period.

Drop Procedure After Census Date

1. After the 12th day of classes, the instructor’s signature is required on the drop card. Students may not drop courses which they are failing after the 12th day of classes. Courses dropped after this date will appear on the permanent record with a grade of W. No refund is made for courses dropped after the 12th day of classes.

2. After the drop deadline, courses may not be dropped unless there are documented circumstances clearly beyond the student’s control (accident, illness, etc.). In addition to the instructors’ certification (as in 1 above), the student must petition his or her dean’s office for approval to drop the course. Individual schools and colleges may have further restrictions on this time period. Petitions normally will not be approved after the drop deadline.

3. Students who are reported not attending a course for which they are registered NC will be administratively dropped and assigned a grade of W for that course.

4. Students may not drop courses which they are failing.

5. No refunds will be made for dropping courses after the 12th day of classes. Charges will be assessed for the addition of courses.

6. Dropping all courses requires an official University withdrawal form.

Withdrawal Policy Regarding Tuition and Fees

Payment of the registration or confirmation deposit and submission of registration materials oblige the student to pay the full amount of tuition and fees for the semester. If a student withdraws from the University, assessment of full tuition and fees is made as follows:

1. Full amount of tuition deposit through the first 12 days of the semester.

2. Forty percent from the 13th day through the 22nd day of the semester or the tuition deposit, whichever is the greater.

3. Sixty percent from the 23rd day through the 32nd day of the semester or the tuition deposit whichever is the greater. No refund thereafter.

Withdrawal Procedure

To withdraw from the University, the student must obtain approval of the academic dean’s office, the counseling and student affairs office, and the bursar’s office. Failure to contact the bursar’s office on withdrawal from school will obligate the student to pay full tuition and fees for the semester.

1. Students holding a temporary visa must obtain clearance from the UCB Office of the Foreign Student Adviser.

2. Veterans must obtain clearance from the UCB Veteran’s Office, Willard Administrative Center.

3. Students having a National Defense/National Direct Loan must participate in an exit interview at the bursar’s office concerning their rights and responsibilities under the N.D.S.L. program.

4. Students must pay any outstanding emergency short-term loans.

Notation is recorded on the student’s permanent record page. Students who do not officially withdraw are subject to grades of F for all course work.

Students who withdraw without communicating with the office of the dean and filing the appropriate Withdrawal Form will be marked as having failed their courses for the term. A graduate student who desires to withdraw from the University must apply to the dean of the Graduate School for permission to withdraw in good standing.

Originality of Work

In all academic areas it is imperative that either work be original or explicit acknowledgment be given for the use of other persons’ ideas or language. Students should consult with instructors to learn the specific procedures appropriate in each given field. Breaches of academic honesty can result in disciplinary measures ranging from lowering of a grade to permanent compulsory withdrawal from the University.

Grade-Point Average

The grade-point average is computed by multiplying the credit points per hour (A = 4 credit points per hour, B = 3, C = 2, D = 1, F = 0) by the number of hours for each course, totaling the hours and the credit points, and dividing the latter by the former.

Grades of P, NC, Y, W, IP, IW, and IF are not included in the grade-point average.

If the IF grade has not been completed within one year maximum, it is regarded as failed and a grade of F is automatically calculated in the grade-point average at the end of the one-year grace period.

If a course is repeated, all grades earned are used in determining the grade-point average.

The grade-point average of graduate students includes only courses, credit hours, and credit points accumulated while enrolled in the Graduate School.

The grade-point average does not appear on official transcripts issued from the Records Office, but does appear on the Grade Report issued each semester.

Students should consult with their dean’s office for explanation of any exceptions made to the University uniform grade-point average.
Grade Reports

Grade reports are normally available for students to pick up from their dean's office within two to three weeks after the end of the semester. Grade reports are not automatically mailed; however, a self-addressed, stamped envelope may be supplied to the dean's office by individual students.

Transcripts

Transcripts of academic record at the University of Colorado (all campuses) may be ordered in person or by mail from the UCB Records Office, Campus Box B-7, Transcript Section, Regent Administrative Center 125, Boulder, Colorado 80309. Official transcripts will not be available until approximately five weeks after final examinations. A transcript that is to have the degree recorded will not be available until approximately eight weeks after final examinations. Requests should include the following:

1. Student's full name (include maiden or other name if applicable).
2. Student number.
4. The last term and campus where the student was in attendance.
5. Whether the current semester grades are to be included when a transcript is ordered near the end of a term.
6. Agency, college, or individuals to whom transcripts are to be sent. Complete mailing addresses should be included. Transcripts sent to students are labeled "issued to student."
7. Student's signature. (This is the student's authorization to release the records to the designee.)

There is no charge for transcripts. Transcripts are prepared only at the student's request. A student having financial obligations to the University that are due and unpaid will not be granted a transcript. Copies of transcripts from other institutions cannot be furnished.

EXPENSES, BOULDER CAMPUS

Enrollment Confirmation Deposit

Nonrefundable confirmation deposits are required from all first time and/or returning former undergraduate, graduate, and law applicants when they confirm their intent to enroll for the fall or spring semesters. Students must submit the deposit regardless of any financial aid that may or will be received. Tuition deposits may be required for the summer session. In addition, freshman applicants are required to pay a designated advance payment for housing which will be applied to the following spring semester.

Confirmation deposits should be made by the date specified on the Student Confirmation Form; and will be accepted only until the enrollment limit is reached. Deposits received after the limits are met may be returned.

Matriculation Fee

There is a one-time nonrefundable matriculation fee of $15 for new degree students. This fee will be assessed at the time of initial registration. Charges then will not be made for adding or dropping courses or for transcript orders. A special student who is admitted to degree status will be assessed a $15 matriculation fee at the time of the student's first registration after the charge has been made.

Tuition and Fees, Per Semester

BOULDER CAMPUS

Tuition and fees for 1982-83 have not yet been set. The rates per semester for the 1981-82 school year are as follows:

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</tbody>
</table>

1. Students making separate registrations on more than one campus of the University for 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. Students using the advance concurrent registration system to enroll for courses on more than one campus for a single term will pay the applicable tuition and fee rates of the student's home campus for the total hours enrolled for at all campuses.
2. Any permanent employee may enroll for not more than 6 semester hours credit and any permanent part-time employee for a proportionate number of hours of credit in any year without payment on a space available basis. Time taken to attend classes during normal working hours shall be made up and shall be

The Board of Regents reserves the right to change tuition and fees without prior notice.

1Students registered for 4 or more hours will be assessed a $2.00 fee for women's collegiate athletics.

2A part-time registration fee of $30.00 per semester is assessed for each hour of enrollment.
limited to one course during any term. Persons appointed for less than full time are not eligible for release time during assigned hours.

3. Students admitted to "candidacy for degree" will register for and be charged for 10 hours of credit for each full-time term of doctoral dissertation work. For each term of part-time enrollment, students will be charged for 7 hours of credit, except that students not making use of campus facilities may petition the Graduate School for 3-credit-hour status. Continuous registration during the academic year (fall and spring) will be required until completion of the dissertation defense. Doctoral dissertation rates will be charged at the graduate resident and nonresident rates. Nonresident doctoral dissertation students pay 1/15 the applicable full-time rate for each credit hour of enrollment.

4. Nonresident students enrolled as master's "candidate for degree" only to take a comprehensive examination for a master's degree will pay for 3 credit hours at the rate prescribed for graduate resident students.

5. Students should see Drop/Add and Withdrawal Procedures for specific tuition and fee policies regarding drop/add and withdrawal.

6. 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.

7. Zero or fractional credit is regarded as 1 hour in assessing tuition and fee charges.

8. Insurance is not available unless the student pays full fees.

Summer term tuition and fees are listed in the Schedule of Summer Courses, available from the Office of Registrations after April 1.

Some courses carry laboratory or other fees for practical activities. Consult the Schedule of Courses for special fees.

All persons attending regularly scheduled classes must be registered or must have obtained an auditor's card. There is no auditor status in summer. Auditors, whether resident or nonresident, pay resident tuition for 3 credit hours per fall or spring semester for class instruction and library privileges only.

To qualify as an auditor for fall or spring semester, a student must be 21 years of age or older. Students may not be registered for any other University of Colorado courses during the time they are auditing and are not eligible to audit courses if they are under suspension from the University. The Records Office does not keep any record of courses audited; therefore, credit for these courses cannot be established. Auditors may attend as many courses as they wish, except those courses with laboratories or where equipment is used provided they have received permission from each instructor. Auditor's cards are issued after classes begin. This card should be presented to the instructor when requesting permission to attend a class.

LABORATORY BREAKAGE DEPOSIT

A $10 or $20 deposit is required for each laboratory course for which a student is registered. The unused portion of the deposit is returned at the end of the course.

Fee Regulations

1. Payment of Fees. Students enrolling at the University of Colorado Boulder Campus are responsible for full payment of tuition, fees, and University dormitory charges. A student's initial bill will include the following charges: tuition, student fees, and University Housing charges (when applicable). The bill will include the following credits when applicable: financial aid awards, teaching assistant tuition adjustments, and advance payments or deposits. (Current deposits include confirmation deposits, tuition deposits, and housing deposits.) Housing deposits are not applied to the student bill until the spring semester. Failure to receive an official University billing will not relieve the student of responsibility for payment by the established due date. To avoid assessment of late payment charges and service charges, the student must see that payment of tuition and fees is received at the University by the published due date.

2. Registration Deposit. Whether or not students pay their fees just prior to the beginning of classes or mail in an advance payment, all continuing students are required to pay a minimum registration deposit by the specified business day in July in order to guarantee their fall registration. (The registration deposit for the spring semester is due at the time of preregistration in November.) New students, returning former students, and transfer students guarantee their registration through their nonrefundable confirmation deposits.

3. Deferred Payment Plan. Students may enroll in this plan by completing a Tuition Defeatherment Agreement, which will be available at the Bursar's Office. The deadline for submission is 4 p.m. on the 26th day of classes each semester. Tuition and fee balances of less than $100 are not deferrable. This plan will allow the student to pay tuition and fees in two installments. At least one-half of the obligation must be paid in the first installment. The deferred balance will be subject to a finance charge computed at a periodic monthly rate of 1 percent per month on the unpaid balance (equal to an annual percentage rate of 12 percent) beginning the first day of class. Payments under the deferred tuition plan are due approximately the fifth and ninth week of classes. The Board of Regents reserves the right to revise or eliminate this program at any time.

4. Enforcement. Failure to make the required payment on any due date will result in the following action:

a. The student may be withdrawn from the University, becoming ineligible for all University services;

b. No grades will be issued for courses in progress;

c. No transcripts, diplomas, certification, or preregistration materials will be issued for the student until the bill is paid in full;

d. A late payment charge in addition to the interest on the unpaid balance will be assessed according to the following schedule:

<table>
<thead>
<tr>
<th>Balance Due</th>
<th>Late Charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1-99.99</td>
<td>$5</td>
</tr>
<tr>
<td>$100-999.99</td>
<td>$10</td>
</tr>
<tr>
<td>$1000-4999.99</td>
<td>$20</td>
</tr>
<tr>
<td>$5000-9999.99</td>
<td>$30</td>
</tr>
<tr>
<td>$10000-99999.99</td>
<td>$40</td>
</tr>
<tr>
<td>$100000 and over</td>
<td>$50</td>
</tr>
</tbody>
</table>

14 / General Information
When a student defaults on a payment, an official notification will be mailed by the registrar to the student's address of record. The letter will inform the student that his or her account is overdue and that he or she may be subject to withdrawal. The student will also be informed of the appeal procedure.

5. Reinstatement. Students who fail to make required payments and who are withdrawn may become eligible for readmission for the next term only upon full payment of the balance due as determined by the University policy, plus any finance or late registration charges which have accrued.

6. Appeals. Students who are withdrawn following the beginning of classes for failure to make required payments, may appeal to a Tuition Adjustment Committee for reconsideration. The board will consist of three University administrators and four students. Appeals must be made in writing and must be received within 10 days of the student's removal from registration or enrollment.

7. Personal Checks. Any student giving a check not acceptable to the bank will be subject to withdrawal. Any student paying a registration deposit with a check not acceptable to the bank may not be sectioned for classes. Any student paying tuition with a check not acceptable to the bank may be subject to withdrawal from the University, a $6 returned check charge, late charges, and service charges. Any check presented to any department of the University which is returned from the bank unpaid will require payment of the amount due plus a $6 returned check charge. The student may also be liable for collection costs and prosecution under one of the following Colorado Criminal Statutes: 18-4-401, Theft by deception; 18-5-205, Fraud by check; 18-5-512, Issuance of a bad check. The University of Colorado at Boulder is a member of the Boulder Credit Bureau. Specific inquiries concerning reporting should be directed to the Collections Department of the Bursar's Office.

8. Withdrawal Policy Regarding Tuition and Fees. No change of program or withdrawal is valid without the written consent of the dean of the college or school in which the student is registered. Payment of the registration or confirmation deposit and submission of registration materials obligate the student to pay the full amount of tuition and fees for the semester. If a student withdraws from the University, assessment of full tuition and fees is made as follows:

1. Full amount of tuition deposit through the first 12 days of the semester.
2. Forty percent from the 13th day through the 22nd day of the semester or the tuition deposit whichever is the greater.
3. Sixty percent from the 23rd day through the 32nd day of the semester or the tuition deposit whichever is the greater. No refund thereafter.

Students who do not pay tuition and fees in full at the time of withdrawal must contact the Collection Department to arrange for payment.

9. Drop/Add Tuition Adjustment. Complete adjustment of tuition and fees will be made on drop/add changes through the first 12 days of classes only. No refunds will be made for dropping courses after the 12th day of classes. Charges will be assessed for the addition of courses.

10. Late Registration Fee. A late registration fee will be charged students who are authorized to register after their regular registration period. The late registration fee is $20 for the first day, $25 for the second day, and a maximum of $30 beginning the third day and thereafter. The late registration fee is separate and distinct from any penalty that may be assessed for late payment of tuition and fees.

Classification of In-State and Out-of-State Students

A student is initially classified as an in-state or out-of-state registrant for tuition purposes at the time an application and all supporting credentials have been received in the Office of Records. The classification is based upon information furnished by the student and from other relevant sources. After the student's status is determined, it remains unchanged in the absence of satisfactory evidence to the contrary. The student who, due to subsequent events, becomes eligible for a change in classification, whether from out-of-state to in-state or the reverse, has the responsibility of informing the Tuition Classification Officer, Office of Admissions, in writing within 15 days after such a change occurs.

An emancipated minor whose parents move their domicile from Colorado to a location outside the state is considered an out-of-state student from the date of the parents' removal from the state. The student will be assessed nonresident tuition at the next registration. The student or parent is required to send written notification to the tuition classification officer within 15 days after such a change occurs.

If an adult student or an emancipated minor establishes domicile outside Colorado, he or she is to send written notification within 15 days to the tuition classification officer.

PETITIONING FOR CLASSIFICATION CHANGE

Detailed instructions concerning the procedure to follow, deadline information, the necessary petition forms, and information regarding tuition classification criteria are available from the tuition classification officer, University of Colorado. Boulder Campus students should address their requests to Regent Administrative Center 125.

CLASSIFICATION NOTES

1. Petitions will not be acted upon until an application for admission to the University and complete supporting credentials have been received.
2. Changes in classification are made effective at the time of the student's next registration.
3. A student who willfully gives wrong information to evade payment of the out-of-state tuition is subject to legal and disciplinary action.

Housing

Living quarters are an important facet of a college student's life. The residence halls provide a wide range

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Footnote: Classification standards conform to state statutes and judicial decisions and are applicable to all of Colorado's state-supported colleges and universities.
of facilities and services which support the physical well being and the intellectual, cultural, social, and personal growth of single student residents. There are 21 residence halls units housing approximately 5,900 single students.

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

Housing rates per semester in the residence halls for 1981-82 are as follows:\footnote{It is expected that rates will be increased for 1982-83.}

<table>
<thead>
<tr>
<th>Housing Type</th>
<th>Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Board and single room</td>
<td>$1,100</td>
</tr>
<tr>
<td>Board and double room</td>
<td>$1,361</td>
</tr>
</tbody>
</table>

A $100 advance payment, which will be applied toward spring semester room and board, is required to reserve residence halls accommodations. All contracts are for the two-semester academic year. Only students entering the halls at midyear are granted one-semester contracts. A liquidated damage fee is charged if the student withdraws from the residence halls during the period of the contract. (See Residence Halls Agreement for details).

For information concerning available housing off campus, write or contact the University of Colorado Student Union (UCSU) Off-Campus Housing Office, Campus Box 206, Room 305, University Memorial Center, University of Colorado, Boulder 80309.

Single students desiring more information about University housing, or about the various residential programs which are offered, should correspond with the Supervisor, Residence Halls Reservation Center, University of Colorado, Boulder 80309. Family Housing information may be obtained from the Manager of Family Housing, 1350 20th Street, Boulder 80302. All new students receive, at the time of admission, an information booklet on student housing and a housing application form.

Estimate of Expenses

Expenses for students attending the University of Colorado, Boulder, may vary according to programs of study, personal needs, and individual interests. Tuition and fees may also vary substantially for students attending the Denver Health Sciences Center professional health service programs, the Denver Campus, or the Colorado Springs Campus.

It is difficult, therefore, to provide exact statements of total expenses. The following costs per academic year are established for undergraduate students attending the University of Colorado Boulder Campus in 1981-82; however, the Board of Regents reserves the right to change the costs for tuition and fees and room and board at any time.

\begin{equation}
\begin{array}{ll}
\text{Tuition and fees} & \text{Resident} \quad \text{Nonresident} \\
\text{Board and room} & \text{(on campus)} \\
\text{Total} & \text{$3,153 to $3,471$} \quad \text{$6,172 to $6,490$}
\end{array}
\end{equation}

\footnote{The Regents have passed a $20 per semester fee for all students registered for 12 or more credit hours on the Boulder Campus to provide support for Women's Intercollegiate Athletics.}

The cost of attending a single fall or spring semester would be one-half of the amount shown. Students planning to attend the optional summer sessions would add the appropriate amount as stipulated in the Schedule of Summer Courses. Additional costs would include transportation, books, supplies, special laboratory or departmental fees, special residential program fees, entertainment, any added health insurance, and any other personal needs or interest items or services. Many students are able to work part time on- and off-campus to earn room and board and pay for other miscellaneous expenses, substantially reducing the amount of outside financial help needed.

PARKING REGULATIONS, MOTOR VEHICLES AND BICYCLES

Students who wish to park a vehicle on the Boulder campus must purchase a permit each semester. Fall and spring semesters are considered four months each. The parking rates can range from $16 to $32 per semester. All available student parking will be assigned on a first-come basis. Public transportation is available between Denver and Boulder and within the city.

All bicycles operated or parked on University property must be registered with the Parking Management Office for a fee of $2 for two years. All valid city licenses will be honored, provided the owner registers the bicycle with the Parking Management Office at no charge. Any unregistered bicycle parked on campus is subject to impoundment.

Since parking and traffic regulations are frequently revised, all students should obtain copies of the latest regulations to avoid possible fines and/or impounding of their vehicles. Further information may be obtained from the Parking Management Office, 1511 University Avenue, 492-7364.

STUDENT FACILITIES AND SERVICES

Counseling Service

The University Counseling Service is located in 134 Willard Administrative Center and has the responsibility for assisting students in the following areas:

\textbf{Individual Counseling.} Individual counseling services are offered to students who are experiencing concerns in some area of their personal, social, or educational lives. In addition, career counseling and testing are available to students through the University Counseling Service. Examples of the nature of student concerns are loneliness, family or marriage conflicts, or poor grades. Personal concerns of any type may be discussed openly, frankly, and privately with one of the professional psychologists or counselors on the staff.

\textbf{Group Counseling.} Frequently, problems and concerns which students experience are most effectively met through some method of group counseling. This form of personal assistance allows students to help one another under the direction of a group counselor or psychologist. Throughout the year, the Counseling Ser-
services offer a series of workshops designed to help students gain skills in specific areas. Examples of the workshops offered are academic improvement, self-defeating behavior, assertiveness training, test anxiety, career-decision making, and social skills development.

Educational Counseling. The Counseling Service assists students in various schools and colleges by offering educational and career exploration opportunities. These services are designed to assist the student who wants to choose a major, receive general academic advising, learn about careers related to majors, and develop educational goals and objectives.

Women’s Center. The Counseling Service’s Women’s Center offers individual counseling, academic and job information, and testing services to University students, faculty, and staff, as well as to any mature woman or man who wishes to resume an interrupted academic program or to change or enrich a career. Special educational, vocational, and personal insight workshops are offered several times a year both on campus and in cities throughout the state.

Peer Counseling. Peer counselors (undergraduate paraprofessionals) are trained to provide academic assistance in the College of Arts and Sciences and to assist in various workshops offered by the Counseling Service. The unique role served by the peer counselor is to assist students on a student-to-student basis.

Testing and Assessment. The Counseling Service uses achievement, interest, and personality tests as an aid to the counseling available for students. All test batteries which are assigned or administered are interpreted for students by one of the Counseling Service staff.

Academic Skills Center. The University Academic Skills Center helps students increase reading speed, improve comprehension, and improve personal study habits. Classes are offered each term, and individual assistance is provided by a reading specialist. This service is located in Willard Administrative Center 231.

Call-Us University Tape Information Hotline. Frustrations caused by the University’s complexity can now be solved by a phone call to the Call-Us tape hotline at 492-5252. Answers to the questions students ask most frequently in the areas of admissions, financial aid, registration, Arts and Sciences, and Continuing Education have been recorded to give accurate, consistent information about the University and its services. Call-Us hotline offers over 150 tapes, each containing information approved by officials within the departments and giving up-to-date information. To use Call-Us, dial 492-5252 and request the desired tape number from the answering operator. Brochures listing tapes available are located throughout the campus in dormitory offices and building lobbies.

Commuters’ Club. The Commuters’ Club is a new University organization offering services specifically for the commuting student. Carpooling, discounts on bus passes, parking stickers, and lockers for commuters are among projects undertaken by the club. Information on becoming a member of Commuters’ Club is available in Willard 100, the Peer Counseling Office, or call 492-7620.

The above services are offered to University of Colorado students free, except the Reading and Study Skills Program, which requires a nominal fee. For further information about any of the Counseling Services, students may call 492-6766 or inquire in Willard Administrative Center 134.

Financial Aid

The purpose of the financial aid program at the University of Colorado at Boulder is to provide assistance to students who need help in meeting the cost of their education. Students who believe they will require financial aid to enroll are encouraged to submit aid applications. Approximately 15,000 students, or about 70 percent of the student body, annually receive need- and non-need-based financial aid from federal, state, University, or private sources. In most cases, grants are supplemented by part-time employment (work-study) and/or long-term loans to meet the demonstrated need of recipients.

Financial aid counselors are available to talk with prospective students and their parents regarding the financing of an education at UCB. Students who are unable to visit the office in the Environmental Design Building may call (303) 492-5091. Office hours are Monday-Friday from 9 a.m. to 4 p.m. (8:30 a.m. to 3:30 p.m. in the summer).

It is recommended that students who wish to apply for need-based financial aid submit a 1982-83 Family Financial Statement (FFS) to the American College Testing (ACT) Service. An FFS application should be available through local high school counselors or the UCB Office of Financial Aid around January 15, 1982. The preferential filing date for summer 1982 and the fall and spring semesters (1982-83 academic year) is March 1, 1982. FFS applications received after March 1 will be processed on a rolling basis according to the availability of funds. For students who wish to be considered for UCB aid for the summer session 1982, the FFS must be received by ACT by March 1 and all discrepancies must be totally resolved by May 1, 1982.

The Office of Financial Aid expects to begin making award/denial announcements in mid-April 1982 for those students who correctly submit an FFS prior to the March 1 preferential filing date. Students should note that financial aid applications will not be processed unless they have been officially admitted to or are currently enrolled in a degree-granting academic program at the University of Colorado at Boulder. Prospective students should not wait for formal verification of acceptance to UCB to apply for financial aid, however. Meeting the preferential filing date of March 1, 1982, is paramount.

Financial Aid recipients must complete (pass) a minimum of 12 semester hours (5 hours for graduates) each semester (6 hours for summer undergraduates, 3 hours for graduates in summer). Half-time students (minimum of 6 hours for undergraduates, 3 hours for graduates) may receive Guaranteed Student Loans, Pell (Basic) Grants, and/or on-campus student employment, if eligible. It is unlikely that the Office of Financial Aid will be able to provide the total amount of aid necessary to meet the full financial need.
demonstrated by most high need nonresident students. This is because of federal limitations on the annual and/or cumulative amounts of aid which may be awarded to individual students. Also, it is unlikely that the full financial need of every aid applicant (regardless of residency status) will be met because of the limited aid funds available.

STUDENT EMPLOYMENT AREA

The student employment area of the Office of Financial Aid assists students in seeking part-time positions while attending the University of Colorado. Services for students include part-time employment, work-study, federal summer work-study, odd jobs, and temporary employment. Students interested in working should visit the student employment area of the Office of Financial Aid in the basement of the Environmental Design Building.

Career Counseling and Occupational Information Services

The Career Counseling and Occupational Information Services office is located in Willard Administrative Center and assists students at all stages of their career development. Activities and services are detailed below:

Career Counseling. A staff of professional counselors will assist students in any area of their career concerns from career choice to assistance with job placement.

Career Exploration Groups. These groups help students become aware of themselves and the world of work. Activities include values clarification, skills analysis, receiving of occupational information, talking with individuals in occupations of interest, and decision making.

Computerized Career Information. A computerized system not only will help an individual select among more than 200 occupations, but also will give accurate job descriptions, salary levels, educational requirements, and information on outlook for the future, schools and college information, financial aid information, and employers in Colorado.

Career Library. Within the career library is a wealth of data on occupations, companies, schools and colleges, current job openings, and many other types of career-related information.

Job Skills Workshops. Workshops on resume writing, interviewing, job search techniques and skills analysis teach students the most up-to-date skills in these four most crucial aspects of finding a job.

Job Vacancy Bulletin. Published weekly, this newspaper lists hundreds of job openings, in Colorado and nationally, of interest to students and alumni.

Job Interviews. Throughout the year companies and organizations recruit students on campus. Last year over 3,000 interviews were conducted.

Credentials Service. Students and alumni may establish a file of references which can be mailed to prospective employers.

Liberal Arts Career Program. Counselors are available to assist liberal arts students in making career decisions and finding employment. The counselors make frequent visits with liberal arts employers.

Health Sciences Advising. Students applying to undergraduate and graduate health programs may obtain information about these programs and set up and send recommendations to colleges.

Students may go to Willard, Room 3, or call 492-3832 for additional information.

Cooperative Education Office

The Cooperative Education Office is located in Willard Administrative Center and assists students in finding preprofessional and professional level employment opportunities in their major field of study. The intent of the Co-op Office is to facilitate the placement of students in applied learning, academically relevant employment situations which will enhance the students' career potential.

Biweekly group orientation meetings are held to acquaint students with Co-op Program goals, opportunities, employers, and application procedures. The student will be expected to attend a group meeting prior to filing an application with the Co-op Office. The student will then attend an individual interview and, upon completion of the application will be referred to appropriate employers. Activities and services are detailed below.

Internship Advising. Program coordinators will assist students with all areas which revolve around the Co-op placement search: referral, interviewing, and setting up a learning contract; the Co-op assignment — progress reports, problem solving, evaluations; and administrative procedures — readmission, procedures, transcript notation, faculty liaison.

Interviewing/Referral. The Co-op Office will coordinate scheduling with employers who wish to do on-campus interviewing with prospective Co-op candidates. The office will also refer by mail those students who wish to make application with an employer not interviewing on campus.

Co-op Opportunities Information. In coordination with Career Services and appropriate faculty representatives, the Co-op Office will keep students informed of Co-op opportunities through weekly listings in the Job Vacancy Bulletin and posting notices. A listing of current positions will also be on file in the office.

Employer Information. The office coordinates information about companies and agencies with the Career Library in Career Counseling and Occupational Information Services.

Student/Faculty/Employer Presentations. The Co-op staff is available to give presentations to student groups, classes, and faculty or employer groups upon request. Developing new employer contacts and positions for students is an on-going concern and priority for the office.

Workshops/Seminars. The Co-op Office coordinates workshops with Career Counseling and Occupational Information Services relevant for students seeking Co-op placements (e.g. skills assessments, interviewing skills, resume writing). The office sponsors seminars several times a year for those students on assignment at that time, or after their return from an out-of-state placement.
The Cooperative Education Program is open to students from all colleges, both undergraduate and graduate levels. To be eligible for Cooperative Education, a student must be enrolled at the time of application in a degree program at the University’s Boulder Campus on a full-time basis and must have a grade-point average of 2.5 or better.

Alumni

The University of Colorado at Boulder alumni program is maintained by both alumni and University funds. Dues to belong to the Alumni Association are $15 per year for the first five years out of school and $25 per year thereafter, except for those alumni who are retired, who pay a $12.50 membership fee. All dues are charged on an annual basis and are family memberships if both husband and wife are University of Colorado at Boulder alumni. Dues are current for 12 months following the date of receipt. All graduates and former students are encouraged to keep their addresses current with the campus alumni office to receive notices of alumni activities in their area.

Dues-paying members help the Alumni Association in its efforts to assure high quality education at the University of Colorado at Boulder. These members receive all issues of *The Colorado Alumnus*, an alumni news tabloid published eight times annually which keeps alumni current with campus programs and progress as well as news about fellow alumni.

The Alumni Office maintains records of alumni; arranges alumni events at Homecoming, at Commencement, and with local alumni groups throughout the United States; plans class reunions and awards programs; sponsors an undergraduate alumni support group, alumni programs, and services for recent CU alumni; and offers a variety of other alumni-related programs.

The Alumni Office works closely with the Boulder Campus chancellor, faculty members, staff, and students in an effort to foster better communication between the Boulder campus and the total alumni body.

Day Care Center

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

Educational Opportunity Program

The Educational Opportunity Program (EOP), located in Willard Administrative Center, provides academically and financially disadvantaged minority students with an environment conducive to academic growth. Since 1967 EOP has been structured into five units: the Asian Americans (AA-EOP), Black Education Program (BEP), Migrant Action Program (MAP), Native American EOP (NA-EOP), and the United Mexican-American Students (UMAS-BOP). Services provide students with individual assistance in the following areas:

*Academic Support.* This program is designed to improve EOP students’ basic educational skills through specially designed curriculum and courses, tutoring, and academic advisement.

*Personal and Cultural Development.* Personal counseling, social/recreational/cultural activities; housing and family relations assistance; financial advising; and exit counseling aid in the social, emotional, and cultural development of EOP students.

*Career Development.* Career and vocational guidance, job development, and graduate and professional school advising are offered to increase career opportunities for EOP students while assisting them in career and occupational choices.

*Institutional Development.* Program activities include curriculum development, recruiting, cultural activities, instruction, and institutional relations in a campus environment more responsive to the academic and cultural needs of minority students.

*Administration.* Delivery of EOP Services is facilitated through program planning and development, program evaluation, community relations, and other administrative support.

For more information concerning admission to the University of Colorado through the Educational Opportunity Program, students may call 492-7884, 492-7555, or 492-5123.

Intensive English Center

The Intensive English Center (IEC) provides full-time instruction in English as a second language to international students from all parts of the world. The year-round program, which is designed to prepare adult learners for college or university work in Colorado or elsewhere in the United States, offers five eight-week sessions of intensive daily instruction at all levels of English-language proficiency. Orientation to academic customs and to life in the United States is an integral feature of the comprehensive curriculum which gives attention to all the language skills: listening, speaking, reading, writing. Application information may be obtained from the Intensive English Center by mail (Campus Box 178-E), in person (at the IEC Building at 889 17th Street), or by telephone (492-5547).

International Education

The Office of International Education maintains liaison among academic departments, administrative units, foreign governments, and U.S. governmental agencies and foundations. This liaison stimulates and provides administrative support for students and faculty members who desire to study or to conduct research overseas, and to assist foreign students, faculty members, and visitors who come to the University of Colorado.

Specific functions include expediting the exchange of students and faculty, arranging the programs of foreign visitors, promoting special relationships with foreign universities, and acting as an advisor for Fulbright and other international scholarships.
The Office of International Education maintains a small resource library on foreign study, travel, and work opportunity, including temporary summer jobs, volunteer internships, and career opportunities abroad. International Student Identification Cards and Eurail and Britrail Passes are also available through the office.

STUDY ABROAD

The study abroad office, a branch of the Office of International Education, offers over 20 different study-abroad programs around the globe. Some of these programs are of the traditional junior year abroad variety, which places a student directly in a foreign university for an academic year. Such programs are available at the Universities of Lancaster and East Anglia, and the London School of Economics, England; the University of Bordeaux, France; the University of Costa Rica, San Jose; the American University in Cairo, Egypt; the University of Regensburg, Germany; the Hebrew University in Jerusalem, Israel; the University of Bologna, Italy; Konan University, Japan; the University of Seville, Spain; Linköping University, Sweden; the National Taiwan University, Taipei, Taiwan; Catholic University of Lima, Peru; and Leningrad State University, U.S.S.R. Engineering and Commercial Spanish students may be particularly interested in programs at ITESM in Monterrey, Mexico. Generally students need to have completed a minimum of two years of college work with a B average or better and have studied two years of the appropriate language.

For students unable to spend an academic year abroad, programs for a single semester are available with various emphases, particularly on intensive language learning. Students may study beginning/intermediate language in Chambery, France, during the spring semester of each year. In either fall, spring, or summer, students may attend a one-semester language program in Jalapa, Mexico. Students who wish the experience of a foreign institution may attend a single-semester program in San Jose, Costa Rica; Rennes, France; or Seville or Cadiz, Spain; and Linköping, Sweden. Special summer and interim programs, e.g., art history in Italy, are organized with specific departments upon request.

Professional school students (business, education, engineering, environmental design, journalism, music) are encouraged to investigate five-year double degree programs leading to the professional bachelor’s degree and a B.A. in area studies or language, incorporating a year of study abroad.

All participants in University of Colorado study-abroad programs remain enrolled at the University and all credit earned while abroad is considered resident credit. Financial aid from the University can be applied to program costs in most cases.

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

FOREIGN STUDENT ADVISER

The University of Colorado has welcomed foreign students for many years. Currently more than 500 students from over 60 foreign countries are enrolled. The foreign student adviser, a member of the staff of the Office of International Education, provides information and assistance to foreign students regarding University regulations, legal requirements, financial matters, and personal affairs. All foreign students are urged to visit the foreign student adviser as soon as they arrive on campus and to maintain contact with him during their stay at the University. For further information concerning foreign students, one should call 492-8057 at the Office of International Education.

Office of Student Conduct Policies and Standards

Students should thoroughly familiarize themselves with the academic and nonacademic student conduct standards of the University. Academic standards questions should be directed to the dean of the school or college in which the student is enrolled. Nonacademic conduct questions should be directed to the coordinator of the Office of Student Conduct Policies and Standards.

Enrollment of a student in the University is a voluntary entrance to the academic community. Through voluntary entrance, the student assumes obligations of performance and behavior reasonably imposed by the University relevant to its lawful missions, processes, and functions. In addition, as students do not surrender their civil rights as citizens upon enrollment, their obligations of citizenship continue. Enrollment does not give them rights to immunity or special consideration with reference to civil and criminal laws.

Committing or physically attempting to commit the following acts shall be subject to disciplinary action which may include warning, probation, suspension, or permanent expulsion:

1. Intentional obstruction, disruption, or interference with teaching, research, disciplinary proceedings, or other University activities including its public service functions, or other authorized activities on University premises.

2. Impediment of freedom of movement of students, school officials, employees, and invited guests to all facilities of the University.

3. Physical abuse of any person on University-owned or controlled property or at University-sponsored or supervised functions, or conduct that threatens or endangers the health or safety of any such person.

4. Hazing in any and all forms. Hazing is defined as striking, laying hands upon, treating with violence, or offering to do bodily harm to another person with intent to punish or injure him or her, or other treatment of a tyrannical, abusive, shameful, insulting, or humiliating nature.

5. Prohibited entry to or use of University facilities has been defined as unauthorized entry or use of University property (facilities) for illegal purposes or purposes detrimental to the University.

6. Forgery, alteration, or use of University documents, records, or instruments of identification with intent to defraud the University.

7. Theft of or damage to University property and the private property of students, school officials, employees, and invited guests when such property is
located upon or within University buildings or facilities. Discipline in such cases may include compensation, replacement, or repair of the theft or damage to University or private property.

8. Unauthorized possession of firearms, explosives, or other dangerous weapons within or upon the grounds, buildings, or any other facilities of the University. If academic discipline is determined appropriate in such cases, discipline shall be limited to suspension or expulsion and, if suspension shall be determined appropriate, the minimum period of suspension shall be one semester.

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

Nothing in this section shall be construed to prevent peaceful and orderly assembly for the redress of grievances. For additional information, students should refer to the University of Colorado Student Conduct Policies and Standards brochure.

Ombudsman Office

The Ombudsman Office provides an informal grievance procedure for students who have had difficulty resolving conflicts with faculty or staff. The ombudsman is an unbiased mediator who helps students to document their cases by advising them of current policy and facilitates communication between both parties in a dispute. The office reviews policy and will make recommendations to revise policies when necessary. The office also offers an information and referral service including information on how to establish Colorado residency, academic requirements, University organizational structure, and deadline dates. Procedural information is published regularly.

Students are encouraged to stop by or call the office if they have questions or don't know where to go for help. The Ombudsman Office is located in UMCq, room 328; telephone, 492-5077.

Services for Disabled Students

The Office of Services for Disabled Students (OSDS) is a program recently established at UCB to assist disabled students in functioning within the University setting.

The goal of the office is to remove physical barriers and provide supportive services to permit students with disabilities to participate fully in the academic, cultural, and social activities of the University. This is accomplished by offering individualized services in the areas of admissions, registration, parking, housing, recreation, career counseling, and personal counseling, etc. A media center has been established to provide equipment and materials required by blind students. A program for deaf students is also being developed which includes interpreter services and special assistance with reading and language skills.

At the present time much of the Boulder Campus is accessible to individuals in wheelchairs. An active program is underway to remove the remaining barriers. Provisions exist to transfer classes to accessible locations when necessary. A van equipped to provide access to persons using wheelchairs is available for transportation of students. A program serving students with learning disabilities provides support to students enrolled in the regular academic program. Assistance is given both in developing more effective learning strategies and in grasping specific course work. Prospective students having disabilities are urged to correspond with the Office of Services for Disabled Students regarding special problems or needs.

Student Health Service

The Wardenburg Student Health Service is a 22-bed hospital and outpatient clinic located on the Boulder Campus. It is fully accredited by the Joint Commission on Accreditation of Hospitals and provides inpatient, outpatient, and emergency services. There are no facilities for major surgery or intensive care. If students do not have an insurance plan or prepaid health plan to pay for those services not available at the Student Health Service, it is recommended that they participate in the Supplemental Student Insurance Plan.

Services available to students are:

Outpatient Services: Medical Clinics, Psychiatry, and Gynecology. Subspecialty clinics available through referral are allergy; dermatology; ear, nose and throat; orthopedics; and neurology. The service is generally open from 8 a.m. to 5 p.m. Monday through Friday and 8 a.m. to 1 p.m. Saturdays.

Emergency Services. A physician and the hospital staff are at the Health Service after clinic hours and on weekends, except during academic breaks and summer session. The Psychiatric Department has a physician on call for psychiatric emergencies. The emergency entrance is on the south side of Wardenburg Student Health Service.

Ancillary Services: Laboratory, X-ray, and physical therapy services are available.

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

Vacation Periods. The outpatient clinic is open during some University holidays, academic breaks, and summer session. However, the hospital, emergency room, and subspecialty clinics are closed. If a student requires medical care not available from the Health Service, the care received elsewhere is at the student's own expense.

Medical History. All students entering the University for the first time are required to complete a medical history form which will be mailed with registration materials or is available at new student orientation or the Student Health Service.

Fee-for-Service. Students will be required to pay fees for some services. These fees are established by the Student Health Board and are subject to revision. For a current outline of charges, contact the Health Service.

The Wardenburg Student Health Service is a service of the University of Colorado Student Union (UCSU.)

Fraternities and Sororities

Currently at the University of Colorado, Boulder, there are approximately 30 social fraternities and sororities. There are over 2,200 students in these organizations. Even though there are no legal ties between the Greeks and the University, there is a
relationship of mutual cooperation and support, recognizing that the Greek system can make a valuable contribution to campus student life. It is the intent of the University to find specific ways in which the Greeks may be assisted in providing an educational, growth-oriented environment for their members in addition to integrating them more totally into the campus community. Additional information may be obtained by contacting the University-Greek Liaison or the Panhellenic/Interfraternity Council Office.

**University Memorial Center**

The University Memorial Center (UMC) serves as a focal point for campus nonacademic programs and activities. The UMC houses and provides such special services and facilities as (1) a reception desk which acts as a central campus information point; (2) a Fine Arts Center with an art gallery, browsing room, and music listening rooms; (3) a food service which includes a cafeteria, grill, delicatessen, pizza parlor, vending room, and catering operation with several private dining areas; (4) the University Book Center; (5) a conference center and special meeting rooms, including the Glenn Miller ballroom and the Forum Room; (6) a games area with bowling, billiards, and table tennis; (7) attractive lounges; (8) a photography laboratory for individual use; (9) an arts and crafts area offering noncredit classes in macrame, jewelry, pottery, leathercraft, batik, and others; (10) a copy center/sign shop; (11) a computerized ticket service; (12) a flower shop; (13) radio studios; (14) banking facilities; and (15) numerous offices for student organization and student government use.

The UMC has been designated as the official state memorial to those who died in past wars to preserve our democratic freedom. It has also been designated as a multicultural center where opportunities are provided for relationships and understanding between all cultures represented in the University and the community at large.

**Veterans Affairs**

The Veterans Affairs Office, located in the Willard Administrative Center, assists veterans and veteran dependents in receiving Veterans Administration Educational Benefits. Prospective students are always welcome at this office.

**Veterans Educational Benefits, Chapter 34 (G.I. Bill).** In order to complete application materials for benefits, the student must be accepted to the University of Colorado, Boulder, or admission must be imminent. If the student was discharged from the military before July 1, 1979, a certified DD 214 is required (certified copies of discharges can be obtained from any County Courthouse without charge); if the student was discharged after this date, Copy 4 of the DD 214 is required. An application for veterans benefits is completed and a statement of the tentative number of credit hours the veteran expects to take is completed. This and other necessary information allows the Veterans Affairs Office to enroll the student with the Veterans Administration Regional Office (VARO) in order to generate the appropriate monthly payment.

Promptness is imperative because it affects the time of the student's payment.

**Advance payment may be received at the start of a term if the application materials are submitted to the VARO by the Veterans Affairs Office approximately 60 days preceding the term.**

**Veterans Contributory Educational Program, Chapter 32.** The veteran must have participated in this program while in the service in order to receive benefits. Please read the above paragraph for instructions about the DD 214 and materials required for application.

**Dependent's Educational Assistance Act, Chapter 35.** Students between the ages of 18 and 26 who are eligible to receive educational benefits because of the death of a parent in active military service or because of a service connected disability should establish their eligibility with their Veterans Administration Regional Office. Children and wives of 100 percent disabled veterans may also qualify. This office needs the claim number that the Veterans Administration assigns to the student in order to complete paperwork. At each registration each dependent must complete paperwork with this office as described above.

Veterans who entered the service from the state of Colorado during the period August 5, 1964 through May 12, 1975 may be eligible for some state tuition assistance.

The Veterans Affairs Office has a counselor on the staff for providing assistance to students in planning academic schedules in relation to VA regulations. This service is free and confidential. The student is encouraged to stop by this office at any time.

**EDUCATIONAL FACILITIES**

**Health Sciences Center in Denver**

The University's Health Sciences Center is at 4200 East Ninth Avenue, Denver, on a 32-acre campus. It includes the School of Dentistry, the School of Medicine, the School of Nursing, the Health Sciences Center Division of the Graduate School, the University Hospitals, the Children's Day Care Center, the John F. Kennedy Child Development Center, and the Children's Diagnostic Center for the evaluation of emotionally disturbed children.

Also at the center are the Florence R. Sabin Wing for Research in Cellular Biology, the Denison Memorial Library, and the Humphreys Postgraduate Center. On the Health Sciences Center campus and cooperating closely with Health Sciences Center functions are the affiliated Webb-Waring Lung Institute, Eleanor Roosevelt Institute for Cancer Research, the Belle Foun-

bils Memorial Blood Center, the Barbara Davis Center for Childhood Diabetes, and the Rocky Mountain Multiple Sclerosis Center.

More than 1,900 students and trainees enroll annually at the Health Sciences Center. In addition to those who study for the dental, medical, and nursing professions in the Schools of Dentistry, Medicine, and Nursing, others study in such allied health fields as medical technology, physical therapy, occupational therapy, dental hygiene, child health associate
program, and as advanced degree candidates in the life sciences and in health administration.

Extending the regular undergraduate, graduate, and paramedical courses of study within its 23 departments, the School of Medicine offers intensive refresher courses for practicing physicians, more than 6,500 of whom attend these classes every year. The School of Nursing has a separate department of continuing education which offers workshops and courses in recent advances in knowledge and techniques to more than 1,500 practicing nurses and health care personnel each year. The School of Dentistry initiated an office of continuing education in 1970 and currently offers nearly 50 extension courses per year to dentists in Colorado and the region.

The $20 million University Hospitals and Clinical Research Wing at the Health Sciences Center were completed in 1964. New facilities for the School of Nursing were completed in 1967, and enlarged quarters for the School of Medicine and Graduate School were completed as segments of a $10.9 million expansion program in 1971. Dental school facilities were completed in 1976.

An important step toward winning the fight against childhood diabetes was taken on May 14, 1980, with the dedication of the $1 million Barbara Davis Center for Childhood Diabetes on the Health Sciences Center Campus. A $1.8 million School of Nursing addition was officially dedicated on September 5 and 6, 1990.

Colorado Springs Campus

The University of Colorado at Colorado Springs is located on a 400-acre campus on Austin Bluffs Parkway. Its programs and faculty recruitment are geared to serve the university-level needs of southern Colorado.

The College of Letters, Arts and Sciences offers the Bachelor of Arts degree in the fields of anthropology, biology, chemistry, distributed studies, economics, English, fine arts, geography and environmental studies, history, mathematics, philosophy, political science, psychology, Spanish, and sociology. A Bachelor of Science degree in chemistry is also offered.

The College of Business and Administration, the School of Education, and the College of Engineering and Applied Science offer programs leading to the baccalaureate degree. Courses toward graduate degrees are available through the Graduate School, the Graduate School of Business Administration, and the Graduate School of Public Affairs.

Additional credit and noncredit courses are offered by the Division of Continuing Education.

Denver Campus

The University of Colorado at Denver, located at Fourteenth and Arapahoe Streets in downtown Denver, serves the urban student and community with programs especially sensitive to the needs of the urban population and environment. UCD is sharing facilities in the Auraria Higher Education Center with Metropolitan State College and the Community College of Denver.

The University of Colorado at Denver is fully accredited by the North Central Association of Colleges and Secondary Schools and is a member of the Association of Urban Universities. Its educational endeavors emphasize quality instruction, professional and preprofessional training, research, and community service. Students may complete degrees in 35 undergraduate fields and nearly 50 graduate areas.

Academic programs within the University are offered by colleges which admit freshmen, by professional schools which admit students who have completed at least two years of preprofessional study, and by the Graduate School. Colleges and schools at UCD include the College of Business and Administration and Graduate School of Business Administration, School of Education, College of Engineering and Applied Science, College of Environmental Design, Graduate School, College of Liberal Arts and Sciences, College of Music, and Graduate School of Public Affairs. Additional research, public service, and instructional programs are offered through the Institute for Urban and Public Policy Research, Center for Urban Transportation Studies, Division of Continuing Education, and Center for Community Development and Design.

The Center for Environmental Sciences, a cluster of federally funded research grants, studies various environmental problems of concern to the state and nation.

Division of Continuing Education

The mission of the Division of Continuing Education of the University of Colorado, Boulder, is to facilitate the dissemination of knowledge to the adult community beyond the campus by providing the University’s academic resources in response to local, state, regional, and national needs. In accomplishing its mission, the division offers credit and noncredit courses, seminars, and related services to over 35,000 persons each year.

Learning experiences are provided by University-approved instructors in traditional, nontraditional, and innovative frameworks including the classroom, correspondence study, individualized instruction, and telecommunication programs. Boulder faculty frequently are the primary providers of instruction in the professional fields of real estate, law, business, and engineering.

The division, which is self-supporting through tuition and fees, offers the following certificate programs: Real Estate Education, Childhood Education, and Management Development. These programs may offer Continuing Education Units (CEUs), although they do not lead to credit toward a degree. Seminar programs focus on improving professional, technical engineering, and management skills as well as the development of human resources.

The division is responsible for administering, marketing, and coordinating educational activities designed and taught primarily for the benefit of persons who are not enrolled or considered as regular students on any of the University campuses. Clientele consists of governmental, business, and industrial organizations and agencies, students working to fulfill deficiencies,
and individuals seeking self-enrichment and alternative learning experiences.

Information is available from the Division of Continuing Education, Campus Box 178, Boulder, Colorado 80309, (303) 492-5146 and (303) 492-8756, and at the Western Colorado Continuing Education Office, P.O. Box 175, Grand Junction, Colorado 81501, (303) 242-5731.

Communication Disorders Clinic

The Communication Disorders Clinic has a two-fold purpose: it provides facilities for the training of undergraduate and graduate students and offers speech, language, and hearing evaluation and remediation services for the greater Boulder community, preschool to adult population. Any student of the University or any member of the community is eligible for the services offered. Services include evaluation of speech and language skills, training for the improvement of communication skills, evaluation of hearing, instruction in lipreading, and evaluation for hearing aid use. The clinic and the offices and classrooms for the Department of Communication Disorders and Speech Science are located in the Communication Disorders Building west of the Events Center. Address inquiries to Coordinator of Clinic Training and Services, Communication Disorders Building, Campus Box 409, University of Colorado, Boulder 80309.

Events/Conference Center

The Events/Conference Center (ECC) is a multipurpose facility which opened in November 1979. It provides an attractive, efficient, and comfortable setting for a wide variety of activities, offered for the benefit of the students, staff, and faculty of the University and for the community.

The ECC was designed and is utilized 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 of Colorado.

The main arena of the ECC has a seating capacity ranging from 8,500 to 12,000, depending on event configuration. The conference level offers six carpeted and air conditioned meeting rooms, which range in capacity from 40 to 150, depending on the type of activity.

Fine Arts Exhibitions

The Department of Fine Arts sponsors exhibitions of painting, graphic arts, photography, and sculpture from its own collections and from those of major museums, collectors, artists, and galleries throughout the country. The exhibitions are held in the Eve Drewelowe Gallery and the other two University of Colorado Art Galleries, which are all located in the Sibell-Wolle Fine Arts Building.

The Phillips, Brackett, Faye, and Oliver collections and the Department of Fine Arts collections are also located on the campus.

Fiske Planetarium and Space-Theatre

The Fiske Planetarium on the Boulder Campus regularly presents astronomically oriented shows designed to entertain as well as inform. It is used as a teaching tool in astronomy classes and by many other departments of the University. In addition, multimedia shows, dance and musical concerts are presented in the planetarium. Students are employed on a part-time basis to help in the running of the planetarium. Equipped with a Zeisse VI star projector in a 65-foot diameter dome with 213 seats, the Fiske Planetarium is one of the finest planetarium facilities in the world.

Libraries

The University Libraries support the academic study, teaching, and research at UCB. The collection of library materials contains over 1,800,000 books, periodicals, audiovisual materials, and maps plus over 1,900,000 microforms. The libraries include the central library (Norlin Library) and branch libraries.

Norlin Library contains the major resources in the humanities, social sciences, and life sciences as well as various special collections and services. Its Government Publications Library serves as a depository for publications of the U.S. government, European Communities, GATT, and the Organisation of American States. The Technical Reports Center, housed there, contains research materials published by agencies such as NASA, NTIS, and the Department of Energy.

Norlin Library also contains the Rare Books Room, Western History/University Archives, and the Audiovisual Department which provide specialized resource materials. Computer-based reference service is offered to library users with a charge to help offset the cost. There are copying facilities in Norlin and all of the branches.

The branch libraries include Business, Earth Science, Engineering, Law, Mathematics/Physics, and Music.

The Interlibrary Loan Department serves faculty, students, and staff by borrowing research materials from other libraries when those materials are not available in the University Libraries' collection. The University's membership in the Center for Research Libraries further extends the resources available to users.

Macky Auditorium

This fine proscenium concert hall seats 2,505. Macky has become the focal point for Artist Series concerts by internationally celebrated soloists and ensembles; community Boulder Philharmonic Orchestra concerts; band, choral, and orchestral performances presented by the College of Music; Program Council-sponsored jazz and rock concerts; and lectures, films, meetings, and conferences. The box office telephone is 492-6309 for information on all events.

Museum

The University of Colorado Museum—through its collections in anthropology, botany, geology, and zoology—is a primary resource for teaching and
research. It preserves physical evidence of what is known about the Rocky Mountain region, making it indispensable for faculty and graduate student research. Its extensive program of foreign studies and exchanges of specimens and information has given the museum an international reputation; 1.8 million specimens are available for study.

Through assistantships, the museum gives professional instruction to students in the field and in the laboratory. Museum faculty members teach courses in their specialties including Southwestern archaeology and ethnology, Bryology and lichenology, vertebrate paleontology, malacology, and entomology, in addition to museology and museography. Financial support is provided to selected, qualified students through the Walker Van Riper Fund to encourage participation in museum-related research.

The exhibit halls, open daily to the public, present informative exhibits for education and enjoyment at all levels. The Hall of Earth contains exhibits of minerals, rocks, and fossils, particularly illustrating local geology. The Hall of Life shows highlights of the plant and animal worlds, with emphasis on Colorado and Rocky Mountain forms. The Hall of Man exhibits samples of the cultures of widely separated primitive peoples of recent times, as well as synoptic series illustrating the North American Indian cultures, with special emphasis on those of the prehistoric Southwest. The changing exhibit hall is used for four or five temporary exhibitions per year, often anthropological in nature.

Recreation Program

The Boulder Campus recreation program is designed to fulfill a vital educational function and to provide students and other members of the University community the opportunity to participate in a variety of activities for personal enjoyment and satisfaction.

The Student Recreation Center provides excellent facilities for instructional programs and individual or group activities ranging over approximately 60 sports activities for those current fees-paid students and members. The center contains two swimming pools with an adjoining patio-sun deck; an ice skating rink enclosed by glass windows; handball courts, squash/ racquet-ball courts; a large gymnasium for volleyball, fencing, dance, badminton, etc.; exercise rooms; men’s and women’s locker rooms equipped with showers and hair dryers; a first aid and therapy room and two dry-heat saunas. Basketball courts and an indoor running track are located nearby.

The student-oriented Recreation Department staff gives personal attention to the needs of individual students, faculty, and staff. Detailed information regarding programs and events may be obtained from the various offices within the Recreation Center complex.

Reserve Officers Training Corps

Navy and Air Force Reserve Officers Training Corps (ROTC) units are established at UCB, operating in the fall and spring semesters only. Enrollment in ROTC programs is open to both men and women, and courses are open to all students whether or not they are enrolled in ROTC programs. Army ROTC offers courses in the fall and spring semesters and the summer session. In addition, programs are available that offer guaranteed specialties and guaranteed aviation training. All services provide undergraduate and selected graduate students with the opportunity to combine academic study with a military officer’s educational program. The three services conduct courses in their respective areas leading to regular or reserve commissions upon graduation. The Navy also offers a program leading to regular or reserve commissions in the Marine Corps. Scholarships paying full tuition, fees, book costs, and a monthly stipend to assist in defraying living expenses are available to qualified ROTC enrollees on a selected basis. Flying instruction, which can lead to the awarding of a private pilot’s license, is provided to qualified ROTC students in their senior year.

For further information concerning these programs see the ROTC sections of this catalog or write to the following at the University of Colorado, Boulder, Colorado 80309, or call:

ARMY: Professor of Military Science, Campus Box 370; 492-6495
NAVY: Professor of Naval Science, Campus Box 374; 492-8287
AIR FORCE: Professor of Air Force Aerospace Studies, Campus Box 371; 492-8351

Theatre

Facilities for dramatic arts include Macky Auditorium, the University Theatre, the beautiful outdoor Mary Rippon Theatre, Theatre 300, and the Old Main Theatre.

The Department of Theatre and Dance presents a major season bill of six to seven productions each academic year. Another four to six productions are staged in the Theatre 300 under the auspices of the Minor Season.

The Colorado Shakespeare Festival, presented each summer in the outdoor Mary Rippon Theatre, is produced by the Department of Theatre and Dance under the sponsorship of the Creative Arts Program. It has had 24 years of distinguished history, being one of seven theatre groups in the world that have completed the entire Shakespearean canon of 37 plays.

Throughout the year, the Department of Theatre and Dance presents various workshop productions, touring companies, story theatre, and dance programs, including a summer dance artist-in-residence workshop. Also produced by the Department of Theatre and Dance is the Colorado Careavan, a troupe of actors teachers which tours during the academic year with an offering of plays and workshops.

RESEARCH AND PUBLIC SERVICE

Combined sponsored research and related instructional programs within the University represent annual expenditures amounting to some $80 million. Of this total, the expenditures on the Boulder, Denver, and Colorado Springs campuses are now over over $40 million per year. The sponsored research and instruction program of the Health Sciences Center in Denver totals more than $40 million annually. The principal sources
of these funds for research and training contracts and grants are various agencies of the federal government. There is also assistance in the support of the research activity from appropriations of the state of Colorado, private foundations, and private donors.

Research programs and agencies are described in the Graduate School section of this catalog.

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College of Arts and Sciences

Everly B. Fleischer, Dean

INFORMATION ABOUT THE COLLEGE

History and Purpose
Incorporated by an act of the First Territorial Legislature of Colorado in 1861, the University of Colorado enrolled its first students in September 1877. The College of Arts and Sciences is the oldest academic division of the University, dating to 1878.

The College of Arts and Sciences provides a broad range of educational opportunities in the liberal arts and the sciences. The college recognizes the fact that its students have a wide variety of educational objectives, ranging from a highly specialized interest to a desire for the broadest and most general education.

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

Pursuant to these beliefs, the college requires all of its students to undertake work in the areas of humanities, the social sciences, and the natural sciences. Students are also required to present a considerable body of work in at least one major field of study.

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

Academic Advising
The College of Arts and Sciences maintains an advising staff located in the Office of the Dean of Arts and Sciences. Students in the college are expected to assume the responsibility for planning their academic programs in accordance with college rules and policies and departmental major requirements. However, they are urged to consult with advisers in the dean’s office and in their major department concerning their academic progress and objectives. All freshmen are required to attend an orientation and advising program prior to matriculation. All transfer students are expected to attend transfer advising activities held at the beginning of each semester.

DEGREES AND DEGREE REQUIREMENTS

General Requirements for the Bachelor’s Degree
1. A total of 124 semester hours passed.
2. A 2.0 (C) grade average on all University of Colorado work.
3. Forty semester hours of upper division work (courses numbered in the 300s and 400s). Note that all courses transferred from junior colleges carry lower division credit. Exceptions to this policy require the approval of the dean of the college.
4. Completion of the last 30 hours in University of Colorado courses on the Boulder Campus as a degree student in the College of Arts and Sciences.
5. Not more than 45 semester hours in a single department, except for B.F.A. and B.S. degrees.
6. Completion of a major (see Majors and Major Requirements below).

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

Area Requirements
Candidates for liberal arts degrees are expected to be literate in their own language, to have at least a minimal acquaintance with a language other than their own, and to be familiar with the subject matter and the methodology of the three broad areas of learning represented by the humanities, the natural sciences, and the social sciences. These expectations generate the requirements of the college.

Each student pursuing a Bachelor of Arts or a Bachelor of Fine Arts degree in the College of Arts and
Sciences is required to complete the following area requirements. A student pursuing a Bachelor of Science degree must complete all of the area requirements with the exception of the foreign language requirement.

Each student seeking the B.A., the B.F.A., or the B.S. degree must present two 2-semester course combinations in each of the following areas:

1. Humanities
2. Natural science
3. Social science

An area requirement may be satisfied in this college in one of two ways:

1. By taking one lower division combination followed by two upper division courses for which the lower division combination is prerequisite.
2. By taking one lower division combination in one department and one lower division combination in a different department. Course combinations which satisfy these requirements are published each fall and spring semester in the Schedule of Courses.

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

1. Completion of an appropriate third-semester college course.
2. Demonstration of third-semester proficiency or its equivalent by examination in any foreign language.

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

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

Students planning to go on to graduate work are advised to complete the fourth semester of a foreign language in preparation for the language requirements of graduate schools.

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

College Expository Writing Program (CEWP)

The College of Arts and Sciences offers two levels of expository writing courses. Students who have not demonstrated adequate proficiency in writing are required to enroll in a special section of A.S. 100. See listings under Arts and Sciences for details.

Limitations on Course Work

1. Students may take not more than 45 hours in any one department. Note exceptions for the Bachelor of Fine Arts degree and the Bachelor of Science degrees.
2. Students may count toward the fulfillment of requirements for the Bachelor of Arts and Bachelor of Fine Arts degrees a total of 30 hours in the following categories, subject to the maxima specified:

- Up to 30 hours, including Math. 103 and Math. 121, in curricula leading to degrees other than the B.A. (e.g., physical education, recreation, business, education, and the other professional schools and colleges).
- Up to 5 hours in activities courses (physical education, applied music, and ensembles).
- Up to 6 hours in approved ROTC courses.
- Students must complete the last 30 hours of their course work on the Boulder Campus in the College of Arts and Sciences.

Work from accredited institutions of higher education which has been completed with a grade of C or better may be transferred to the University of Colorado. All courses transferred from junior colleges carry lower division credit. A maximum of 72 hours taken at junior colleges may be applied toward the bachelor’s degree in the College of Arts and Sciences. No courses taken at a junior college will be credited toward graduation at the University of Colorado after a student has completed a total of 72 hours of course work at all institutions attended.

Bachelor’s Degree Programs

The College of Arts and Sciences offers the following degrees:

BACHELOR OF ARTS

Majors

- African and Middle Eastern studies
- American studies
- Anthropology
- Asian studies
- Biological sciences
- Black studies
- Central and East European studies
- Chemistry
- Chinese
- Classics
- Communication
- Communication disorders and speech science
- Dance
- Distributed studies
- Economics
- English
- Environmental conservation
- Fine arts
- French
- Geography
- Geology
- German
- History
- Humanities
- Individually structured
- International affairs
- Italian
- Japanese
- Latin American studies
- Linguistics
- Mathematics
- Philosophy
- Physics
- Political science
- Psychology
- Religious studies
- Russian
- Sociology
- Spanish
- Theatre

BACHELOR OF FINE ARTS

Majors

- Studio arts
- Art history
- Art education
- Dance
- Theatre

BACHELOR OF SCIENCE (PHYSICAL EDUCATION)
BACHELOR OF SCIENCE (RECREATION)

The College of Arts and Sciences also has the following programs that do not offer undergraduate majors:

- A.S. in Geophysics
- Bibliography
- Chicano studies
- Comparative literature
- Conflict and peace studies
- Experimental studies
- Film studies
- History and philosophy of science
- Honors
- Interdisciplinary studies
- Medieval studies
- Museum studies
- Women studies

28 / College of Arts and Sciences
Majors

All students pursuing a B.A. or B.F.A. degree must declare a major. As soon as the student has determined a major (certainly no later than the beginning of the junior year), formal application must be made to the department or program. Admission to certain majors may be limited, and students are advised to consult with departmental advisers regarding criteria for admission.

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

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 hours of C-grade or higher in the major area.
3. A 2.0 (C) grade-point average in all major work attempted.
4. Eighteen hours of upper division courses in the major, all with grades of C or higher.
5. Special requirements as stipulated by the major department.
6. Not more than 8 hours of independent study may be credited toward the minimum requirements in the major.
7. Students are subject to those major requirements in effect at the time the student formally declares a major.

Comprehensive Examinations

Departments may require candidates for degrees to pass comprehensive examinations in their major during the senior year.

Double Majors

Students pursuing the B.A. or B.F.A. may graduate with more than one major (e.g., biological sciences and French) by completing all requirements for both majors.

Double Degrees

Two degrees may be earned from the University of Colorado at Boulder if the following conditions are fulfilled:

1. The student has completed all area and major requirements of the College of Arts and Sciences.
2. The student has completed at least 30 hours of liberal arts course work offered in the College of Arts and Sciences.
3. The student presents a total of at least 150 hours passed.
4. For the B.A. and B.F.A. degrees, the student presents a total of 94 hours of liberal arts course work.
5. Students who wish to earn two degrees should notify the office of the dean as soon as they have decided on this degree option. Specific graduation requirements will be determined on the basis of when formal notification of double degree status occurs.

Second Undergraduate Degrees

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

1. All general requirements for the degree have been met.
2. The major for the second bachelor's degree is different from the first.
3. At least 30 hours in the major field, including 18 hours of upper division work, are taken in this college after admission to a second degree program.

Graduate Degree Programs

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

ACADEMIC STANDARDS

Grade-Point Average

The grade-point average is computed by multiplying the credit points per hour (A = 4 credit points per hour, B = 3, C = 2, D = 1, F = 0) by the number of hours for each course, totaling the hours and the credit points, and dividing the latter by the former. For example:

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<thead>
<tr>
<th>Course</th>
<th>Hours</th>
<th>Points</th>
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<tr>
<td>English</td>
<td>120-3</td>
<td>B = 9</td>
</tr>
<tr>
<td>Geology</td>
<td>101-4</td>
<td>C = 8</td>
</tr>
<tr>
<td>Mathematics</td>
<td>110-5</td>
<td>A = 20</td>
</tr>
<tr>
<td>Sociology</td>
<td>211-3</td>
<td>B = 9</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>46</td>
</tr>
</tbody>
</table>

The grade-point average is therefore 46/15 = 3.067.

The grades received at another institution will not be used in computing the student's grade-point average at the University of Colorado.

Graduation With Distinction

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

Graduation With Honors

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

**Attendance**

Successful work in the College of Arts and Sciences is dependent upon regular attendance in all classes. Students who are unavoidably absent should make arrangements with instructors to make up the work missed. Students who, for illness or other good reason, miss a final examination must notify the instructor or the Office of the Dean no later than the end of the day on which the examination is given. Failure to do so may result in an F in the course.

**Probation**

Students whose grade averages fall below 2.0 will be placed on probation and will have one semester to raise their grade-point average to 2.0 cumulative or be dismissed from the college.

If students who have been placed on probation elect to remain out of school for a full calendar year, they may return to the University in good standing, but will be placed on probation again at the end of the semester in which they return if the grade-point average is still below 2.0 at that time.

**Scholastic Dismissal**

Good academic standing in the college requires a grade-point average of 2.0 (C) on all University of Colorado work. Grades earned at another institution are not used in calculating the grade-point average at the University of Colorado. However, grades earned in another school or college within the University of Colorado will be used in determining the student's scholastic standing and progress toward the degree in the College of Arts and Sciences. Students who are still below a 2.0 cumulative average after exercising their semester of probation will be dismissed and will not be able to register for University of Colorado daytime courses during the regular academic year, August to May.

Students dismissed from the college shall be eligible for reinstatement when they have achieved a cumulative 2.0 average by virtue of work done in the University of Colorado's summer session and/or Division of Continuing Education. They may also return as transfer students when they have overcome their deficiencies by enrolling at another institution (i.e., by achieving an overall 2.0 average in the University of Colorado work plus all work taken elsewhere since dismissed). Dismissed students pursuing this option will have two semesters after re-enrollment to bring their University of Colorado average up to 2.0 or they will be dismissed again.

It should be noted that UCB's summer session does not count as a probationary semester, nor are students dismissed as a result of summer work. It should also be noted that students reinstated following dismissal will be eligible to re-enroll only if the enrollment quotas have not been filled (i.e., reinstatement does not necessarily entail re-enrollment).

**Academic Ethics (Dishonesty, Cheating)**

Students are expected to conduct themselves in accordance with the highest standards of honesty and integrity. Cheating, plagiarism, illegitimate possession and disposition of examinations, alteration, forgery, or falsification of official records, and similar acts or attempts 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 the student's own. It is recommended that students consult with their instructors as to the proper preparation of reports, papers, etc., in order to avoid this and similar offenses.

**REGISTRATION IN COURSES: CREDITS AND ENROLLMENT**

UCB operates on the semester system. The term “course” as used in the catalog means a one-semester course. Except for laboratory and studio courses, the credit-hour value assigned to a course is roughly equivalent to the number of hours per week of class work involved in the course (a 3-semester-hour course normally meets 3 hours per week). The normal course load is 12-18 hours.

**Course Numbering**

Courses numbered 100 and 200 or 910-929 (independent study courses) are designed principally for freshmen and sophomores. Courses numbered 300 and 400 or 930-949 (independent study courses) are designed principally for juniors and seniors.

Undergraduate students may not normally enroll in graduate courses (500, 600, 950-969), unless they have permission of the instructor and the department in which the course is offered.

**Advanced Placement Program**

The University of Colorado, Boulder, is a cooperating member of the Advanced Placement Program of the College Entrance Examination Board which provides able high school students, while still in high school, an opportunity to take work and be examined for credit on the college level.

Advanced placement and college credit may be granted on the basis of the College Entrance Examination Board's Advanced Placement Test. For students who achieve scores of 3, 4, or 5 on the CEEB Advanced Placement Examination, advanced placement as well as college credit may be granted. Official test scores must be submitted to the Office of Admissions, Regent Administrative Center 125. College credit granted will be treated as transfer credit without a grade but will count toward graduation and will meet other specific requirements for which it may be appropriate.

**College Level Examination Program (CLEP)**

The College of Arts and Sciences accepts a maximum of 30 hours of CLEP credit from subject (not general) examinations toward its bachelor's degree programs. For information as to what subject examinations have been approved for credit, students should contact the
College of Arts and Sciences dean's office or the testing office, Willard 130. More detailed information regarding the College Level Examination Program may be found in the General Information section of this catalog.

Credit by Examination (Challenging Courses)

Students in the College of Arts and Sciences may obtain credit in courses taught by the college by taking advanced standing examinations. See the General Information section of this catalog under Advanced Standing Examinations. The fee for taking such an examination is assessed at the lowest resident tuition charge currently in effect for the Boulder Campus.

Independent Study

With the approval of the department, students may register for independent study only within the first 12 days of instruction in the semester. No more than 8 hours of independent study may be credited toward the major and no more than 16 hours may be credited toward the degree.

A student may not use independent study projects in partial fulfillment of the college's area requirements.

Students may not register for more than 8 hours of independent study credit during any term. All independent study courses are numbered in the 900 series. Lower division credit is assigned 910 through 929. Upper division credit is assigned 930-949.

Correspondence Study

With the approval of the dean of the College of Arts and Sciences, students in the college may take work in correspondence study offered by the University's Division of Continuing Education. A maximum of 30 hours of correspondence work may count toward the degree. Arts and sciences courses offered by the University's Boulder Division of Continuing Education carry resident credit.

Senior Thesis

A senior student may register for as many as 6 hours of Senior Thesis (investigation paper) in the major with the approval of the departmental honors committee and the chairperson of the department. The title of this project and the credit hours awarded will be entered on the student's transcript. The hours awarded for Senior Thesis will count toward the major and must be included in the maximum 45 hours allowable toward the degree.

Students pursuing the Individually Structured Major must complete a Senior Thesis. For further information, see the section on the Individually Structured Major.

Pass/Fail

Students in the College of Arts and Sciences may not use the pass/fail option for courses taken to fulfill the area requirements, courses used to satisfy the foreign language requirement, or the minimum requirements for the major.

Students exercising the pass/fail option may take up to 16 hours of elective credit on a P/F basis; for transfer students, the limit is 1 hour in every 8 attempted at the University of Colorado. Students may take only 6 hours maximum of pass/fail each semester, including the one before graduation.

Drop Procedure

A detailed description of the drop procedure may be found in the General Information section of this catalog. Note: students may not drop courses which they are failing.

Add Procedure

A detailed description of the add procedure may be found in the General Information section of this catalog.

Credit/No Credit

Credit/no credit changes must occur within the first 12 days of instruction.

Withdrawal Procedure

See the General Information section. Students who are permitted to withdraw after the 10th week of a fall or spring semester will normally not be allowed to register for the following spring, summer, or fall semester. Students may not withdraw after the last day of class.

Students who withdraw two semesters in a row will have a dean's stop placed on them, and may not register until one semester has elapsed.

Appeals

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

SPECIAL ACADEMIC PROGRAMS

Foreign Language House

The Foreign Language House is a small academic community in Williams Village for students who are interested in French, German, or Spanish from both the linguistic and the cultural point of view. Students who are accepted into the program earn 2 semester hours of upper division credit per semester by participating in classes (which they help to plan) and by speaking the foreign language in their dormitory routine. A maximum of 8 hours of such credit will count toward graduation. Instructors from the appropriate language departments live on the floor to supervise the classes, organize cultural events, and give personal guidance to resident students enrolled in the course. Students are not required to be language majors, but they must have had three semesters of the language in college or three
years in high school or have acquired an equivalent fluency on their own. A modest surcharge must be paid for the privilege of participating in the Foreign Language House in addition to regular dormitory room and board.

For more information consult the Center for Interdisciplinary Studies, Ketchum 228, or the staff in Darley Commons 207, Williams Village.

**Residential Academic Programs**

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

The Farrand Program, open to students from all colleges within the University, offers 400 freshman and sophomore students the opportunity to enjoy a more integrated and interdisciplinary approach to the fulfillment of requirements in the liberal arts. Its small classes, community atmosphere, opportunity for informal interaction with faculty, attention to advising and counseling, and programs reflecting the participants' interests all provide students with the personalized environment they might enjoy at a small liberal arts college. At the same time, the students take the majority of their classes within the University as a whole and gain the advantages of a cosmopolitan research institution in which eighty percent of the faculty hold doctorates and to which renowned scientists, artists, musicians, and lecturers are drawn.

The Farrand curriculum is designed to enable students to achieve the goals of a liberal education, no matter what their chosen fields of study or professions:
1. To be able to express themselves clearly in the English language in speech and writing.
2. To have a historical perspective of their own culture through study of previous civilizations as reflected in their history, philosophy, literature, religion, art, and music.
3. To understand and use the methods of inquiry employed by the natural sciences.
4. To become familiar, through acquaintance with the social sciences, with what people have learned and are learning about living together.
5. To have an understanding of the mathematics that underlies basic fields of study and the uses of mathematics in our contemporary culture.
6. To be able to make moral choices based upon a considered system of values.

The Farrand Program requirements constitute two to three courses each academic year from among the eight to ten that students normally select. It is possible for students in specially structured majors to participate in the program only during the first year.

**Freshman Required Courses**

Hum. 101, a 6-hour course offering an integrated study of the history of literature, music, and art from the Greeks through the Renais-sance. This course fulfills one-half of the humanities requirement for the College of Arts and Sciences, part of the social-humanistic requirement for the College of Engineering, and electives in the humanities for the Colleges of Business, Environmental Design, and Music. Students have the option of continuing with Hum. 102, completing the survey through the modern period.

Freshman Seminar, A.S. 104, a 4-hour course emphasizing expository writing and public speaking. The content of the course is determined by the discipline of the teacher. Some topics for seminars include public policy and persuasion, the Supreme Court and the citizen, argument, working with ideas, the idea of man, and images of women in literature. Students write papers and prepare discussions and debates on the topic of their seminar.

The Spirit and Uses of Mathematics, Math. 113, a 4-hour course required only for students not otherwise studying mathematics at the University. This course presents mathematics for general students, both introducing them to rudimentary concepts for understanding advances in our technological society and offering elementary instruction in basic computer programming.

**Sophomore Required Courses**

History of the Modern World, Hist. 261-262, a two-semester sequence of courses, 4 hours each, devoted to explaining the processes and developments of the past few centuries which have been most important in shaping the nature of the contemporary world. The 20th century segment of the course focuses on the nations exerting the most influence on the world today. This course fulfills the social-humanistic requirement for the College of Engineering, and electives for the Colleges of Arts and Sciences, Business, Environmental Design, and Music.

Sophomore Seminar, A.S. 260, a 3-hour course presenting an interdisciplinary approach to a contemporary world problem or issue. Some topics for sophomore seminars include evolution, urbanization of underdeveloped nations, hunger, and overpopulation.

The faculty of Farrand is selected from among successful teachers of undergraduates who have a reputation for combining their professional competence with demonstrated concern for the personal growth and development of the students. A student-faculty coffee room provides a friendly meeting place.

Farrand's student government works with the staff in planning parties and special events, setting up speaker series, and providing opportunities for creative participation. Students are also involved in curriculum planning, program evaluation, questions of educational policy, and judicial matters. The staff for the Farrand Program includes a director available for academic advising and program assistants in counseling, career development, peer counseling and academic improvement, and special-interest program development. In addition, the building is managed by a building manager resident responsible for student life in the residence hall.

There is a modest charge for the Farrand Program per semester in addition to regular tuition, fees, and room and board. Students who qualify for financial aid will automatically have their need assessment and cost budget adjusted by the Office of Financial Aid to include the charge for Farrand. A limited number of need-based scholarships is also available.

Any student admitted to a degree program at the University of Colorado at Boulder is eligible to apply for the Farrand Program. Special efforts will be made to have a mix of students who can gain from a variety of experiences, ethnic backgrounds, and geographical variation.

Questions about the Farrand Program should be directed to the Director, Farrand Program, Campus Box 180, Boulder, Colorado 80309.

**SEWALL HALL**

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

Students who live in Sewall take one Sewall seminar each semester. These seminars are limited to 20 students; vary in content with an emphasis on the natural sciences, social sciences, humanities, and fine arts; and stress critical inquiry and creative participation. In addition to the seminars, many of the large lecture classes at the University offer special laboratory and recitation sections for Sewall students.

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

Participants in the Residential Academic Program are centrally involved in regular campus life, take the majority of their classes with the rest of the University, and are encouraged to join in all-University activities. The major emphasis at Sewall is participation—in classes, in student government, in special programs and performances, and in creative projects. Students, faculty, administrators, and staff enjoy close working relationships.

All entering freshmen accepted at the University of Colorado at Boulder are welcome to apply for the Residential Academic Program. Applications will be included in the housing materials sent to all freshmen upon admission. Applications will be considered in the order in which they are received. Thus, prompt application is recommended. There is a modest charge for participation in the program in addition to regular tuition and room-and-board fees. Students who have academic questions should address them to the Director, Residential Academic Program, Sewall Hall, Campus Box 353, Boulder, Colorado, 80309.

## Study Abroad

For information regarding study abroad programs available to students in the College of Arts and Sciences, see the General Information section of this catalog under the topic International Education.

### AFRICAN AND MIDDLE EASTERN STUDIES

**Office in IBS Building 5, Unit 11**

Professors Gottfried Lang and Ragaei El Malikah, Co-Chairmen

The University of Colorado, through its various departments and the African and Middle Eastern Studies Committee, offers a broad interdisciplinary undergraduate major in African and Middle Eastern Studies. Within the framework of the requirements, students have considerable latitude to shape their studies in the areas and disciplines which most interest them. In addition to the courses listed below, other courses may be taken to meet the requirements with the approval of either of the chairmen. Information may be obtained from either of the professors.

### BACHELOR'S DEGREE REQUIREMENTS

1. Satisfaction of the regular college requirements for the Bachelor of Arts degree.
2. Completion of at least 48 hours in courses pertaining to Africa and the Middle East, all with a grade of C or better.
3. Second-year college competence in a language appropriate to Africa or the Middle East.
4. Completion of the senior seminar in African and Middle Eastern Studies, included in the 48 hours specified in item 2.
5. The specific courses that may be counted to meet these requirements are to be determined by the advising committee for African and Middle Eastern Studies and the dean of the College of Arts and Sciences.

Students are encouraged to seek courses, seminars, and independent studies (including appropriate ones from black studies) deemed relevant upon consultation with their advisers and to submit these to one of the chairmen for consideration as fulfilling requirements.

<table>
<thead>
<tr>
<th>Anthropology</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Anth. 226. Old World Archaeology</td>
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</tr>
<tr>
<td>Anth. 227. Biblical Archaeology</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 432. Archaeology of Ancient Egypt</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 440. Culture Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 451. Africa: Peoples and Societies in Change</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 483. Egyptian Hieroglyphics I</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 484. Egyptian Hieroglyphics II</td>
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<thead>
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<th>Black Studies</th>
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<tr>
<td>Bl.St. 211. Politics of Contemporary Africa, I</td>
<td>3</td>
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<tr>
<td>Bl.St. 212. Introduction to African Literature</td>
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<tr>
<td>Bl.St. 216. Pre-Colonial History of West Africa</td>
<td>3</td>
</tr>
<tr>
<td>Bl.St. 456. The African Novel</td>
<td>3</td>
</tr>
<tr>
<td>Bl.St. 450. Critical Approaches to African Literature</td>
<td>3</td>
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<tbody>
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<td>Econ. 456. Agricultural and Rural Economics</td>
<td>3</td>
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<tr>
<td>Econ. 458. Comparative Agricultural Systems and Development</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 477. Economic Development: Theory and Problems</td>
<td>3</td>
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<tr>
<td>Econ. 478. Policies of Economic Development</td>
<td>3</td>
</tr>
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<td>Econ. 489. The Economics of Africa and the Middle East</td>
<td>3</td>
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<tr>
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<tbody>
<tr>
<td>F.A. Hist. 404. The Art of the Ancient Near East</td>
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<tr>
<td>F.A. Hist. 407. Byzantine Art</td>
<td>3</td>
</tr>
<tr>
<td>F.A. Hist. 470. Art of Africa and Oceanica</td>
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<tbody>
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<td>Geog. 394. Geography of the Middle East</td>
<td>3</td>
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<table>
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<tr>
<td>Hist. 104. Introduction to Asian History: China and Japan</td>
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<tr>
<td>Hist. 456. The Medieval Middle East</td>
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<tr>
<td>Hist. 457. The Modern Middle East</td>
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<td>Hist. 491. The Arab-Israeli Problem</td>
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<table>
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<tr>
<th>Political Science</th>
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<tr>
<td>P.Sc. 222. Introduction to International Relations</td>
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P.Sc. 416, Political Systems of the Middle East and North Africa
3
P.Sc. 419, Political Systems of Sub-Saharan Africa
3
P.Sc. 473, The Middle East and World Affairs
3
P.Sc. 474, Sub-Saharan Africa in World Affairs
3
P.Sc. 511, Seminar: Political Development
3
P.Sc. 519, Seminar: Comparative Politics of Sub-Saharan Africa
3

Religious Studies
R.St. 196, Jesus and the New Testament
3
R.St. 260, World Religions: Western
3
R.St. 284, Traditional African Religions
3
R.St. 410, Biblical Judaism
3

AMERICAN STUDIES
The College of Arts and Sciences, through its various departments and its American Studies Committee, offers a broad interdisciplinary program of courses relating to American thought and culture.

BACHELOR’S DEGREE REQUIREMENTS
1. Satisfaction of the regular college requirements for the Bachelor of Arts degree.
2. Completion of 6 upper division credit hours in three of these primary fields:
   - Anthropology
   - History
   - Art History
   - Journalism
   - Economics
   - Political Science
   - English
   - Sociology
3. Completion of the two-semester Senior Seminar in American Studies, Am.S. 495-496.
4. Completion of 6 upper division credit hours in the history, culture, or language of a non-American civilization.
5. Completion of 6 credit hours in architecture, black studies, geography, integrated studies, music, or philosophy.

ANTHROPOLOGY
Office in Hellmans Building, Room 90
Campus Box 233
Professor David Greene, Chairman

BACHELOR’S DEGREE REQUIREMENTS
Majors in anthropology must take Anth. 103 and 104, Principles of Anthropology; Anth. 201 and 202, Introduction to Physical Anthropology; Anth. 203 and 204, Laboratory in Physical Anthropology 1 and 2; Anth. 220, Introduction to Archaeology; Anth. 453, History of Anthropology; one topical course in cultural anthropology (Anth. 441-459); and one ethnographic area course (Anth. 460-477).

GRADUATE DEGREE PROGRAMS
Prerequisites. To be admitted as regular degree students, applicants must have a minimum undergraduate grade-point average of 2.8 (4.0=A) or a Master of Arts degree. Graduate Record Examination scores for verbal and quantitative aptitude tests are required. Letters of recommendation and evidence of previous anthropologically oriented experience and work are carefully considered. Students with less than 18 semester hours of previous course work in anthropology are considered deficient and will be asked to present a correspondingly greater number of hours for a degree.

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

Course Requirements. All entering graduate students must have had the equivalent of Quantitative Methods in Anthropology (Anth. 405/505) or take it during their first semester in residence.

To qualify for a graduate degree all students must complete at least three seminars, one each from any of the following four categories: Cultural Anthropology, Physical Anthropology, Archaeology, or Anthropological Linguistics.

Other specific course requirements will be established through a qualifying interview and consultation with the department chairman and an academic adviser.

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 prime specialties in any of the major subfields of anthropology: archaeology, cultural, physical, and linguistic anthropology. In addition students may develop as a specialty the archaeology of the ancient Middle East. Students interested in pursuing this as a specialty should write the chairperson of the department for additional details.

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

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

ARTS AND SCIENCES
College Expository Writing Program (CEWP)
Office in Hellmans Building, Room 115
Campus Box 226

The College Expository Writing Program is designed to teach University students the skills of written discourse essential to a successful college and professional career. The program is composed of expository writing courses on two levels: Beginning (A.S. 100-104) and Advanced (A.S. 110). On the beginning level, the program offers a general course (A.S. 100) and topic-oriented courses in the humanities (A.S. 101), social sciences (A.S. 102), and natural sciences (A.S. 103). Special sections are offered in Farrand Hall (A.S. 104). All beginning courses are equivalent; students may not take more than one semester on this level. Certain sections
of A.S. 100 are controlled enrollment, open only to students who have received notification by mail or have the course marked on their advisement cards. These students may not register in any other expository writing course to satisfy that requirement. Students who wish to take an additional semester of expository writing should register for the advanced course (A.S. 110).

Practicum in the Liberal Arts

The practicum program offers courses that normally entail a seminar on a given topic and an additional component of field work. It is also possible to propose an individually structured practicum under the sponsorship of a faculty member, who will supervise independent study including both readings and paper writing in conjunction with a project in the field. In no case is work experience per se considered for credit toward the B.A. degree, and students must plan an individually structured practicum well in advance of the semester in which the work is to be carried out. A student may register for up to 6 semester hours of practicum work in a single term and not more than 12 hours total as a part of the B.A. degree.

For more information about courses offered through the practicum program, consult the Center for Interdisciplinary Studies, Ketchum 226.

ASIAN STUDIES

Office in Ketchum 128

Campus Box 331

Professor Joyce Lebra, Chairwoman

Professor Laurence Beer, Adviser, Ketchum 34A

The University of Colorado, through its various departments and the Asian Studies Committee, offers a broad interdisciplinary undergraduate major in Asian studies. In addition, a number of departments (i.e., fine arts, history, philosophy, political science, and theatre and dance) offer graduate training with an emphasis on Asia.

Students planning to major in Asian studies are encouraged to consider study abroad in Asia. The University offers year-long programs in Kobe, Japan, and Taipei, Taiwan. For further information, contact the program adviser.

BACHELOR'S DEGREE REQUIREMENTS

A student majoring in Asian studies may choose one of two options:

Option 1: Complete a total of 41 hours, consisting of (a) 20 hours (two years) of Chinese or Japanese language; and (b) 21 hours of non-language courses, at least 9 of which are upper division, including Asian Studies 499.

Option 2: Complete a total of 36 hours of Asian Studies courses, at least 21 hours of which are upper division, including Asian Studies 499.

Under either option, the major must fulfill the following general requirements:

1. Satisfaction of the general requirements for the Bachelor of Arts degree in the College of Arts and Sciences.

2. A grade of C or higher in all course work taken to fulfill major requirements.

3. At least two courses each in the social sciences (e.g. economics, anthropology, and political science), and in the humanities (e.g. fine arts, literature, philosophy, religious studies, and theatre and dance) concerning Asia.

Honors. A student with an outstanding record may be recommended for graduation with honors in Asian studies, upon petition to the Asian Studies Committee and successful completion of a honors paper and examination designated by the Asian Studies Committee.

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

**Anthropology**

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>Anth. 470</td>
<td>Ethnography of China, Japan, and Korea</td>
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**Asian Studies**

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
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<tbody>
<tr>
<td>Asian Studies 499</td>
<td>Senior Seminar (for seniors only)</td>
<td>3</td>
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<td>Asian Studies 490</td>
<td>Independent Study</td>
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**Economics**

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<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tr>
<td>490/560</td>
<td>Economic Development in East Asia</td>
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**Fine Arts History**

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<tr>
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<tbody>
<tr>
<td>F.A. Hist. 324</td>
<td>Introduction to Asian Art</td>
<td>3</td>
</tr>
<tr>
<td>F.A. Hist. 405</td>
<td>Art of India and Southeast Asia</td>
<td>3</td>
</tr>
<tr>
<td>F.A. Hist. 474</td>
<td>The Arts of Japan</td>
<td>3</td>
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**History**

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Hist. 103</td>
<td>Introduction to Asian History: Middle East and India</td>
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</tr>
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<td>Hist. 104</td>
<td>Introduction to Asian History: China and Japan</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 270</td>
<td>Japanese History through Cinema</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 271</td>
<td>History of the Modern Far East (Fall)</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 272</td>
<td>History of the Modern Far East (Spring)</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 318</td>
<td>Selected Readings in Japanese History</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 338</td>
<td>Selected Readings in Recent Chinese History</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 346</td>
<td>Research Seminar: Japanese History</td>
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</tr>
<tr>
<td>Hist. 350</td>
<td>Research Seminar: Recent Chinese History</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 378</td>
<td>Japan at War</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 400</td>
<td>Women in Asian History</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 422</td>
<td>World War II in Asia and the Pacific</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 470</td>
<td>History of Modern Chinese Intellectual Thought</td>
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**Oriental and Slavic Languages and Literatures**

<table>
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<td>Chin. 101</td>
<td>First-Year (Beginning) Chinese</td>
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<tr>
<td>Chin. 102</td>
<td>First-Year (Beginning) Chinese</td>
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</tr>
<tr>
<td>Chin. 211</td>
<td>Second-Year (Intermediate) Chinese</td>
<td>5</td>
</tr>
<tr>
<td>Chin. 212</td>
<td>Second-Year (Intermediate) Chinese</td>
<td>5</td>
</tr>
<tr>
<td>Chin. 311</td>
<td>Third-Year (Advanced) Chinese</td>
<td>3</td>
</tr>
<tr>
<td>Chin. 312</td>
<td>Third-Year (Advanced) Chinese</td>
<td>3</td>
</tr>
<tr>
<td>Chin. 411</td>
<td>Readings in Modern Chinese Literature I</td>
<td>3</td>
</tr>
</tbody>
</table>

**College of Arts and Sciences / 35**
The department offers both M.S. and Ph.D. degrees. During the first two years of graduate study, before specializing, students generally obtain a broad background through courses regarded as basic to all three areas. Many students take graduate-level courses in the Physics Department (e.g., electrodynamics and quantum mechanics). In their second semester, first-year students are required to register for a one-unit reading and research course, under the supervision of a faculty member. Depending upon the student's preparation and interests, the basic courses are chosen from the following list:

A.G. 511. Internal Processes in Geas
A.G. 515. Introductory Plasma Physics
A.G. 516. Intermediate Plasma Physics
A.G. 540. Fluid Dynamics I
A.G. 541. Fluid Dynamics II
A.G. 554. Mathematical Methods
A.G. 555. Radiative Transfer
A.G. 550. Reading and Research

Descriptions of more specialized courses in the three major areas follow. Students interested in applying to this program are invited to write to the Chairman, Department of Astro-Geophysics, Campus Box 391, University of Colorado, Boulder, Colorado 80309.

Astrophysics (Including Solar Physics)

The department offers a broad range of courses and research in this area. Graduate-level courses are offered in the following subjects (see also the section on Atmospheric and Planetary Sciences below):

A.G. 530. Introduction to Magnetospheres
A.G. 533. The Sun
A.G. 560. Introduction to Astrophysics
A.G. 562. Stellar Interiors
A.G. 563. Physics of the Interstellar Medium
A.G. 566. Galaxies and Cosmology
A.G. 583. Solar Physics
A.G. 614. Astrophysical Fluid Dynamics
A.G. 640. Radio Astronomy
A.G. 661. Stellar Atmospheres
A.G. 665. Observational Astronomy
A.G. 667. High Energy Astrophysics

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

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

The department operates a 24-inch Cassegrain-Coude and an 18-inch Cassegrain telescope, available for photographic, photometric, and spectrographic observations, as well as for instrument and detector development. Opportunities for graduate research also exist with the University's Laboratory for Atmospheric and Space Physics (LASP) and Joint Institute for Laboratory Astrophysics (JILA). (See descriptions under the Graduate School section.) Research also is carried out with national laboratories and international
collaborators: High Altitude Observatory (HAO) in Boulder (solar physics), Kitt Peak National Observatory in Tucson (optical astronomy), National Radio Astronomy Observatory (NRAO) in Virginia, and Boulder-Sydney Agreement in Astrophysics in Sydney, Australia (solar physics and radio astronomy).

Students from the Physics Department may, with appropriate approval, complete M.S. and Ph.D. degrees in the astrophysics program.

**Atmospheric and Planetary Sciences**

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

A.G. 505. Atmospheric Physics I
A.G. 506. Atmospheric Physics II
A.G. 520. Meteorology of the Upper Atmosphere
A.G. 530. Introduction to Magnetospheres
A.G. 533. The Sun
A.G. 540. Fluid Dynamics I
A.G. 541. Fluid Dynamics II
A.G. 542. Geophysical and Astrophysical Turbulence
A.G. 556. Radiative Processes in Planetary Atmospheres
A.G. 581. Geomagnetism (offered only occasionally)
A.G. 613. Geophysical Fluid Dynamics
A.G. 624. Physics of Planetary Atmospheres
A.G. 630. Advanced Magnetospheric Physics

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

- Structure and composition of planetary atmospheres (Earth, Venus, Mars, Jupiter, Saturn)
- Planetary aeronomy, including atmospheric photochemistry, airglow and aurora, UV and IR spectroscopy, upper atmosphere ozone and trace constituents, and noctilucent clouds
- Atmospheric dynamics (small- and large-scale), including acoustic and gravity waves, experimental geophysical fluid dynamics, and ocean dynamics
- Energetics of the Earth's atmosphere, including radiative transfer and radiative/chemical coupling, and climate modeling
- Magnetic probing of the Earth's core
- Planetary magnetospheres (spacecraft observations and theory)

Graduate research opportunities and assistantships are available with individual department faculty members as well as through research programs of various institutes on campus (e.g., the Laboratory for Atmospheric and Space Physics [LASP] and the Cooperative Institute for Research in the Environmental Sciences [CIRES]). Research support also is available through cooperative arrangements with the National Center for Atmospheric Research (NCAR) and various laboratories of the Environmental Research Laboratory of the National Oceanic and Atmospheric Administration (NOAA). The department has its own Apple II minicomputer for data reduction and theoretical modeling, as well as access to the larger University computer (CYBER 172) and the high-speed CRAY at NCAR. There is a well equipped laboratory for studies in geophysical fluid dynamics, and the department operates a weather facsimile system for daily weather analysis.

**Plasma Physics**

A complete program of courses and research is available for students specializing in theoretical or experimental plasma physics. The curriculum and research can be taken for M.S. or Ph.D. degrees in either astro-geophysics or physics. Courses offered are:

A.G. 440. Introduction to Controlled Fusion
A.G. 514. Experimental Plasma Physics
A.G. 515. Introductory Plasma Physics
A.G. 516. Intermediate Plasma Physics
A.G. 517. Advanced Plasma Physics
A.G. 615. Magnetohydrodynamics

Research in theoretical and experimental plasma physics is carried out in the following areas:

- Fundamental processes in plasmas
- Kinetic theory of plasmas
- Plasma turbulence
- Plasma diagnostics
- Nonlinear optics of plasmas
- Laser-plasma interactions
- Radar propagation through the ionosphere
- Solar plasmas, radio emission from the sun

Collaborative research is pursued with the Mathematics and Physics Departments and with major institutions in Boulder and the U.S. These include the National Center for Atmospheric Research (NCAR), with access to the CRAY computer; the Los Alamos Scientific Laboratory; and several University groups. A departmental plasma laboratory is equipped with modern diagnostic instrumentation and a variety of plasma research devices.

Graduate assistantships and postdoctoral positions are available.

**Departmental Requirements**

Those wishing to pursue graduate work in astro-geophysics leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog. The following are special departmental requirements.

**Master's Degree**

Prerequisites. A thorough undergraduate preparation in physics and mathematics. Courses should include thermodynamics, mechanics, electricity and magnetism, atomic physics, and mathematics at least through differential equations.

Qualifying Examination. The Graduate Record Examination aptitude tests and advanced test in physics are used in place of a qualifying examination, and this examination normally is taken before the time of entry into Graduate School.

Preliminary Examination. Students starting work in the Department of Astro-Geophysics will be given a written preliminary examination prior to registration. This examination will test fundamental knowledge in classical physics and mathematics and will help students plan a program of graduate studies. A student failing this examination must show evidence by the end of the first year that deficiencies have been mastered.

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 astro-geophysics courses.

College of Arts and Sciences / 37
numbered 500 or above. The remaining hours will normally be in physics and mathematics. Under Plan II, additional hours of approved graduate courses must be presented for a total of 30 semester hours of which at least 16 must be in astro-geophysics courses numbered 500 or above. The master's examination under Plan I is generally oral, covering the thesis and related topics. Under Plan II the examination, which is more comprehensive, may be either written or oral or both. Master's examinations are given after the degree requirements have been completed, but may be given during the last semester of residence if the student is making satisfactory progress on required courses. Students are encouraged to follow Plan I except under special circumstances.

Doctor's Degree

Prerequisites. See prerequisites above.
Qualifying Examination. See above.
Preliminary Examination. See above.

Course Requirements. A student may receive a Ph.D. degree with a minimum of 30 semester hours of work in courses numbered 500 or above, provided his grasp of the field and his ability to do original research showing mature scholarship and critical judgment have been adequately demonstrated. The emphasis is on independent study and research, not on the fulfilling of course requirements.

Language Requirement. Graduate School language requirement.

Examinations. Students in a Ph.D. program are required to pass the preliminary examination described under Master's Degree and a comprehensive examination which is designed to test the student's scientific judgment and initiative as well as mastery of the knowledge and skills necessary for research. Students entering the department are supplied with a detailed description of the examinations.

BIBLIOGRAPHY

Office in Narlin Library, Room N 233
Campus Box 184
Mildred Nilon, Assistant Director for Public Services

Several courses in bibliography (see College of Arts and Sciences in Course Description section of this catalog) are offered to students who wish to develop competence in the use of information tools for their study and career needs.

On approval of the major departments, graduate courses may be accepted as a minor field and as part of the requirements for an advanced degree.

BIOLICAL SCIENCES

The Division of Biological Sciences consists of the Department of Environmental, Population, and Organismic Biology and the Department of Molecular, Cellular, and Developmental Biology. Several programs leading to the B.A. degree with a major in biological sciences are available. Each department defines and administers its own programs separately.

Biology—Environmental, Population, and Organismic

Office in Ramaley Building, Room 122
Campus Box 334
Professor Charles Southwick, Chairman

BACHELOR'S DEGREE REQUIREMENTS

The department offers a major in environmental, population, and organismic (EPO) biology, and a distributed studies major. Students selecting either major area must report to the departmental office for lists of requirements and assignment to an academic adviser. Courses in mathematics, chemistry, and physics are required of all EPOB majors (except for distributed studies majors). All transfer students must take at least 12 hours in regular EPO biology courses on the Boulder Campus.

Courses acceptable toward the minimum of 35 semester hours required for an undergraduate major in EPO biology may include up to 12 semester hours of certain biological courses offered in other departments. An inclusive list may be obtained in the department office.

For an introductory course in biology, science majors should enroll for either EPOB 121-123 and 122-124 or MCDB 105-106. No credit toward a biology major is given for NASC 123-124 although a student presenting these courses will not be required to take EPOB 121-123, 122-124.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in EPO biology leading to candidacy for advanced degrees may obtain a preliminary application for admission and a listing of faculty and their research areas directly from the EPO biology office. For general requirements for advanced degrees, consult the Graduate School section of this catalog. The equivalent of an undergraduate major in biology is expected. Consultation with an adviser is mandatory when making up a study plan.

At the graduate level the department offers the M.A. and Ph.D. degrees and a Plan II M.A. degree, without thesis. There are special laboratories within the department for animal behavior, comparative endocrinology, comparative reproduction, cryptogamic botany, data systems, ecosystemics, experimental plant ecology, entomology, environmental physiology and hydrobiology, fish physiology, herpetosystematics, limnology, microbiology, plant physiology, population genetics, and vertebrate ecology.

In addition, there are several associated accessory and peripheral institutes and departments which greatly increase the available teaching and research facilities: the Department of Molecular, Cellular, and Developmental Biology, the University Museum, the Institute of Arctic and Alpine Research, and the Institute of Behavioral Genetics.
Biology—Molecular, Cellular, and Developmental
Office in Biosciences Building, Room 131
Campus Box 347
Professor William B. Wood, Chairman

BACHELOR’S DEGREE REQUIREMENTS

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Description</th>
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<td>MCD 312</td>
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<td>MCD 384</td>
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<td>MCD 405</td>
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<td>Chem. 103-106 or Chem. 107-108</td>
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<td>Chem. 211-212 or Chem. 330-336</td>
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<td>Chem. 451-452</td>
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<td>Phys. 111, 112, 114 or Phys. 301, 302</td>
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<td>Math. 130, Math. 230</td>
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<td>Electives in MCDB</td>
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</table>

Students interested in MCD biology should consult with an adviser in the department. Recent changes in the list of available courses and other pertinent information for majors are described in a mimeographed brochure available in the departmental office.

GRADUATE DEGREE PROGRAMS

Opportunities for graduate study and original research are available in a variety of areas, including animal virology, biosynthesis of macromolecules, structure and function of ribosomes, control of gene expression, cellular regulatory mechanisms, cellular motility, biosynthesis and fine structure of intracellular organelles, molecular structure of membrane systems, nuclear-cytoplasmic interactions, growth and reproduction of cells, mechanisms of cellular differentiation and aging, interactions of cells and tissues, visual neurophysiology, embryogenesis, and mechanisms responsible for congenital deformities.

Entrance Requirements and Prerequisites. The graduate programs of the Department of Molecular, Cellular, and Developmental Biology are sufficiently flexible to accommodate students with a wide range of training. Students with bachelor's degrees in any of the biological, biochemical, or physical sciences are encouraged to apply. Background necessary for the program includes the equivalent of undergraduate courses in cell biology, developmental biology, genetics, organic chemistry, chemical thermodynamics, differential and integral calculus, and general physics. These requirements are intentionally stated in terms of areas of knowledge rather than as credits in specific courses. Students accepted with deficiencies may demonstrate mastery of the required areas by taking appropriate undergraduate courses, by passing advanced-standing examinations, or by successfully completing graduate-level courses that require the undergraduate courses as prerequisites.

Areas of Study. All students will be expected to develop competence in five areas: (1) biochemistry, including biochemical phenomena associated with cellular and molecular biology; (2) genetics, including molecular mechanisms of gene function, regulation of gene activity, and genetic control of development; (3) cell structure and function, including function of organelles, molecular organization, ultrastructure, biosynthesis, growth and reproduction; (4) developmental systems and mechanisms, including types of developmental phenomena and the morphological and molecular mechanisms involved; and (5) current research techniques of experimental biology.

Doctoral Program

Course of Study. The faculty of the department offers a variety of courses to help graduate students acquire knowledge in the various areas of study. Further, students are encouraged to work in several different laboratories to broaden their education and to help them identify the field of greatest interest for their thesis work.

Examination Sequence. At the time of entrance a counseling committee examines each student's background and interests and recommends courses for the first year in residence. A member of the faculty is then appointed as adviser for each new student to serve until the student is ready to select a sponsor for his or her thesis research.

A preliminary examination is held at the end of the student's second semester in residence to determine eligibility for continued graduate study, to identify areas of weakness, if any, and to assist in ranking for fellowship competition.

The comprehensive examination, which is normally scheduled during the student's fourth regular semester in residence, consists of two parts: a written research proposal and an oral examination designed to test the student's mastery of the broad field of knowledge related to his or her overall degree program.

Language. Before admission to candidacy for the Ph.D. degree, students must satisfy the language requirement established by the Graduate School.

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 present a public seminar and to take a final oral examination on his or her thesis and related topics.

Teaching. Two semesters of apprentice teaching are required of each candidate for the Ph.D. degree. Normally this obligation is met during the student's second or third year of graduate study.

Course Requirements. A minimum of 30 semester hours of courses numbered 500 and above is required. Specific courses depend on the student's background and field of specialization.

In view of the strong research orientation of the fields involved, the department does not accept applications from students seeking the M.A. as a terminal degree. The Master of Arts degree, either with a thesis (Plan I) or without (Plan II) is awarded under special circumstances. Candidates must pass the preliminary examination (described under Doctoral Program) and a comprehensive final examination. There is no foreign language requirement. For Plan I a thesis based on
original research must be submitted. Final determination of whether a student will follow Plan I or Plan II is made by the department.

BLACK STUDIES PROGRAM

Office in Woodbury Building, Room 302
Campus Box 294

The Black Studies Program is multidisciplinary and offers courses in the humanities and social sciences. Many of these courses will satisfy the requirements for the College of Arts and Sciences. Although its primary purpose is to explore, analyze, and experience various aspects of Afro-American life and culture, the program is enhanced by courses, seminars, and colloquia which focus on the African and Caribbean experience as well. The program offers a major which leads to the B.A. in black studies.

BACHELOR’S DEGREE REQUIREMENTS

1. Satisfactory completion of the regular College of Arts and Sciences requirements for the B.A. degree.
2. Satisfactory completion of Bl.St. 200, Introduction to Black Studies; Bl.St. 450, Research Methods in Black Studies; and Bl.St. 496, Senior Seminar in Black Studies.
3. Satisfactory completion of the core program in black studies as defined below. At least 3 credit hours are required from each of the categories below.

History
Bl.St. 215-216. Afro-American History

Literature
Bl.St. 232-233. Afro-American Literature
Bl.St. 280. Introduction to African Literature

Music, Art, Religion, Dance
Bl.St. 240. Afro-American Dance
Bl.St. 254. Traditional African Religions
Bl.St. 270-271. Afro-American Art History
Bl.St. 280-281. Afro-American Music History

Social Sciences
Bl.St. 203-204. Behavioral Analysis
Bl.St. 205. Black Social Movements
Bl.St. 255. The Black Woman in American Society

4. Satisfactory completion of black studies courses in an area of concentration. This includes 15 hours of additional course work in a subject area chosen by the student and approved by the Black Studies Program faculty for a total of 36 hours of credit in black studies. Of this total, at least 16 hours must be in upper division courses.

CENTER FOR INTERDISCIPLINARY STUDIES

Office in Ketchum Building, Room 128
Campus Box 331
Professor David M. Armstrong, Director

The Center for Interdisciplinary Studies creates and offers interdisciplinary courses and programs in the major areas of learning: humanities, natural sciences, and social sciences. It also sponsors interdisciplinary programs and courses, taught by faculty of other departments in the college.

CENTRAL AND EAST EUROPEAN STUDIES

Office in Ketchum Building, Room 215
Campus Box 333
Professor Edward J. Rozek, Chairman

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

BACHELOR’S DEGREE REQUIREMENTS

1. Satisfaction of the regular college requirements for the Bachelor of Arts degree.
2. A demonstrated proficiency in German, Russian, Polish, Serbo-Croatian, or any other Central European language.
3. At least 48 semester hours selected from courses numbered 200 or above, dealing with problems of Central or Eastern Europe or the Soviet Union, which are offered by any department in the College of Arts and Sciences: e.g., economics, geography, history, political science, Slavic languages, and sociology.
4. The specific courses that may be counted to meet these requirements are to be determined by the advising committee for the Bachelor of Arts in Central and East European Studies and the dean of the College of Arts and Sciences.

CHEMISTRY

Office in Chemistry Building, Room 109
Campus Box 215
Professor Arlan D. Norman, Chairman
Professor Bert Tolbert, Associate Chairman

BACHELOR’S DEGREE REQUIREMENTS

A student can earn a bachelor’s degree in chemistry in one of three ways: (1) as a regular major in chemistry, (2) as a major in chemistry with the biochemistry option, and (3) as a major in distributed studies with chemistry as the primary area. A student will be helped in choosing among these possibilities by a department adviser. An adviser should be selected in the freshman or sophomore year.

For graduation with a regular chemistry major, students must present credits in the following courses or their equivalent: Chem. 103, 106 (or 107, 108), 335, 336, 418, 451, 452 or 453, 455; Phys. 111, 112, 114; and Math. 130, 220, 240. A minimum of 33 semester hours in chemistry is required for a degree. Chemistry majors concentrating in physical chemistry should take the entire physical chemistry sequence: Chem. 451, 452, 453, and 455. All students, but especially students intending to enter graduate school in chemistry, should take additional advanced courses. Recommended courses include Independent Study, Chem. 343; a third semester of physical chemistry; Inorganic Chemistry, Chem. 401 or 501; Biochemistry, Advanced Analytical Chemistry, Chem. 481 and 482; and Advanced Organic Chemistry, Chem. 551.

Students majoring in chemistry with the biochemistry option must present credits in the following courses or their equivalents: Chem. 103 and 106 (or 107,
108); 331 and 332 (or 335, 336); 450 or 451, 462 or 453; 481, 492, and 496; Phys. 111, 112, and 114; Math. 130, 230, and 240; MCD 105, 106 or EPOB 121, 122, 123, 122, 124; and MCD 384 or EPOB 383. All biochemistry option students, and especially students intending to enter graduate school in the biological sciences, should take additional advanced courses. Especially recommended are Independent Study, Chem. 943; Analytical Chemistry, Chem. 418; Physical Chemistry Laboratory, Chem. 454 or 455; Advanced Organic Chemistry, Chem. 531; Advanced Biochemistry, Chem. 587, 588; and courses in the biology departments such as EPOB 384, MCD 312, 412, 465, 471 and 489.

Distributed Studies (Chemistry Primary Area). The following courses or their equivalents are required for a distributed studies (chemistry) major. (Register at the Innovative Education Office, Ketchum 226.)

1. General Chemistry: Chem. 103 and 106, 10 credit hours. Chem. 100, 101, and 104 may not be substituted for these requirements nor included in the 30-hour requirement of item 4 below.
2. Organic Chemistry: Chem. 331 and 332, 8 credit hours.
4. Additional chemistry credit hours to make a total of 30 hours.

ACS Certification. The American Chemical Society maintains a certification program in which a student graduating with a specified minimum program is certified to the Society upon graduation. To be certified, a graduate must satisfy requirements in addition to the minimum for graduation:

For Chemistry Majors. Two additional 3-credit advanced-level lecture courses plus additional laboratory work (unless Chem. 107-108 was taken). One of the lecture courses must be Chem. 401 or 481; the other course may be another 400- or 500-level course in chemistry or a related field: molecular biology, chemical engineering, computing science, geochemistry, mathematics, or physics. The additional laboratory work may be Chem. 486 or 2-3 credits of Chem. 943 or appropriate advanced laboratory work in a related science.

For Biochemistry Option: Chem. 418 and two of the following: Chem. 107-108 in place of Chem. 103-106; Chem. 335-336 in place of Chem. 331-332; Chem. 943 (2-3 hrs. credit); Chem. 455.

Chemistry Honors Program. Opportunity is provided for qualified chemistry majors, including those with the biochemistry option, to participate in the Chemistry Honors Program and graduate with honors (cum laude, magna cum laude, or summa cum laude) in chemistry. Students interested in the Honors Program should contact the Departmental Honors Adviser during their junior year.

Transfer students who plan to take a regular or biochemistry option major must complete at the Boulder campus a minimum of 9 credit hours of upper division work covering at least two of the subdisciplines: organic, physical, analytical, inorganic, and biochemistry.

A more detailed listing of the bachelor's degree requirements, together with advising information and alternate course options, is available at the Chemistry Department Office.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in chemistry leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section. Following are some of the special departmental requirements. Copies of more detailed rules are distributed to graduate students.

Prerequisites. An undergraduate major in chemistry is desirable since entering graduate students are required to pass examinations covering the major fields of chemistry. GRE scores are required for fellowship competition; they are strongly recommended but not required for admission to the department.

Master's Degree

Language. A student must demonstrate proficiency in a foreign language at a level comparable to a third-semester undergraduate course. This requirement may be satisfied either by having received a satisfactory grade in a third-semester course or by an equivalent grade in the GEPPL. Organic chemistry majors must satisfy this requirement in German; students in other fields may fulfill the requirement in French, German, Japanese, or Russian.

Examinations. Qualifying-preliminary examinations are given during registration week of the fall and spring semesters. These examinations are offered in five fields: analytical chemistry, biochemistry, inorganic chemistry, organic chemistry, and physical chemistry. They cover undergraduate-level material, and their purpose is to determine qualifications for advanced study. A student must pass three of these at the master's degree level, including the examinations in physical chemistry and in the student's proposed major area. Students may attempt more than three examinations if they wish, but are required to pass only three. If the first attempt at the examinations is not successful, they may be attempted once more at the start of the next semester. Entering students who have had no training in a particular area, or who have been out of school for some time, may request from the graduate adviser a deferment until they have a chance to make up their deficiencies.

Candidates also must pass master's final oral examinations at the time of completion of their work.

Course Requirements. There are two methods of obtaining a master's degree from the Department of Chemistry. Plan I requires 24 credit hours including 15 to 20 credit hours of formal course work, 4 to 9 credit hours in research courses, the completion of a research investigation, and the presentation of a thesis. Plan II requires 24 credit hours of formal course work plus 6 credit hours of research, but no thesis; Plan II is available only with departmental approval.

The student should consult with the graduate adviser in the department to ascertain that the proposed plan satisfies the major and minor field requirements.
Doctor's Degree

Language. The language requirement is similar to that for the master's degree except that the level of proficiency required is that of a fourth-semester undergraduate course.

Examinations. The qualifying-preliminary examinations are the same as those described for a master's degree, and the requirements are the same except that they must be passed at the Ph.D. level.

The comprehensive examination consists of written and oral parts. These examine candidates for advanced knowledge in their field of specialization. The written part consists of a series of monthly cumulative examinations, of which the candidate must pass six over a two-year period. Students entering with bachelor's degrees must start taking these in their third semester of graduate school; those entering with master's degrees must start in their second semester. The oral comprehensive must be taken during the fourth semester or the second semester depending upon whether the student enters with a bachelor's or a master's degree. Candidates must also pass a final Ph.D. oral examination at the time of completion of their thesis.

CHICANO STUDIES

Office in Ketchum Building, Room 11
Campus Box 322
Associate Professor Reyes Ramos, Director

The Chicano Studies Program at the University of Colorado provides all students a conceptual means by which bilingualism and biculturalism, in a context of racial/ethnic pluralism, can be fully developed. The undergraduate program provides students majoring in related disciplines an extensive knowledge and insight into the largest single language minority in the country. It also provides an academic context for the study of the Chicano experience in both a historic and demographic/structural framework. No major is offered.

This department encourages students to include in their studies the study abroad programs offered in Mexico in order to gain deeper understanding of the culture and attitudes of Mexico and their carry-over into the United States, especially the Southwest. Students interested in study abroad will find further information under the section on Special Educational Opportunities or they may consult the Office of International Education.

CLASSICS

Office in Education Building, Room 320F
Campus Box 248
Professor Ernst A. Fredricksmeyer, Chairman

BACHELOR'S DEGREE REQUIREMENTS

The major in classics is individually structured, upon consultation with the undergraduate adviser, to reflect the student’s interests in the field. Major programs can be arranged with a concentration on either Latin or Greek or a combination of the two, or a broadly based program in classical antiquities (mythology, literature, philosophy and religion, art, archaeology, and history). The candidate for the degree must present a minimum of 36 credit hours plus the equivalent of two college years of either Greek or Latin. Prospective majors should consult the undergraduate adviser and the departmental major list.

General classics courses do not require a knowledge of Greek or Latin and may also be used as a secondary field in the distributed major or in an individually structured program.

Students who have completed a Level III high school Latin course have automatically satisfied the college graduation requirement in foreign language. This requirement may also be satisfied by completion of Lat. 211 or by demonstration of equivalent proficiency by placement test. Students who have studied Latin in high school and wish to continue with the language will be placed according to their high school records, verbal SAT and/or ACT scores, and an interview. Students may not receive credit for a course at a lower level than that into which they are placed. Questions concerning language placement should be directed to the classics department office.

GRADUATE DEGREE PROGRAMS

Master’s Degree

The candidate may choose to emphasize Greek, Latin, classical antiquities, or classical humanities.

The student choosing to emphasize Greek or Latin as a major will be required to take a qualifying examination to demonstrate proficiency in translating Greek or Latin.

The student choosing to emphasize classical antiquities or classical humanities will be required to take a qualifying examination to demonstrate a breadth of knowledge in the general area of classical Greek and Roman culture.

Language Requirement. The department requires a reading knowledge of one modern language for those students emphasizing the study of Greek or Latin. If the major emphasis is in Greek (Latin), the candidate will be required to demonstrate a reading proficiency in Greek (Latin) appropriate for a student with two years of college Greek (Latin).

Degree Requirements. Candidates for the M.A. degree in Greek (Latin) will be required to take written comprehensive examinations in the following fields:

1. The language (translation test), literature, and history of Greece (Rome). This examination will be both comprehensive and detailed.

2. The literature and history of Greece (Rome). This examination will test the candidate's general survey knowledge of these fields.

Candidates for the M.A. Plan I (24 hours including thesis) will take an oral examination in defense of thesis. Candidates for the M.A. Plan II (30 hours without thesis) must have departmental approval.

Candidates for the M.A. degree with emphasis upon either classical antiquities or classical humanities will be required to complete at least one graduate-level course in either Greek or Latin with a grade of B, will be required to take written comprehensive examinations, and must take Plan II (30 hours without thesis).
Doctor's Degree

The candidate may choose to emphasize Greek and Latin languages and literatures or classical archaeology and history. For those selecting the languages and literatures emphasis, the following are required:

1. Excellent command of Greek and Latin languages and a knowledge of Greek and Roman history and literature.
2. A reading knowledge of two modern foreign languages; one must be German and the other is to be approved by the department.
3. Successful completion of at least four graduate seminars.
4. Comprehensive examinations. The candidate will be tested in Greek and Latin languages (translation tests) and will write examinations on a major classical author and one of the following special fields: art and archaeology, history, linguistics, mythology and religion, palaeography, or philosophy. There will be an oral examination in which the student is expected to demonstrate his or her overall factual knowledge of the field of classics.
5. The candidate must write a Ph.D. dissertation, which is a contribution to knowledge, and complete an oral examination on the dissertation.

For those selecting the archaeology and history emphasis, the following are required:

1. Excellent command of the Greek (Latin) language and literature and satisfactory course work in the Greek (Latin) language and literature.
2. A reading knowledge of two modern foreign languages; one must be German and the other is to be approved by the department.
3. Successful completion of at least four graduate seminars.
4. Comprehensive examinations. The candidate will be tested in the Greek (Latin) language (translation tests) and will write examinations in classical archaeology, history, and on a major classical author. There will be an oral examination in which the student is expected to demonstrate his or her overall factual knowledge of the field of classics.

COMMUNICATION

Office in Communication Building, Room 104
Campus Box 458
Associate Professor George A. Matter, Chairman.

BACHELOR'S DEGREE REQUIREMENTS

The program in communication has both humanistic and social scientific concerns. Major areas of undergraduate emphasis are interpersonal, organizational, and public communication.

Students should indicate as soon as possible their desire or intent to major in communication.

Majors must present a minimum of 30 semester hours, including specific requirements for graduation. All students must receive a grade of C or better in all communication courses. Lists of required and suggested courses may be obtained from the departmental office. (Freshmen are not eligible for 400-level courses.)

Special Requirements. Communication majors planning to teach at the secondary level should acquaint themselves with the School of Education Professional Year Program.

Communication Proficiency Requirements for Prospective Teachers. Each student pursing a program in the School of Education must meet minimal standards of competence in communication. Normally this requirement is met by completing Communication Principles in Instruction (Comm. 230). Additional information may be obtained through the department office or the School of Education.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in communication for advanced degrees should read carefully both Requirements for Advanced Degrees and the following departmental requirements.

Admissions Policy. All graduate applicants are required to submit a scholarly paper. All applicants except those who have not attended an academic institution recently should have at least three of their four letters of recommendation from academic sources who have worked with them in classes or in their degree programs.

All graduate applicants with a cumulative grade-point average below 3.0 should submit scores on the Graduate Record Examination. GRE scores are optional for all other applicants.

Ph.D. applicants receiving an M.A. degree from this department cannot take any course work for the Ph.D. program, or any course work that will transfer to that program at a later date, until reevaluation has been made by the student's committee and reevaluation to the Ph.D. program has been made by the departmental Graduate Committee.

Diagnostic Examinations. Each student's progress in both the M.A. and Ph.D. programs will be reviewed yearly by the faculty of the Department of Communication. This evaluation will determine the form of the qualifying examination for M.A. students and the preliminary examination for the Ph.D. student. Examinations may be oral or written or a combination of the above, at the determination of the faculty.

Adviser and Graduate Committee. For every student admitted to the graduate program, an adviser will be initially appointed. The student then must choose a permanent adviser and committee. This choice must be made not later than the second semester (or second summer session) in residence for all M.A. students, and at the beginning of the second year in residence for all Ph.D. students. The adviser and committee have the responsibility for (1) approving the student's graduate program, (2) evaluating the student's qualifying or preliminary examination, (3) directing and evaluating the student's thesis or dissertation, and (4) administering the comprehensive examination and the final examination.

Each candidate for a degree has the responsibility of making certain that the appropriate persons or committees have been appointed to supervise the various steps in the candidate's graduate program. Details of specific requirements are available from the department office.
Master's Degree

The M.A. degree in communication has been designed for those students who desire advanced training in communication for use in professional settings. It is designed with an emphasis in basic communication theory and research techniques, training in interpersonal and organizational communication, and specific work outside the department to supplement this emphasis. No undergraduate training specifically in communication is required, although courses to correct undergraduate deficiencies may be recommended.

Course Requirements. All M.A. candidates must complete the following courses with at least B-level proficiency: Comm. 601, 603, 518, 524, and 526. At least 6 hours of course work must be taken outside the department, with approval of the adviser and committee.

Plan I, With Thesis. The student following Plan I must earn a minimum of 30 hours of credit, 6 of which must be thesis hours.

Plan II, Without Thesis. Students under Plan II must earn a minimum of 30 hours credit including 6 credit hours outside the department. These must be taken on the 500 level, or be approved courses on the 600, 700, or 900 level.

All Plan II students must submit three scholarly works. These works may be completed either as parts of the courses taken or specifically assigned and completed to meet this particular requirement.

Doctor's Degree

The Ph.D. degree may be obtained in organizational communication or rhetorical analysis of public communication. The student in organizational communication will possess the following skills: (1) the ability to conduct qualitative (and possibly quantitative) research in organizational communication, (2) the ability to diagnose communication problems within organizations, and (3) the knowledge to facilitate change within organizations. The student in rhetorical analysis of public communication will possess the following skills: (1) the ability to interpret public messages, (2) the ability to evaluate public messages, and (3) the ability to write interpretations and evaluations as critical discourse to be disseminated among a variety of readerships.

To be admitted to the Ph.D. program, any applicant must (1) have an M.A. in communication or have an M.A. in a communication-related discipline as determined by the Graduate Committee, and be willing to complete courses to make up any deficiencies (courses which would not count toward the doctorate), (2) demonstrate a high degree of linguistic competence in scholarly writing, and (3) express career goals and research interests compatible with the expertise of the communication faculty.

All Ph.D. students in communication will be expected to earn 36 hours of course work in the Communication Department beyond the master's degree, all of which must be on the 600 level or above. Ph.D. students are required to complete Comm. 601 and 626, and two of the following three: Comm. 602, Comm. 603, or a quantitative methods course from outside the department. All required work must be at B-level proficiency.

Further requirements for specific degree plans may be obtained in the departmental office.

COMMUNICATION DISORDERS AND
SPEECH SCIENCE

Communication Disorders Building
Campus Box 393
Professor Richard H. Sweetman, Chairman

BACHELOR'S DEGREE REQUIREMENTS

The Bachelor of Arts degree with a major in communication disorders and speech science provides a broad general education, develops concepts basic to human communication and normal language processes, and provides necessary background for entrance into professional training at the graduate level.

Majors must present a minimum of 38 semester hours of course work listed in the schedule below. Prior to entering the third year of study, students should have completed at least 6 semester hours of psychology.

Enrollment is limited, and prospective majors must apply for assignment to an academic adviser as soon as they enter the program.

(All courses offered in Sequence A, B, and C are required for graduation with a major in communication disorders and speech science.)

SEQUENCE A (FRESHMAN OR SOPHOMORE YEAR)

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<td>CD 200. Audiology I</td>
<td>CD 400. Audiology II</td>
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<td>CD 459. Speech Disorders I</td>
<td>CD 459. Observation and Cotherapy</td>
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SEQUENCE B (SOPHOMORE OR JUNIOR YEAR)

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SEQUENCE C (JUNIOR OR SENIOR YEAR)

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SEQUENCE D (SENIOR YEAR)

(Courses in Sequence D are available to students who have completed Sequence A, B, and C. Sequence D is not required for a B.A. degree in communication disorders and speech science and need not be taken in its entirety.)

Only one semester of CD 469 is required.

44 / College of Arts and Sciences
Fall
CDSS 370. Manual Communication I ................................ 2
CDSS 407. Articulatory Phonetics .................................. 2
CDSS 469. Observation and Co-therapy* ......................... 1

Spring
CDSS 371. Manual Communication II .............................. 2
CDSS 469. Observation and Co-therapy* ......................... 1

GRADUATE DEGREE PROGRAMS

The graduate curriculum in communication disorders and speech science leads to either the master’s or doctor’s degree. All courses of study are planned by the student and an adviser and formalized in a degree plan. The programs in speech pathology and audiology are accredited by the American Speech-Language-Hearing Association (ASHA).

Students wishing to emphasize phonetics studies should contact the Department of Communication Disorders and Speech Science.

Prospective students should read Requirements for Advanced Degrees in the Graduate School section and request additional information from this department.

Master’s Degree

The master’s program in communication disorders places heavy emphasis upon clinical training and experiences. The program leads to certification by ASHA and the Colorado State Department of Education. Students having an undergraduate degree in speech pathology and audiology can expect to spend two calendar years to complete the program. Those without such background are required to make up undergraduate deficiencies which normally require at least an additional year. Students not seeking clinical certification may place major emphasis on speech science or phonetics.

Doctor’s Degree

The doctoral program demands demonstrated expertise beyond the academic knowledge and clinical skills required for clinical certification. Supervisory, administrative, instructional, and research activities are provided to acquaint the student with problems and concepts of a high level of activity and responsibility.

A great deal of latitude prevails in planning individual programs. It is expected that students will have some professional experience before entering the program, and that they will have specific academic or professional goals in mind. Student degree plans are individually prepared through the joint efforts of the student and an advisory committee.

Ph.D. candidates are required to take a three-course sequence in statistics.

Speech and Hearing Clinic

The Speech and Hearing Clinic has a two-fold purpose. It provides facilities for the training of undergraduate and graduate students, and it provides speech and hearing evaluation and remediation services for the Boulder community. Any student of the University or any member of the Boulder community is eligible for the services offered. Services include evaluations of speech and language skills, training for the improvement of communication skills, hearing evaluations, lipreading instruction, hearing aid evaluations, and auditory training for the hearing-impaired.

The Speech and Hearing Clinic, as well as the office and classrooms for the Department of Communication Disorders and Speech Science, are located on Observatory Hill. Address inquiries to Chairman, Communication Disorders and Speech Science, Campus Box 121, University of Colorado, Boulder, 80309.

COMPARATIVE LITERATURE

Office in Ketchum 128
Campus Box 331
Associate Professor Edward P. Nolan, Chairman

Although comparative literature is a graduate program, undergraduates should be aware that comparative literature may form either a primary or secondary field in a distributed studies major (see Distributed Studies Program) as well as function as a related field in individually structured majors. Any student selecting comparative literature as a field in such a major program should confer with the chairperson as early as possible.

Students wishing to pursue graduate work in comparative literature should consult the Graduate School section of this catalog.

Prerequisites. On the 400 level students may read all texts in translation; however, reading knowledge in at least one foreign language is highly recommended. On the 500 level students must be able to read in two foreign languages or obtain the consent of the instructor. Comparative literature seminars (numbered 600) are open only to those who have the necessary linguistic qualifications and literary background.

For Latin/Greek for graduate students, see Classics.

For foreign literatures in translation, see the individual foreign language departments.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in comparative literature leading to candidacy for advanced degrees should read the information provided in the Graduate School section of this catalog and the special memoranda for the M.A. and Ph.D. degrees in this field. These memoranda can be obtained from the secretary, Ketchum 128.

Master’s Degree

Prerequisites. For those seeking the M.A. degree, the following are required:

1. Upon entrance to the program a student must have a reading, speaking, writing, and auditory ability in one foreign language and knowledge of its literature and civilization.

2. By the completion of M.A. work, a student must have attained reading competence in a second foreign language and knowledge of its literature.

Requirements. In consultation with the graduate adviser, students will plan as the basis of their M.A. programs a set of interrelated courses, with emphasis on the two literatures for which their B.A. degrees have

*Only one semester of CDSS 469 is required.
equipped them. Students will take a minimum of 12 hours in comparative literature (including C.L. 510 and at least one proseminar in literary theory and research methods). Reading competence in an ancient language is recommended.

Examinations and Thesis. Students should consult the memorandum available in Ketchum 128.

Doctor’s Degree

Prerequisites. An M.A. degree in comparative literature or in a single literature (which may be English), with a proven capability in a second literature. Reading competence in two foreign languages.

Requirements. Candidates for the Ph.D. degree in comparative literature must fulfill the general requirements of the Graduate School. They must take at least 30 semester hours of work at the 500 level or above in comparative literature or related courses approved by their advisory committee. Students will be responsible for one language and literature as a chronological whole (including its philology), and will take at least 18 hours of graduate work in that department. In addition students, who must have mastered two foreign languages to enter the doctoral program, must master a third to complete it. They will also be required to master the literature of those languages in their areas of specialization.

Students are, in addition, required to take one year of an ancient language. If study of an ancient language is a substantial element in a student’s work and is pursued beyond one year’s work, it will count as one of the student’s three languages (see above).

C.L. 560 (The Art of Translation) is required for all doctoral candidates.

Comparative Literature is an administrative unit of the Center for Interdisciplinary Studies.

CONFLICT AND PEACE STUDIES

Campus Box 331

The Conflict and Peace Studies Program is affiliated with the Center for Interdisciplinary Studies (Ketchum 128). The program is a multidisciplinary concentration of courses, seminars, field work, and independent study possibilities centering on the peace development process. Analysis of peace and war systems, dispute settlement techniques, social movements, future world systems, conflict analysis and regulation, and mediation and arbitration are among the areas of faculty expertise represented in the concentration. While no C.P.S. major is offered, it is possible for a student to design an Individually Structured Major with a faculty advisory committee.

Because of the intrinsically international nature of conflict and peace studies, students are encouraged to consider a program of study abroad to gain an understanding of intercultural relations. For information on study abroad, consult the Office of International Education.

The Conflict and Peace Studies Committee, composed of faculty and students from various social science disciplines, meets regularly and welcomes those interested in this area of study.

DISTRIBUTED STUDIES PROGRAM

Students working toward the B.A. degree may elect a two- or three-area major in the distributed studies program. Those students wishing to pursue a two-area major must complete 30 hours of course work in each department; 15 hours in each department must be upper division course work. Students must have a 2.0 grade-point average and 30 hours of C grade or better, including the 15 hours of upper division course work in each department.

In a two-area major, each department must approve the student’s program, and therefore either department may deny the student’s proposal.

Students pursuing a three-area major must designate one area as primary and the other areas as secondary. In the primary area, 30 hours of work including 15 hours of upper division work must be completed. A grade-point average of 2.0 in the primary area and 30 hours of C grade or better, including the 15 hours of upper division work, are required.

In the secondary areas the student must complete 15 hours in each of the departments, including 8 hours of upper division work in each department. A grade-point average of 2.0 is required in each of the secondary areas, as well as 15 hours of C grade or better, including the 8 hours of upper division work in each department.

Language Courses

No first-year course in a foreign language (101-102) or English language (composition) may be used in satisfaction of the requirements of the distributed studies major.

The areas which may be used in the program are limited to those in which a departmental major for the B.A. is offered. Astro-geophysics, comparative literature, and computer science are also acceptable as either primary or secondary areas.

For guidelines and application forms, consult the College of Arts and Sciences Dean’s Office, Hellmans 152.

ECONOMICS

Office in Economics Building, Room 212
Campus Box 256
Professor Wesley J. Yordon, Chairman

BACHELOR’S DEGREE REQUIREMENTS

Students majoring in economics must take a minimum of 38 semester hours and not more than 45 semester hours in economics, of which 22 semester hours must be in upper division courses. The following courses are required of all economics majors: Econ. 201, 202, 381, 407, 408, 480; Math. 107, Math. 108, and Acct. 200 or Math. 107, 130. (Students planning a career in economics will find it advantageous to take Math. 130 instead of Math. 108.) Six semester hours of accounting may count toward the economics major.

For all courses numbered 300 and above, the prerequisite, unless otherwise indicated, is Econ. 201 and 202 or permission of the instructor.
GRADUATE DEGREE PROGRAMS

Admission Requirements for Graduate Study in Economics

1. Three letters of recommendation.
2. Undergraduate degree with grade-point average of 2.75, or better.
3. Minimum of 16 semester credit hours of work in economics.
4. The Graduate Record Examination (verbal, quantitative, analytical and advanced economics) is required of all applicants who reside in the United States. This includes all foreign students enrolled in U.S. colleges or universities at the time the application is made. All students who submit their applications for Graduate School while residing in a foreign country are urged to take the Graduate Record Examination (verbal, quantitative, and analytical). Foreign applicants must exhibit competence in the English language. This can be demonstrated either through the TOEFL or other comparable English language examination.
5. Applicants who seem likely to succeed in the program may be admitted provisionally even if they do not meet all of the above requirements, but these exceptions must be approved by the dean of the Graduate School.

Master's Degree

1. Required Courses:
   b. Quantitative Methods: Econ. 581, Introduction to Econometrics, or Econ. 681, General Economic Statistics.

   The graduate adviser may permit substitutions of courses taken outside the department for the required courses if, in his judgment, at least the same body of material was covered at an equivalent level; except that when such substitution is for Econ. 507 and/or 581, the student must take and pass the 507 and/or 581 final examination(s) with grade of B or better to effect the substitution. A course syllabus will be prepared for each of the required courses to provide a basis for materials to be covered wherever and whenever these courses are offered and for making up the final examinations in these courses.

   M.A. candidates are required to attempt the courses or examinations in theory and quantitative methods within two academic years and be passed within two and one-half academic years from the date that they enrolled in the graduate program. Passing the Ph.D. preliminary examinations in theory, quantitative methods, and history of thought also satisfies this M.A. requirement.

   For any student entering the Ph.D. program from the master's program, the preliminary examinations for the Ph.D. must be attempted within three academic years and passed within three and one-half years from the date the student enrolled in the graduate program. The Graduate Review Committee is empowered to make exceptions for regular and provisional students in M.A. and Ph.D. programs.

2. Credit Hours:
   Plan I
   a. Minimum of 24 semester hours of graduate work, including a thesis to count for 4 semester hours;
   b. Minimum of 12 semester hours, exclusive of thesis, in courses at the 600 level or above;
   c. A B or better average in all work presented for the degree.

   Plan II
   a. Minimum of 30 semester hours of graduate work;
   b. Minimum of 15 semester hours in courses at the 600 level or above.
   c. A B or better average in all work presented for the degree.
   d. No thesis requirement.

3. Examinations:
   a. Comprehensive-Final Examination: Each candidate for a master's degree is required to take a comprehensive-final examination after the other requirements for the degree have been completed. This examination may be given near the end of the candidate's last semester of residence while he is still taking courses, provided that he is making satisfactory progress.

   (1) Plan I candidates must take an oral examination covering the dissertation and other work presented for the degree. (See Rules of the Graduate School for details concerning coverage of work not done in formal courses and seminars in economics.)

   (2) Plan II candidates will be examined in two fields. (Ph.D. comprehensive examinations are acceptable substitutes.) In each of the fields the candidate must have had a minimum of 6 semester hours of course credit, of which at least 3 semester hours must be at the 600-level or above. One of the fields may be individually structured to meet a particular need provided the candidate's plan is approved by the student's adviser and the campus departmental graduate adviser. An individually structured field may be based wholly or partly upon the candidate's work in an Economics Internship (Econ. 698). If a field is based wholly on an economics internship the examination for that field may be oral, written, or both, at the option of the examining committee. Otherwise, the examination in each field consists of a three-hour written examination. Candidates ordinarily present two fields based on regular course work in economics at the University of Colorado; deviations from this are limited to one of the following options:

   (i) One of the fields may be outside the discipline of economics or
   (ii) Course credits for one field may be transferred from another university or
(iii) One of the fields may be based wholly or partly upon an economics internship.

b. Supplemental Examinations: If a master's degree candidate fails the same examination twice, the possibility of a supplemental examination to acquire further information about the candidate's knowledge of the field in question remains open. To qualify for a supplemental examination the candidate must, within ten days of the notification of failure, submit a written appeal to the Graduate Review Committee requesting further examination and stating the reasons for the appeal. The Graduate Review Committee shall examine evidence related to the overall competence of the student as an advanced degree candidate. The committee must decide within 20 days of the notification of failure whether or not a supplemental examination is warranted.

If the supplemental examination is approved, it shall be conducted by a committee composed of two members of the original examining committee plus the student's major adviser. The format of the examination will be determined by the supplemental examination committee, and this examination must be administered within 30 days of the notification of failure. The examining committee shall pass or fail the candidate solely on the basis of demonstrated competence in the field in question; the overall potential of the student as an M.A. candidate should not enter into the judgment of the examining committee.

4. Other Requirements:
M.A. requirements regarding (1) transfer of credits, (2) residence, (3) time limitations, (4) thesis, and (5) admission to candidacy, are stated in the Graduate School section of this catalog.

5. Special Program in International Economic Development:
Students participating in the special program in International Economic Development must meet the general requirements for the Master of Arts degree specified above. In addition, the following course and examination requirements must be satisfied for a master's degree with a double field of specialization in development:

(a) Completion of at least 6 hours in general economic development (Econ. 577, 478 and 677).

(b) Completion of at least 9 hours from at least two of the following allied fields:
- Agricultural and rural economics
- Resources and environment
- International trade and finance
- Comparative economics
- Other field studies approved by the Development Program Committee.

(c) In place of the two separate field examinations, successful completion of a two-part comprehensive examination covering material from sections (a) and (b) above. The examining committee will consist of one faculty member representing the field of general economic development and two from the allied fields.

Students electing to combine a single field of specialization in development with a second separate field of specialization will complete a minimum of 9 hours of course work from sections (a) and (b), including Econ. 577 or 677 to meet the course requirements for a single field in development. The comprehensive examination in development will be administered by at least one faculty member from general development and at least one from the allied fields.

6. Administration:

a. Degree requirements for admission, courses, credits, examinations and grading are the same for both the Boulder and Denver campuses without exception.

b. The Denver Campus has its own graduate adviser and its own admission procedures. Both the Boulder and Denver advisers will consult and review all marginal cases for admission. If disagreement occurs, the cases will be referred to the Graduate Review Committee.

c. All master's degree candidates from both the Boulder and Denver campuses will be given the same examinations in each of the specialized fields offered. Whenever students from both campuses are expected to take the same examination, the committee making up and grading the examination will have at least one faculty representative from each campus.

d. Members of the graduate faculty, in addition to giving grades to M.A. and Ph.D. candidates in graduate-level courses, will prepare a classroom list in which the students are ranked according to their course performance. These lists will be kept on file in the Department of Economics office.

Doctor's Degree Requirements

1. Satisfactory completion of the written preliminary examination covering microeconomic theory, macroeconomic theory, statistics, and history of economic thought. Preliminary examinations are given regularly in August and January. The four examinations may be taken all at once or may be split up over a maximum of two examination periods, subject to the approval of the graduate adviser. The examination in microeconomic theory and macroeconomic theory must be taken in one examination period. An examination failed in one examination period must be taken again and passed in the next examination period. Students admitted as regular degree students must attempt these examinations within their first two academic years and pass them within the first two and one-half academic years. Students admitted as provisional degree students must attempt these examinations within their first three academic years and pass them within the first three and one-half academic years. It is strongly recommended that students attempt at least part of the preliminary examinations by the beginning of the second academic year. The Graduate Review
Committee is empowered to make exceptions for regular and provisional students in M.A. and Ph.D. programs.

2. Satisfactory completion of the written and oral comprehensive examinations covering two or three fields of specialization in course work at the 600 level or above. The third may be taken in lieu of the elective courses requirement as stated in 4 below. These examinations must be attempted no later than two years after the student's first sitting for his preliminary examinations. These examinations will be offered at the beginning of each fall term and candidates are expected to take them at this time; but if the plan of course work conflicts with taking the examination in the fall, the candidate may arrange with the graduate adviser to take the comprehensive examination at the beginning of the spring semester. Those failing all or part of these examinations have the option of repeating them once at the beginning of the following term.

Doctoral students electing a field of specialization in economic development are required to complete a minimum of 9 credit hours of course work at the 600 level or above selected from the areas of general economic development and the following allied fields:

a. Agricultural and rural economics;
b. Resources and environment;
c. International trade and finance;
d. Comparative economics;
e. Other field studies approved by the Development Committee.

Econ. 677 must be taken as part of the required 9 hours. The examining committee in development shall consist of one faculty member from the General Development field and two from the allied fields.

A student will normally complete a minimum of 6 semester hours in each field of specialization. In lieu of one of the standard fields, the student may offer a combination field when the material in certain courses spans two or more areas or when courses from different areas are complementary in meeting the specialization objectives of the student. Courses may be included from outside the economics department on approval of the student's adviser and the graduate adviser. Students offering a special field are responsible for obtaining the written agreement of at least two faculty members who will be involved in evaluating their competence in the field.

3. The student is expected to choose a general thesis topic before the comprehensive examinations and be prepared to discuss it briefly in the examination.

4. For students presenting two fields for comprehensive examinations, the following requirement must be fulfilled: four elective courses, which include at least two fields other than the two in which the student has chosen to specialize, must be completed with a B or better before the student may take the comprehensive examinations. (In the case of students transferring schools, this requirement may be modified by the Graduate Advisory Committee.) In all cases, two formal courses at the 600 level or above must be taken at the University of Colorado in fulfillment of this requirement. This will provide students with a working familiarity in areas in which they have a professional interest without requiring them to specialize in these areas. Two of these elective courses may be taken outside the economics department. This will develop a broad, possibly interdisciplinary, perspective while allowing the student to specialize in two chosen areas of concentration within economics.

5. As much as 10 hours of work towards fulfillment of all requirements may be transferred on the basis of previous graduate work at another institution, subject to the approval of the graduate adviser and subject to the exception in 4 above.

6. Demonstration of competence in one foreign language before taking the comprehensive examinations.

7. Ph.D. thesis and final examination on the thesis. This must be completed within four years after the student has completed his comprehensive examinations.

8. Members of the graduate faculty, in addition to giving grades to M.A. and Ph.D. candidates in graduate-level courses, must prepare a classroom list in which the students are ranked according to their course performance. These lists will be kept on file in the Department of Economics office.

ENGINEERING

The following courses offered in the College of Engineering and Applied Science are accepted for College of Arts and Sciences credit (see College of Engineering in Course Description section).

Engr. 110-3. Creative Uses of Technology II.

ENGLISH

Office in Helinans Building, Room 101
Campus Box 226
Professor James K. Folsom, Chairman

BACHELOR'S DEGREE REQUIREMENTS

Expository Writing Program

Expository writing courses are now offered by the Arts and Sciences College Expository Writing Program (CEWP). See listings under Arts and Sciences.

Students Who Contemplate Teaching

Sheets listing curriculum required for a teaching certificate may be obtained in room 247, Education Building. Students should consult Mrs. Cline, Mr. Olson, or Mr. Di Stefano, who supervises the teacher-education program. Since requirements for education and English make a very tight schedule, students should seek early advising to complete their college requirements.

Departmental Honors

Students interested in graduating 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.

College of Arts and Sciences / 49
Students Majoring in English

Expository writing courses (freshman composition) do not apply toward the major. English courses taken P/F will not fulfill major requirements. Transfer students must take a minimum of 18 hours in English at the University of Colorado and must have English courses taken at other colleges evaluated by the English Department and recorded on a Faculty Note. Courses taken in other departments will not count in the English major. Each prospective English major must, by the end of the sophomore year, choose to be in Program A, B, or C.

Program A. A minimum of 36 credit hours is required for a major in the Department of English: 3 credit hours in Introduction to English Studies, 3 credit hours in Critical Writing, and 24 credit hours in courses numbered 300 or above. The upper-division credit hours must be divided as follows: 9 credit hours in English literature before 1800, 6 credit hours in English literature after 1800, 6 credit hours in American literature, 3 credit hours in English 499 through 498 (the senior seminar in Authors or Topics) and 6 credit hours in “period” courses. Some of these credits will coincide.

Program B. A minimum of 36 credit hours in the Department of English is required, of which 6 must be earned in the courses Introduction to English Studies and Critical Writing and 24 in courses numbered 300 or above. There will be a Senior Examination, three-and-one-half hours in length, covering the items on the reading list. The student is responsible for signing up for the examination. It should be taken in the first semester of the senior year; it may be taken no more than two times. The exam will be graded P/F.

Program C: The Creative Writing Program. The Creative Writing Program requires a minimum of 36 hours in English: 18 hours of creative writing courses, 9 of which must be upper division writing workshops; and 18 hours of English and American literature, 9 of which must be upper division courses (300-level or above). Admission to the program is not automatic, although all courses are open to all students whether or not they are majors. Students who have reached second-semester sophomore standing and have taken at least 6 hours of writing courses can be considered for admission. Students must have an advocate-advisor (a Creative Writing faculty member with whom they have studied) and must submit a manuscript of 10-12 pages for faculty approval. Transfer students must take at least 3 hours of writing with the program before being considered for admission, no matter how many courses they have taken previously. A student must be accepted formally into the major before the last semester of the senior year. The student should apply by the second semester of the junior year at the latest (or be prepared to complete the English major in Program A or B).

GRADUATE DEGREE PROGRAMS

English Graduate Calendar
August 25, 1985—Required meeting of all new graduate students with graduate director; 10 a.m., Heilms 125.

Comprehensive examinations for both the M.A. and the Ph.D. will be given each semester. Graduate students planning to take any departmental examination must state their intention to the secretary of the director of the graduate studies no later than the end of the third week of any given semester.

Admission Requirements

Master’s Degree in English Literature. Satisfactory scores on verbal and advanced literature parts of the GRE, plus at least 24 semester hours in English (exclusive of composition, creative writing, and speech). These hours should include the equivalent of a survey of English literature. Sixteen of the 24 hours must be in upper division courses.

Master’s Degree in English With Emphasis in Creative Writing. Candidates seeking this degree must meet all of the above-listed minimum admission requirements. In addition, each student must submit a manuscript of at least 10 pages of poetry or a minimum of 25 pages of fiction for evaluation. The candidate must meet the additional requirements specified in the brochure, Master of Arts Degree in English With Emphasis in Creative Writing, issued by the department.

Doctor’s Degree. Satisfactory scores on verbal and advanced literature parts of the GRE; either an M.A. degree in English or at least 30 hours of postgraduate English course work beyond the B.A. degree. Entering graduate students with no degree beyond the B.A. will normally be admitted to the M.A. program. They may later petition for admission to the Ph.D. program.

Degree Requirements

Students wishing to pursue graduate work in English should note Requirements for Advanced Degrees in the Graduate School section of this catalog and should write the department for a fuller description of the graduate programs in English.

ENVIRONMENTAL CONSERVATION

Office in Guggenheim Building, Room 110
Campus Box 260

The environmental conservation (EC) major is a program administered through the Department of Geography. The formal structure of the program includes a Committee for Environmental Conservation composed of representatives from the Departments of Economics, EPO Biology, and Geography.

Environmental conservation, although similar to majors in environmental studies elsewhere, stresses conservation, i.e., a reasoned use of the natural environment so that utilization does not impair the environment’s capacity for self-renewal. The major combines the study of technique and philosophy, natural and social science, with course options from 10 areas: biology, computer science, economics, English, geography, geology, physics, political science, quantitative methods, and sociology.

Students should consult with the secretary in Guggenheim 110 for further information.

50 / College of Arts and Sciences
BACHELOR'S DEGREE REQUIREMENTS

1. Satisfaction of the regular degree requirements for the College of Arts and Sciences.

2. A total of 45 to 50 hours distributed as follows: 31 to 33 hours of Required Courses, 6 to 7 hours selected from the Skills Courses, and 9 hours from the Elective Courses group.

3. Each course applied to the major requires a minimum grade of "C".

4. Courses taken on a pass/fail basis may not be applied toward the major.

5. A double major of environmental conservation and geography is not permissible.

6. All transfer credit toward the environmental conservation major must be evaluated. Transfer students will be required to take Geography 342 and Geography 443. No transfer credit will be applied to the above named courses.

Semester Hours

Required Courses (31-33 hours from the following)

- Econ. 201. Principles of Economics I .................. 4
- EPOB 121/123. General Biology I (with laboratory) .... 4
- EPOB 122/124. General Biology II (with laboratory) .... 4
- EPOB 302. Principles of Ecology ........................ 3
- Geog. 100. Environmental Systems—Climate and Vegetation .................................................. 4
- Geog. 101. Environmental Systems—Landforms and Soils ..................................................... 4
- Geog. 341. Conservation Practice and Management Practice .................................................. 3
- Geog. 342. Conservation Thought ......................... 3

Skills Courses (6-7 hours)

(Required: one computer science course and one other course from the following)

- Econ. 520. Introduction to Mathematical Economics .......................... 3
- Eng. 315. Report Writing ........................................... 3
- EPOB 352. Flowering Plants Systematics (with laboratory) .......... 4
- EPOB 409. Biomes .......................................................... 3
- Geog. 301. Geographical Techniques .................................. 3
- Geog. 306. Cartography I ............................................. 3
- Geog. 306. Map Interpretation ..................................... 3
- Geog. 401. Introduction to Quantitative Methods in Human Geography ........................................ 3
- Geog. 406. Geographic Interpretation of Aerial Photos .............. 3
- Geog. 417. Research Seminar ....................................... 3
- Geog. 420/Geol. 477. Statistics for Earth Sciences .................. 3
- Q.M. Any introductory statistics course .......................... 3

Elective Courses (9 hours; select any courses from this group)

- Econ. 453. Natural Resources Economics .................. 3
- Econ. 454. Environmental Economics .................. 3
- EPOB 351. Insect Biology (with laboratory) .............. 4
- EPOB 317. Arctic and Alpine Ecology or Geog. 325. Mountain Geography or Geog. 332. Geology of the Alpine and Arctic Regions .......................... 3
- EPOB 403. Limnology .................................................. 3
- EPOB 410-414. Advanced Ecology .............. 3
- EPOB 473. Ornithology ............................................. 3
- EPOB 476. Mammalogy (with laboratory) .................. 4
- Geog. 440. Land Use Planning Systems .................. 3
- Geog. 443. Seminar: Conservation Trends .................. 3
- Geog. 450. Water Resources and Water Management of Western U.S. .................. 3
- Geog. 473. Geography of Populations .................. 3
- Geol. 370. Environmental Geology .................. 3
- Phys. 228. Physics of Contemporary Social Problems .............. 3
- P.S. 445. The Environment and Public Policy .................. 3
- Soc. 220. Introduction to Demography and Human Ecology .................. 3

EXPERIMENTAL STUDIES

The Experimental Studies Program offers innovative courses which are taught by undergraduates, graduate students, or other qualified members of the Boulder community under the sponsorship of a regular member of the University faculty. Faculty members are also welcome to submit proposals for such courses. Proposals are due early in the semester preceding the one in which the course is to be taught. These courses either fall outside the subject-matter orientation of regular departments or cross subject-matter boundaries in an interdisciplinary fashion. In no case may an experimental studies course be taught more than twice consecutively; hence, there is an ever-changing list of innovative subject matter available through this program. All courses are graded pass/fail, but these hours do not count in the 15-hour limit established by the college. Experimental studies courses may not be counted toward the fulfillment of area requirements nor for the major, with the exception of the individually structured major.

For information and guidelines about proposing an experimental studies course, contact the Center for Interdisciplinary Studies, Ketchum 226.

FILM STUDIES

Office in Hunter Building, Room 102
Campus Box 316
Associate Professor James Palmer, Director

Photography and cinematography are attracting increasing interest as media of communication and artistic expression. Various departments of the college offer courses dealing wholly or to a significant degree with film as an art form, film history, film in contemporary society, and the art of still photography. Frequent showings of important films are presented on campus for educational purposes, for a nominal admission charge by the University Film Committee and the Experimental Cinema Group.

Students who are interested in study of the film should consult the film studies listing in the current Schedule of Courses and its supplement issue each semester.

Information on the Study Abroad Program, Inter-University Center for Critical and Film Studies in Paris, may be obtained at the Office of International Education, 492-7741.

The Arts and Sciences Committee on Film Study hopes to offer a bachelor's degree program in the near future. Interested students are advised to check with the Film Studies office, extension 7903, for information on the possibilities of a degree in film studies.
FINE ARTS
Office in Sibell-Wolle Fine Arts Building, Room N196A
Campus Box 318
Professor Jerry W. Kunkel, Chairman

BACHELOR’S DEGREE REQUIREMENTS

 Majors are available for the B.A. and B.F.A. degrees in art education, art history, and studio arts. Students are encouraged to consult with an undergraduate adviser in the department in order to obtain advice and current information concerning the program.

ART EDUCATION: 41-45 SEMESTER HOURS IN THE MAJOR

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any two of the lower division art history 280 series</td>
<td>6</td>
</tr>
<tr>
<td>Any two of the upper division art history 400 series</td>
<td>6</td>
</tr>
<tr>
<td>F.A. 100 or 101, Basic Drawing</td>
<td>2 or 3</td>
</tr>
<tr>
<td>F.A. 120 or 121, Basic Painting</td>
<td>2 or 3</td>
</tr>
<tr>
<td>F.A. 150 or 151, Basic Sculpture</td>
<td>2 or 3</td>
</tr>
<tr>
<td>F.A. 216, Beginning Photo</td>
<td>6</td>
</tr>
<tr>
<td>F.A. 286, First-Year Ceramics</td>
<td>3</td>
</tr>
<tr>
<td>F.A. 377, Jewelry Design</td>
<td>3</td>
</tr>
<tr>
<td>F.A. 354, Art in the Elementary Schools</td>
<td>2</td>
</tr>
<tr>
<td>F.A. 366, Art Materials Workshop</td>
<td>2</td>
</tr>
<tr>
<td>F.A. 367, Art Materials Workshop: Weaving</td>
<td>2</td>
</tr>
<tr>
<td>F.A. 368, Art in the Secondary Schools</td>
<td>2</td>
</tr>
<tr>
<td>F.A. 369, Practicum in Art Teaching</td>
<td>1-2</td>
</tr>
<tr>
<td>Studio concentration (consult department for combinations)</td>
<td>6-9</td>
</tr>
<tr>
<td>Mus. 183, Introduction to Music</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 270, Introduction to Theatre</td>
<td>3</td>
</tr>
<tr>
<td>Teacher Education Program (see School of Education for specific requirements)</td>
<td>28</td>
</tr>
</tbody>
</table>

ART HISTORY: 34-45 SEMESTER HOURS IN THE MAJOR REQUIRED

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any two of the following: F.A. 100 or 101, F.A. 120 or 121, F.A. 150 or 151</td>
<td>4-8</td>
</tr>
<tr>
<td>Any four lower division art history (280 series)</td>
<td>12</td>
</tr>
<tr>
<td>Any six upper division art history</td>
<td>18</td>
</tr>
</tbody>
</table>

STUDIO ARTS: 33-45 SEMESTER HOURS IN THE MAJOR REQUIRED

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.A. 100 or 101, Basic Drawing</td>
<td>2 or 3</td>
</tr>
<tr>
<td>F.A. 120 or 121, Basic Painting</td>
<td>2 or 3</td>
</tr>
<tr>
<td>F.A. 150 or 151, Basic Sculpture</td>
<td>2 or 3</td>
</tr>
<tr>
<td>Any three lower division art history (280 series)</td>
<td>9</td>
</tr>
<tr>
<td>Any two upper division art history</td>
<td>6</td>
</tr>
<tr>
<td>Upper division FA/FAH elective (minimum)</td>
<td>12</td>
</tr>
</tbody>
</table>

BACHELOR OF FINE ARTS DEGREE REQUIREMENTS

 The B.F.A. (a professional degree) is offered in art education, art history, and studio arts. Application to the B.F.A. program is required for art education and studio arts.

 1. Students in each area (art education, art history, or studio arts) must complete the minimum B.A. requirements for the area plus additional FA/FAH electives to total 50-57 hours in the major.
 2. Students should apply for the B.F.A. program (art education or studio arts) when they are at least first-semester juniors. In addition, students should have completed a minimum of 25 semester hours in the major.
 3. The B.F.A. review is held in April and November. Portfolios are presented by the students for faculty review. Students are notified by mail of the faculty decision to either accept or defer their application.
 4. Students must be in attendance at UCB when they apply for the B.F.A.

General Requirements

 Candidates for both the B.A. and B.F.A. degrees must satisfy the general college requirements. A fine arts major may not count toward the major any fine arts course above the 200 level taken on a pass/fail basis. Not more than 8 hours of independent study may be credited toward the minimum requirements of the major.

 A transfer student who is a B.A./B.F.A. candidate must complete a minimum of 9/15 hours of fine arts course work while attending the University. Majors who transfer fine arts credits must have an evaluation of those credits made by a fine arts transfer adviser during registration or as soon as possible thereafter.

 Students must arrange for a Statement of Major Status with the Department of Fine Arts during their next to last semester. A student may be graduated with departmental or general honors. If students are interested in pursuing the Honors Program, they should contact the fine arts office as early as possible in their academic careers.

 Students should be aware that work left in studios and/or exhibited in the Sibell-Wolle Fine Arts Building is at their own risk so far as loss or damage is concerned.

Special Programs

 Art History Program in Italy. The Department of Fine Arts annually conducts an art history summer program in Italy. The program offers 6 semester hours of credit during a six-week term, operating from a center in Florence and including numerous visits to other Italian towns and cities. The teaching responsibilities are shared by professors in the art history faculty so that the course offerings vary each year according to the specialties of the directors, which include Ancient Etruscan and Roman art, Late Medieval and Early Renaissance art, the later Quattrocento and the High Renaissance, and the Late Renaissance and Mannerism.

 Inquiries regarding the art history program in Italy may be directed to the Department of Fine Arts or the Office of International Education.

 Other programs, such as Art History in India are arranged by the department in conjunction with the Office of International Education.

 Exhibitions Program. The department sponsors exhibitions from its own collections and from those of artists, museums, collectors, and galleries throughout the country. The exhibitions are held in the Eve Drewelowe Gallery and the other two University of Colorado Art Galleries, which are all located in the Sibell-Wolle Fine Arts Building.

 Visiting Artist Program. The department brings to the campus distinguished, nationally known artists throughout the academic year. The program provides opportunities for the student to attend lectures, slide presentations, and seminars conducted by the artists.

*Consult art education faculty for appropriate substitutions.*
Slide Collection. An extensive collection of slides representing art from prehistoric to modern times is maintained for student and faculty use 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.

Permanent and Thesis Collections. The Department has an extensive collection of old master prints and drawings, paintings, sculpture, and photographs. Art history graduate students use this collection for research.

A collection of work donated by M.F.A. candidates from their thesis shows is also owned by the department.

GRADUATE DEGREE PROGRAMS

Prior to admission, candidates for advanced degrees in the Department of Fine Arts, with the exception of candidates for the Master of Arts (History of Art) degree, must submit slides showing at least 10 examples (Art Education) or 20 examples (Studio) of their creative work. Acceptance in the program is based on an evaluation of these as well as a review of undergraduate scholastic achievement.

Master of Arts Degree (Art Education)

Prerequisites. The following are required for admission to regular graduate status:
1. The baccalaureate degree in art or art education from an approved college or school of art and valid certification for teaching art (see 3 below).
2. At least 30 semester hours of acceptable work in art, including a background course in the history of art.
3. Some teaching experience should precede the beginning of graduate study, but experience may be obtained during the period in which one is studying for the master’s degree. A teacher certification program may be pursued concurrently with the master’s program with the approval of the art education faculty.
4. Students may be required to complete a qualifying examination early in the graduate program to assist the faculty in advising.

Course Requirements. Not fewer than two semesters of acceptable graduate work, amounting to a total of at least 24 semester hours beyond a bachelor’s degree, are required. Of this total at least 18 hours must be in specified course work in areas of the Fine Arts Department; up to 6 hours may be devoted to a minor in an academic area approved by the art education faculty adviser. The student must include in his or her program a minimum of 6 hours in F.A. 564 (Seminar in Art Education, or equivalent approved independent study). It is expected the student will enroll in the Seminar in Art Education each time it is offered throughout his graduate program. For those students electing Plan I (degree with thesis), 4 hours of F.A. 700 (Master’s Thesis) are required within the 24-hour minimum. Students who have been approved for a Plan II program (without thesis) will substitute 6 hours of course work beyond the minimum 24 hours in lieu of the thesis enrollment.

A typical minimum program might appear as follows:

<table>
<thead>
<tr>
<th>Plan I</th>
<th>Plan II</th>
</tr>
</thead>
<tbody>
<tr>
<td>F.A. 564 - 6 cr. hrs. (Seminar)</td>
<td>F.A. 564 - 6 cr. hrs. (Seminar)</td>
</tr>
<tr>
<td>F.A. 568 - 3 cr. hrs.</td>
<td>F.A. 568 - 3 cr. hrs. (Current Issues)</td>
</tr>
<tr>
<td>(Current Issues)</td>
<td>Studio electives - 9-15 cr. hrs.</td>
</tr>
<tr>
<td>F.A. 700 - 4 cr. hrs. (Thesis)</td>
<td>Minor (optional) - 6 cr. hrs.</td>
</tr>
<tr>
<td>Studio electives - 5-12 cr. hrs.</td>
<td>Independent Study</td>
</tr>
<tr>
<td>Minor (optional) - 9 cr. hrs.</td>
<td>(Art Education - Research) - 6 cr. hrs.</td>
</tr>
</tbody>
</table>

Examinations. A written comprehensive-final examination of approximately three hours in the field of fine art and general theory of art must be taken not more than one semester in advance of the graduation date for those students approved for Plan II. For students on Plan I the final examination will be oral and must be scheduled during the semester in which the student expects to graduate; this oral examination may be taken in lieu of the thesis.

Thesis. The student must be approved in all mechanical features with the specifications of the Graduate School and be approved by the designated faculty adviser and the thesis committee.

Nonthesis (Plan II). With the specific approval of the art education faculty, the student may substitute a nonthesis research study for the written thesis requirement. This approval must be granted in writing on the appropriate Fine Arts Department form. Unless the approval is received, it is assumed the student will pursue Plan I and complete a written thesis. A nonthesis project will only be approved if the student can satisfactorily show his research project cannot be appropriately reported in regular thesis form.

Master of Arts Degree (History of Art)

Prerequisites. The following are required for graduate work:
1. A baccalaureate degree from an approved college with a minimum cumulative grade-point average of at least 3.0.
2. A satisfactory score in the Graduate Record Examination.
3. A broad general background in history, literature, and philosophy as well as at least two semesters of art history survey or its equivalent.

Qualifying Examination. A written examination will be given to each accepted candidate within two months of entering the graduate program. This will cover the field of western art history at the elementary level, whatever the student’s intended eventual specialization. The results of the examination will serve as a partial guide to advising students in their course work and may result in additional course requirements above the minimum listed below. In cases where the examination is clearly inadequate, the student may be required to retake it at a later date. If the second examination is unsatisfactory, the student will be dropped from the program.

Course Requirements. At least three semesters of acceptable graduate work, of which two semesters must be spent in residence, are required. This degree may not be obtained through summer residence alone. A minimum of 30 semester hours is required, of which 18 hours (including F.A. H. 649, Tools of Research, to be...
taken the first term) must be in the field of art history, and a minimum of 6 hours in a minor field or fields to be determined by the needs of the student in preparing his thesis. Twelve hours must be at the advanced (500) level, including at least 6 hours of seminars.

Examinations. All degree candidates will be given a written comprehensive examination approximately six hours in length. After acceptance of the final draft of the thesis, an oral examination will take place dealing with the subject matter of the thesis and any areas of weakness which may have been found in the written comprehensive.

Thesis. See thesis requirements under Master of Arts and Master of Science in the Graduate School section of this catalog. Plan II, an alternate to the thesis, is not an option in the graduate program in art history.

Master of Fine Arts Degree

The work offered for this professional degree is designed to provide superior preparation for those whose aim is professional work in the field of art.

Prerequisites. The following are required for graduate work:

1. The Bachelor of Arts or Bachelor of Fine Arts degree from an approved college or school of art.
2. At least 34 semester hours of acceptable work in art, including a background course in the history of art.

Course Requirements. Not fewer than four semesters of acceptable graduate work, amounting to a total of at least 34 semester hours beyond a bachelor's degree, are required (see exception below). At least 36 hours must be completed at the Boulder Campus. All fine arts/fine arts history courses must be at the 500 level or above. P.A. 503 plus 3 hours of art history, or 6 hours of art history, must be taken with 8 credit hours in nonstudio areas. Nonstudio areas of study are construed to be courses in the history of art, criticism, and art seminars. Nonstudio courses taken outside the department may be at the 400 level or above. Photography students must enroll in graduate photography, P.A. 519, each semester, with the exception of the thesis semester. Courses will be elective and chosen in consultation with the student's adviser. In some cases, however, the department may prescribe certain courses on the basis of the student's performance in the year-end review.

Exception: Printmaking graduate students are expected to complete a three-year, 60-hour program. All basic requirements must be completed during the first two years so the final year may be devoted exclusively to work on the student's creative thesis.

Upon admission, each student is assigned an adviser from the student's specialization. The student may select a different adviser at the end of the first semester of graduate work.

When a student has completed at least 24 semester hours of graduate-level work, he or she will be reviewed by a committee of the graduate faculty. At the time of this review the student will be required to submit to the committee (1) examples of his or her studio work and (2) a written statement concerning nonstudio work. On the basis of this review the committee will determine whether the student may continue in the program and will identify specific requirements for further work in both studio and nonstudio areas.

The first-year review for printmaking students will take place at the end of the student's third semester. At that time, the student may petition to complete the program in two years. This would be granted only if the student shows an exceptional aptitude as a productive, creative artist.

If a student wishes to take related work in art education and to qualify for art education teaching at the college level, the candidate must fulfill all prerequisites required for the Master of Arts (art education) degree. All of the work may be done in residence and the last year must be spent in residence. If the first year is not in residence, approval should be secured in advance.

Thesis Requirement. M.F.A. degree candidates must enroll in P.A. 750 (Master of Fine Arts Creative Thesis) during the final semester. M.F.A. creative thesis work may have been produced earlier in the candidate's program as well as during the creative thesis enrollment. It must take the form of original creative work of acceptable professional standards. The candidate is expected to exhibit proficiency in at least two areas. Concurrent with the exhibition of the candidate's creative work will be an oral comprehensive examination and a brief critical written statement concerning the work. The written statement must be presented in a form consistent with the requirements specified by the Department of Fine Arts and must be accompanied by 6 to 10 slides of work selected from the exhibition by the thesis committee. The slides become part of the Slide Collection which is housed in the Department of Fine Arts. The thesis committee may retain a piece of work from the exhibition for the permanent thesis collection of the department.

Credit by Transfer. Credit, not to exceed 16 semester hours, may be approved for transfer from an institution of approved standing toward the professional degree M.F.A., which requires at least two years of work beyond the bachelor's degree.

FRENCH AND ITALIAN

Office in Main Building, Room 107
Campus Box 273
Professor Jacques Barchilon, Chairman

French

Students who have completed a Level III high school French course have automatically satisfied the college graduation requirement in foreign language. This requirement may also be satisfied by completion of Fr. 201 or 211 or by demonstration of equivalent proficiency by placement test. Students who have studied French in high school and who wish to continue with the language will be placed according to their high school record and verbal SAT and/or ACT scores. A student normally may not receive credit for a course at a lower level than that into which he is placed. Exceptions are determined through consultation with the department.
BACHELOR’S DEGREE REQUIREMENTS

Students majoring in French must complete 35 hours beyond the first year. Students presenting four years of high school French for admission must complete 30 hours beyond the second year. Required courses are Fr. 202 or 212, if applicable, 301-302, 305 and 306 or upon consultation, 311-312, 401-402, plus 9 hours of literature/civilization or linguistics courses at the 400 level. A major in business French is also available (see departmental guidelines). Courses at the 400 level are closed to freshmen.

Students majoring in French may not take any of their major requirements pass/fail.

For students interested in study abroad, the University of Colorado offers a year-long study abroad program at the University of Bordeaux, a semester program in Rennes, France, and a semester program in Chambery for near-beginners. Further information is available from the Office of International Education. The Ayer Romance Language Scholarship is available through the department for application toward study abroad programs.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in French leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog. Also, a graduate teaching exchange is available to students who have earned a master’s degree.

Master’s Degree

Prerequisites. The following are prerequisite to graduate study in French:

1. A reading, speaking, writing, and auditory comprehension ability in French (all candidates must have a reading knowledge of one foreign language in addition to the major language).

2. A general knowledge of French literature and civilization.

Prerequisite for a Minor in a Foreign Language. Two years of college work or the equivalent, a course in conversation, and some knowledge of the literature and civilization of the country or countries concerned.

Required Courses. The department allows students to specialize in literature, in linguistics, or in teaching. Each of these tracks differs somewhat from the others in its requirements. See the department’s guidelines for M.A. candidates.

Examinations. Graduate Record Examination required for admission; final examination (conducted partly in French) on the areas covered in the student’s program (see M.A. memorandum and reading lists).

Doctor’s Degree

Prerequisites. Excellence in reading, speaking, writing, and auditory comprehension in French; a general knowledge of French literature and civilization. Reading knowledge of two other foreign languages.

Required Courses. The department allows students to specialize in literature or in linguistics. Each track differs from the other in its requirements. See the department’s guidelines for Ph.D. candidates.

Language Requirement. A reading knowledge of a modern foreign language other than that used for the Graduate School communication requirement, except if the same language is studied through 400-level courses offered by the appropriate department. This language may be one of the following: German, Spanish, Italian, Russian; other languages will be considered depending upon the student’s area of research.

Italian

Students who have completed a Level III high school Italian course have automatically satisfied the college graduation requirement in foreign language. This requirement may also be satisfied by completion of Ital. 211, or by demonstration of equivalent proficiency. Students who have studied Italian in high school and who wish to continue with the language will be placed according to their high school record and verbal SAT and/or ACT scores and interview. Students may not receive credit for a course at a lower level than that into which they are placed.

Students interested in study abroad will find further information under the section on Special Educational Opportunities. The Ayer Romance Language Scholarship is available through the department for application toward study-abroad programs. A junior year abroad program in Bologna is available. For further information inquire at the Office of International Education.

For comparative literature and linguistics courses with Italian emphasis, see those sections.

BACHELOR’S DEGREE REQUIREMENTS

The primary goals of the undergraduate Italian major program are to provide a mastery of the language skills (listening, speaking, reading, writing) and to promote an understanding of the Italian literary and cultural tradition within Western civilization. At the same time, the major provides the necessary background for advanced professional study and specialization.

Students wishing to major in Italian are required to have a thorough advising session with the Italian program undergraduate adviser. In this session the student’s program of study will be outlined in detail. Students are required to see the undergraduate adviser in the event that any of their major courses are cancelled 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 undergraduate adviser.

Students will be offered the option of a senior seminar for 1 credit hour in which direction and advising will be given in order to fill in gaps in their studies. Students majoring in Italian may not take any of their major requirement courses pass/fail.

A student is required to complete 30 credit hours of course work beyond the first year of Italian with a 2.0 average or better. A student may not take more than 45 credit hours in Italian (including the first year).
GRADUATE DEGREE PROGRAM

Master’s Degree

Prerequisites. The following are prerequisite for graduate study in Italian: (1) a reading, speaking, writing, and auditory comprehension ability in Italian (all candidates must have a reading knowledge of one foreign language in addition to the major language); (2) a general knowledge of Italian literature and civilization.

Prerequisites for a Minor in a Foreign Language. Two years of college work or the equivalent in the minor language, a course in conversation, and some knowledge of the literature and civilization of the country or countries concerned.

Required Courses. One course in Italian linguistics or Romance linguistics. See the department’s guidelines for M.A. candidates.

Minor Field. A minimum of two courses. French language and literature or Spanish language and literature are preferred. Also accepted are Latin language and literature, German, Russian, comparative literature, general linguistics, English, Greek, music, fine arts, philosophy, or history.

Language Requirement. A reading knowledge of a classical or modern foreign language: Latin, ancient Greek, French, German, Portuguese, Russian, or Spanish. Language proficiency should be demonstrated as soon as possible after entering the degree program.

Examinations. Qualifying examinations (first semester of residence) on the prerequisites for graduate study in Italian; comprehensive-final examination (conducted partly in Italian) on the literature and linguistics, specific subjects pursued and the thesis (for Plan I students).

GEOGRAPHY

Office in Guggenheim Building, Room 110
Campus Box 360
Professor M. John Loeffer, Chairman

BACHELOR’S DEGREE REQUIREMENTS

In addition to the college requirements, students majoring in geography shall successfully complete the following regularly scheduled courses or their equivalents: Environmental Systems—Climate and Vegetation (Geog. 100), Environmental Systems—Landforms and Soils (Geog. 101), and two of the following: World Regional Geography (Geog. 198), Introduction to Human Geography (Geog. 199), World Geographic Problems (Geog. 200). Students shall also complete two of the following: Geographical Techniques (Geog. 301), Cartography I (Geog. 305), Map Interpretation and Intelligence (Geog. 306), Introduction to Quantitative Methods in Human Geography (Geog. 401), Statistics for Earth Sciences (Geog. 402), Geographic Interpretation of Aerial Photos (Geog. 406), Introduction to Remote Sensing of the Environment (Geog. 409), Research Seminar (Geog. 417).

In addition, majors are expected to have or to achieve a reasonable level of competence in clearly conveying their ideas and perceptions. Basic skills in one or more communications methods—written, oral, symbolic, or graphic—are considered an essential part of a university student’s intellectual attainment. Students exhibiting deficiencies in writing, speaking, mathematics, statistics, or graphics will be urged to take appropriate remedial action.

Distributed majors selecting geography as a primary or secondary subject should consult with the departmental undergraduate advisers. Distributed majors selecting geography as a primary subject shall complete those geography courses identified as departmental requirements plus any other departmental offering relevant to their total program consisting of a minimum of 30 credit hours in geography.

Distributed majors with geography as a secondary subject shall complete Environmental Systems—Climate and Vegetation (Geog. 100) and Environmental Systems—Landforms and Soils (Geog. 101), Introduction to Human Geography (Geog. 199), and World Geographic Problems (Geog. 200).

Students should consult the departmental office for further information and referral to departmental advisers.

GRADUATE DEGREE PROGRAMS

The sections of this catalog concerning Graduate School general, admissions, thesis, degree, etc., requirements should be read carefully. Graduate-level course work at the Boulder Campus may be combined with graduate courses offered at the Denver and Colorado Springs campuses. The following are departmental requirements.

Prerequisites. For admission without deficiency, the minimum requirements are approximately 20 semester hours of geography, including one year of introductory physical geography and introductory human geography. Quantitative skills (mathematics, statistics, computer) are important, and graduate students are encouraged to have some background in college mathematics and statistics. For general background, it is desirable that the student have formal courses in at least two of the following subjects: anthropology, biology, economics, geology, history, mathematics, physics, political science, or sociology.

Students applying for admission are required to have taken the Graduate Record Examination Aptitude Test.

Master’s and Doctor’s Degrees

All incoming graduate students are requested to consult with a departmental adviser to outline their academic programs and to carefully review the departmental requirements for either the M.A. or Ph.D. degrees. Specific degree requirements are obtainable upon request to the department.

The department’s minimum language requirement is the same as the Graduate School’s minimum foreign language requirement. It is possible that more than minimum proficiency may be required for library and/or field research. In any case, the choice of the language(s) must be approved by the student’s advisory committee.

Specific Course Requirement. The preliminary evaluations requirement is fulfilled by the composite
evaluation of the student's performance in his or her first three exclusively graduate courses, one of which should be in physical geography and one of which should be in human geography.

A preliminary evaluation committee recommends methods of deficiency removal, if any, and whether the student is recommended for continuation toward an advanced degree after the three required courses are completed. Courses taken prior to official admission into the degree program may not be used to satisfy the preliminary evaluation requirement. Consult the department for additional details.

GEOLOGICAL SCIENCES
Office in Geology Building, Room 205A
Campus Box 260
Professor Erle Kaufman, Chairman

BACHELOR'S DEGREE REQUIREMENTS

Students who wish to major in the geological sciences (Major Code 129) must apply to the department for admission. Application is normally made late in the sophomore year, after the student has completed the following courses with a grade-point average of 2.3 or better:

1. Geol. 101-102/153-201, plus:
   1. Any four of the following courses:
      Chem. 103
      Chem. 105
      Math. 120

   2. Geol. 111

   Because the number of majors is limited, even successful completion of these requirements will not guarantee acceptance into the program; top applicants will be admitted until the limit is reached. Once in the program, students must maintain minimum academic standards (a 2.0 average in all geology courses and a 2.0 average in the additional courses in mathematics and allied sciences that are required for the major) or risk being dropped from the program.

Students who are interested in the geological sciences but have not been admitted to the major program should register for the prerequisites program (Major Code 164).

Transfer students who are accepted directly into the major program must satisfactorily complete a minimum of 12 semester hours of advanced work (300 level or above) in the Department of Geological Sciences in Boulder, if they wish to obtain a degree in geology from the University of Colorado at Boulder. Before registering for the first time, or within the first week of the semester, such students must see a member of the departmental Academic Progress Committee so as to have previous course work in geology, mathematics, and allied sciences evaluated.

The major program contains five curriculum options, all leading to a B.A. degree in the geological sciences. A student should select an option appropriate to the student's interests and objectives. Information on the curriculum options and other departmental requirements may be obtained from the departmental office.

GRADUATE DEGREE PROGRAMS

Students interested in graduate work in the geological sciences should read carefully the detailed information regarding admission, registration, and degree requirements that is available from the departmental office. A brief summary follows.

All students applying for admission must take the Graduate Record Examination. Results of this examination will be used both for determining admission and for initial academic counseling.

Entering students will normally have completed at least 24 semester hours of basic courses in geological science and two semesters each of chemistry, physics, and calculus. In some cases, exceptional undergraduate preparation in other fields of science, mathematics, or engineering will substitute for part of the 24 hours in geological science.

Initial counseling will be provided on an individual basis by the departmental Committee on Academic Progress. Thereafter each student will acquire an advisory committee which will provide guidance throughout the degree program.

Master's Degree

Candidates for the master's degree in geological sciences must complete at least 24 semester hours of course work numbered 500 or above, including a thesis (Plan I), or 30 semester hours in courses numbered 500 or above without a thesis (Plan II). The Plan II program requires at least 3 hours of Geol. 970 under the supervision of the advisory committee, or 5 hours of Geol. 562 (Field Vertebrate Paleontology). Upon the recommendation of the advisory committee, a student may substitute up to 12 hours of course work taken in related outside departments, including courses numbered below 500.

Doctor's Degree

Candidates for the doctoral degree must complete at least 30 semester hours in course work numbered 500 or above, of which at least 20 must be taken at UCB. In addition to course work, candidates must take a total of at least 30 hours of 800 doctoral dissertation hours, with not more than 10 of these in any one semester and not more than 10 before the comprehensive examination is passed.

Doctoral candidates are required to demonstrate second-year college proficiency in a foreign language of their choice.

GERMANIC LANGUAGES
AND LITERATURES

Office in McKenna Building, Room 129
Campus Box 276
Assistant Professor Robert Firestone, Chairman

Students who have studied German in high school and wish to continue with the language will be placed according to their high school record and verbal SAT and/or ACT scores. The general rule is that one level in high school is the equivalent of one semester in college. Students who are not certain where they should be placed should consult the department.
The academic program may be supplemented by residence on the German Floor of the Language House, located in the Williams Village dormitories. Language House participants may earn 2 hours of credit in the College of Arts and Sciences each semester.

The department sponsors a program in Germany for undergraduate students. Students with at least four semesters may apply for a Junior Year Program in Regensburg, Federal Republic of Germany. Further information on these programs may be obtained from the Office of International Education.

BACHELOR'S DEGREE REQUIREMENTS

The primary goals of the undergraduate German major program are to provide a mastery of the language skills (understanding, speaking, reading, writing) and to promote an understanding of the German literary and cultural tradition within its place in Western civilization. The German major is thus a liberal arts major. At the same time the major provides the necessary background for advanced professional study and specialization.

The German major will normally present a minimum of 35 semester hours from the courses listed in the Course Description section of this catalog; however, the minimum number of hours will be 30 if all the hours are at the 300-level or above. Courses at the 100 level will not be counted toward the 35 hours. Majors must take at least one departmental 400-level course on the Boulder Campus.

German literature and culture courses in English translation normally do not count toward the 35 hours. However, students wishing to use such courses may arrange with their respective instructors and the major adviser to supplement the course work by reading the material and writing papers in German, in which case major credit may be granted.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in Germanic languages and literatures leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section, and the departmental memoranda for the M.A. or Ph.D. degree.

Master of Arts

Prerequisites. For students seeking admission to the M.A. program in German the following are required:
1. The ability to speak, read, and write German and to comprehend spoken German.
2. Some knowledge of the main currents and masterpieces of German literature and civilization.
3. A reading knowledge of one foreign language other than German. Students lacking such knowledge when entering the program must demonstrate that they have made up this deficiency by passing an examination or by completing appropriate course work in a foreign language before they can be admitted to candidacy for the M.A. degree.

Specialization. The program is designed to provide a broad, general knowledge of German literature and linguistics, but it is possible to choose elective courses to provide greater depth in literature, linguistics, or language instruction in the secondary schools, or related fields outside this department.

Examinations. For information concerning qualifying and comprehensive examinations and the master's thesis, consult the departmental memorandum for M.A. candidates.

Doctor of Philosophy

Prerequisites. For students seeking admission to the doctoral program in German the following are required:
1. Excellence in the German language and a broad knowledge of German literature and civilization. This usually means the M.A. in German, with a thesis, or a comparable level of university training.
2. Reading knowledge of two foreign languages other than German. Students entering the program with a deficiency in this requirement must demonstrate that they have made it up by passing an examination or by completing appropriate course work in a foreign language before they can be admitted to candidacy for the Ph.D. degree.

Specialization. At this time the department is not accepting applications from candidates who wish to specialize in Germanic linguistics; doctoral candidates must specialize in German literature.

Related Fields. The department does not require studies in a related field, but students are encouraged to broaden their knowledge by taking appropriate courses outside the department in consultation with the graduate advisor or the chairman of their graduate examination committee.

Examinations. For preliminary and comprehensive examinations and the doctoral dissertation, consult the departmental memorandum for Ph.D. candidates.

HISTORY DEPARTMENT

Office in Helme Building, Room 204
Campus Box 234
Professor Boyd H. Hill, Jr., Chairman

BACHELOR'S DEGREE REQUIREMENTS

Students majoring in history must complete a minimum of 30 semester hours of history courses with a grade of C or better. Not more than 45 semester hours in history will apply to the 124-semester hour requirement for the Bachelor of Arts degree. A student must have a grade-point average of at least 2.0 in the major in order to graduate.

All history majors must complete Hist. 151-152 (6 semester hours) and one of the following course sequences: Hist. 101-102, 103-104, 105-106, 141-142, or 181-182 (6 semester hours each). Any one of these course sequences will satisfy the first-year social science requirement of the College of Arts and Sciences.

All majors must also complete one course at the 300 level titled Selected Readings or Research Seminar. Senior history majors may, with instructor's permission, substitute a 600-level course titled Readings.

A history major must also complete a minimum of 18 semester hours of upper division 300-400 level course work in history.
Completion of course work for the major in history will not automatically satisfy the second year social science requirement of the College of Arts and Sciences.

Transfer students majoring in history must complete at least 12 semester hours of upper division history courses at the University of Colorado at Boulder.

Students may receive credit for Hist. 101-102 and/or 151-152 by advanced placement.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in history leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section. Following are special departmental requirements. Additional information should be obtained from the Department of History.

Master's Degree

Prerequisites. As general preparation for graduate work in history, it is desirable that a student have had a broad liberal arts education as well as a major in history. Candidates for graduate degrees may be required to pursue such fundamental courses in history as the department deems necessary to provide a suitable historical background.

For purposes of admission to the graduate program, the verbal portion of the Graduate Record Examination is required and a score in the 80th percentile or above shall normally be required for admission. The department also encourages students to take the advanced history test of the GRE which, if submitted, will be used in conjunction with other materials pertinent for admitting graduate students.

Residence. While it is possible to obtain the M.A. degree in two full semesters of residence, it is frequently advisable and at times necessary that more time be spent in graduate work.

Degree Requirements. A total of 24 semester hours of course work plus 4 to 6 hours in M.A. Thesis, or 30 semester hours of course work without a thesis is required for the degree. The required qualifying examination is met by a satisfactory score on the Graduate Record Examination. A comprehensive examination must be passed in the major field of concentration before the degree is granted. Candidates should request from the Department of History the set of instructions for M.A. candidates.

Doctor's Degree

Prerequisites. Students who wish to work toward the Ph.D. degree in history must indicate familiarity with certain fields of history, acquaintance with the fundamental tools of historical scholarship, and the ability to do original work. The Departmental Preliminary Evaluation for the Ph.D. program shall be the successful completion of the M.A. degree (or its equivalent) and the positive recommendation of the Graduate Admissions Committee that the student be admitted to the Program.

Residence. At least three years of graduate study, two of which must be spent in residence, are required for the Ph.D. degree.

Degree Requirements. A total of 30 credit hours and dissertation is required for the degree. One language is required; students should be able to use those languages essential to research and advanced study in their respective fields.

A comprehensive written and oral examination, a dissertation which is an original contribution to knowledge, and an oral examination on the dissertation must be successfully completed. Candidates should request from the Department of History the set of instructions for doctoral candidates.

HISTORY AND PHILOSOPHY OF SCIENCE

Campus Box 390
Allen D. Franklin, Chairman

The College of Arts and Sciences offers courses in the history and philosophy of science. These courses are Nat. Sci. 321-322-323-324, offered in the Center for Interdisciplinary Studies, and Phil. 341-342-343-344, offered in the Department of Philosophy. The four semesters cover the time periods Ancient to Copernicus, Copernicus to Newton, Newton to Einstein, and Twentieth Century. Of related interest is Hist. 415, History of Science From the Ancients to Sir Isaac Newton.

The History of Science Committee sponsors a series of six lectures by visiting scholars as well as a biweekly seminar by both visiting and local scholars. Each spring there is a regional conference on the History and Philosophy of Science. Cassette tape recordings of the lectures and seminars are available for loan from the committee office.

No formal major is offered in the history and philosophy of science, but interested students may design their own majors in this area through the individually structured major, with the aid of a faculty advisory committee and the approval of the dean of the College of Arts and Sciences. Information may be obtained from the Office of Innovative Education and the Committee on the History of Science.

Students are also encouraged to consider a distributed major in the appropriate departments: a major in either history or philosophy with courses on the history and philosophy of science, or a major in one of the scientific disciplines with courses in the history and philosophy of science as electives. In addition, physics majors pursuing Plan 2 may take history and philosophy of science to satisfy the interdisciplinary requirement.

An M.A. program in the history and philosophy of science is available in the Philosophy Department.

HONORS PROGRAM (CENTER FOR INTERDISCIPLINARY STUDIES)

Office in Norlin Library
Professor Walter Weir, Program Chairman

The Honors Program at the University of Colorado is designed to provide special educational opportunities for particularly able and highly motivated students. It is open to well-prepared freshmen as well as to students who enter the program at a later stage. The Honors

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Program offers a guide to a carefully constructed curriculum in the liberal arts, thoughtful advising, close contact with faculty and with other honors students, and an opportunity to write an honors thesis, outside the student's major, under close supervision. Students will become conversant with the humanities, the social sciences, and the natural sciences.

The Honors Program is also responsible for determining which students merit the award of the bachelor's degree with honors: cum laude, magna cum laude, and summa cum laude. These awards are made on the basis of special honors work and not simply on the basis of grades earned in courses.

A student may participate in either departmental honors or general honors, or both. Departmental honors may require a junior or senior honors seminar, an independent research project, and/or directed readings. Each department has information pertaining to its own particular program. General honors is designed to help students explore areas outside their major fields and to broaden the basis of their liberal education. Each semester some 30 honors courses in a wide variety of areas are offered; each course is limited to an enrollment of 15 students. Candidates are required to take the honors course in Science and Values and the Senior Colloquium and to write a Senior Thesis.

With a few specific exceptions, Honors courses do not count toward area requirements for the bachelor's degree nor toward requirements for the major.

Detailed information concerning the Honors Program may be obtained in the Honors Office in Norlin Library, either in person or by mail. Application for admission to the Honors Program can also be made in the Honors Office in Norlin Library, either in person or by mail. Freshmen are accepted for honors work on the basis of achievement in high school; students currently enrolled are accepted on the basis of academic achievement at the University of Colorado. While honors students are expected to have a grade-point average of at least 3.3, no student who shows ability and promise is excluded from consideration.

HUMANITIES
Office in Ketchum Building, Room 198
Campus Box 331
Assistant Professor Nancy Hill, Program Chairwoman

The humanities major is structured on an interdisciplinary approach to the arts. In addition to taking courses which combine the study of literature, music, and the visual arts, all students must do work in depth in the literature of a single language. Beyond these requirements students may select a secondary field of concentration as listed below. Since the program is tailored as much as possible to the individual student's interests, majors should see their departmental adviser each semester. Departmental advisers for the major are Professors Palmer and Hill. Early completion of the foundation course, Hum. 101-102, is essential.

BACHELOR'S DEGREE REQUIREMENTS

1. Satisfaction of the regular college requirements for the Bachelor of Arts degree.

2. A total of 63 semester hours distributed as follows:
   a. 12 hours: Introduction to Humanities (Hum. 101-102).
   b. 15 hours: upper division humanities courses.
   c. 24 hours: language/literature courses. These must be within a single language—English or a foreign language, either ancient or modern. First-year courses in a foreign language cannot be counted. Literature courses where material is studied in translation cannot be counted as meeting requirements, though they may be recommended as electives.
   d. 12 hours: courses chosen from any one of the following with approval of the humanities major adviser:
      (1) A second language/literature (not courses with material studied in translation).
      (2) Fine arts.
      (3) Music.
      (4) Dance.
      (5) Theatre.
      (6) Film.

   All students must have their schedules approved each semester by a departmental adviser.

INDIVIDUALLY STRUCTURED MAJOR

The individually structured major is designed by the student during the sophomore year in consultation with a three-member faculty advisory committee. It must be approved by the dean of the College of Arts and Sciences, and once approved, it may be amended only with approval of the student's committee and the dean. The proposal must include a Senior Thesis (A.S. 499) for a maximum of 6 semester hours of credit. Guidelines and proposal applications, as well as advising, are available in the College of Arts and Sciences Dean's Office, Hellem 152.

INTERNATIONAL AFFAIRS
Office in Ketchum Building, Room 103
Campus Box 333
Professor George Coddig, Program Chairman

With the increasing involvement of the United States in world problems, opportunities in government, business and international organization have expanded enormously. Today there is need for young people with strong backgrounds in international affairs. To meet this need the University of Colorado offers a comprehensive and flexible interdisciplinary program leading to the degree Bachelor of Arts in international affairs.

BACHELOR'S DEGREE REQUIREMENTS

In addition to the general college requirements for the Bachelor of Arts degree, the major in international affairs requires the following:

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1. These 15 hours may not include more than 6 of studio or practice courses.
2. In the case of the second language, not more than 2 hours of a beginning course may be counted.
3. Not more than 9 hours of upper division humanities courses may be in film. If film is the major area, film courses may not count for upper division credit in humanities.
1. Requirements:
   a. General—45 hours (30 upper division and 30 of grade C or better), distributed as follows (none may be taken pass/fail):

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anth. 451, Applied Cultural Anthropology</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 458, Anthropology of Politics</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 201-202, Principles of Economics</td>
<td>6</td>
</tr>
<tr>
<td>Econ. 441, International Trade</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 442, International Finance</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 471, Comparative Economic Systems</td>
<td>3</td>
</tr>
<tr>
<td>or Econ. 477, Economic Development</td>
<td>3</td>
</tr>
<tr>
<td>Geog. 471, Political Geography</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 432, Twentieth-Century Europe</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 466, U.S. Diplomatic History Since 1914</td>
<td>3</td>
</tr>
<tr>
<td>or P.Sc. 423, American Foreign Policy</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 100, Introduction to Political Science</td>
<td>3</td>
</tr>
<tr>
<td>or P.Sc. 201, Introduction to Comparative Politics I: Developed Political Systems</td>
<td>3</td>
</tr>
<tr>
<td>or P.Sc. 202, Introduction to Comparative Politics II: Developing Political Systems</td>
<td>3</td>
</tr>
<tr>
<td>or P.Sc. 203, Introduction to Asian Politics</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 211, International Relations</td>
<td>3</td>
</tr>
<tr>
<td>or P.Sc. 428, International Behavior</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 425-429, International Law and Organization</td>
<td>6</td>
</tr>
</tbody>
</table>

   b. Area—12 hours of upper division courses concentrating on the whole or part of a region outside the U.S. (principally, but not exclusively, Africa and Middle East, Asia, East Europe and the Soviet Union, Great Britain and the Commonwealth, Latin America, and Western Europe). None may be taken pass/fail.

   c. Language—A third-year proficiency in a foreign language appropriate to the area of concentration. This requirement may be met (1) by completion of two third-year, university-level grammar courses in the language or (2) by certification by the appropriate department of such competence.

2. Recommendations:
   a. Students should choose electives with a view to their relevance to this program.
   b. During the semester prior to graduation, programs of students majoring in international affairs must be approved by the chairman of the Committee on International Affairs.
   c. 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. The student wishing to participate in such a program should contact his advisor and the chairman of the Committee on International Affairs to work out an appropriate program. Some variation in the general requirements will be permitted in these cases.

The specific courses that may be counted to meet the requirements in this program are determined by the Committee on International Affairs and the dean of the College of Arts and Sciences.

**LATIN AMERICAN STUDIES**

**Office in McKenna 132A**
**Campus Box 278**
**Assistant Professor Lillian Fernandez de Robinson, Chairwoman**

Colorado’s proximity to Mexico and the long-standing mutual influences of the United States and Latin America make Latin American studies a timely and interesting field. The Latin American studies program offers a broad and flexible interdisciplinary approach designed to provide a comprehensive rather than a narrow, single-discipline understanding of Latin America. The curriculum leads to the Bachelor of Arts degree with a major in Latin American studies.

**BACHELOR’S DEGREE REQUIREMENTS**

1. Satisfaction of the regular college requirements for the Bachelor of Arts degree.
2. A demonstrated proficiency in Spanish or Portuguese (successful completion of at least one upper division Spanish or Portuguese course).
3. At least 48 hours in courses pertaining to Latin America, to be distributed among as many of the following fields as possible: anthropology, art history, economics, geography, Hispanic literature, history, and political science. No more than 24 hours in one department may count toward the major. Majors are encouraged to include a study-abroad semester or summer (at Jalapa and Monterrey, Mexico; San Jose, Costa Rica; or Lima, Peru) in their academic programs.
4. The senior seminar in L. Am. 498, normally given during the fall semester.
5. All schedules for students majoring in Latin American studies must be approved by the adviser of the program. Prospective majors in Latin American studies should consult with the adviser at the first opportunity.
6. The specific courses that may be counted to meet the requirements in this program are determined by the Committee on Latin American Studies and the dean of the College of Arts and Sciences. In addition to the courses listed below, special offerings in the honors program, experimental studies, comparative literature, etc., may also be applied with the adviser’s consent. Other related courses may be counted toward the major in Latin American studies with the approval of the adviser.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anth. 227, New World Archaeology</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 342, Peoples and Cultures of Latin America</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 421, Southwestern Archaeology</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 422, Archaeology of Mexico and Central America</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 422, Ethnography of the American Southwest</td>
<td>3</td>
</tr>
<tr>
<td>Anth. 423, Ethnography of Mexico and Central America</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 486, Economic Development Planning and Project Analysis</td>
<td>3</td>
</tr>
<tr>
<td>F.A. Hist. 471, Pre-Columbian Art</td>
<td>3</td>
</tr>
<tr>
<td>F.A. Hist. 472, North American Indian Art</td>
<td>3</td>
</tr>
<tr>
<td>Geog. 381, Latin America</td>
<td>3</td>
</tr>
<tr>
<td>Hist. 391, History of Latin America</td>
<td>3</td>
</tr>
<tr>
<td>The Colonial Experience</td>
<td>3</td>
</tr>
</tbody>
</table>
which linguistic science describes and seeks to explain. The language-related electives are intended to acquaint the student with other theoretical or disciplinary perspectives on the phenomena which linguistics studies.

Requirements

1. Satisfaction of the regular college requirements for the Bachelor of Arts degree.

2. Completion of the following courses in general linguistics with a grade of C or better.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ling. 100, Language</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 300, Introduction to Linguistic Science</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 330, Linguistic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 401, The Nature of Grammars</td>
<td>3</td>
</tr>
</tbody>
</table>

   One course from each of the following pairs:
<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ling. 345, Semantics</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 350, Language and the Public Interest</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 435, Linguistic Phonetics</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 460, Phonology of English for Teachers of English</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 402, Contemporary Brazilian Prose Fiction</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 497, Introduction to Electronic Linguistics</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 335, Spanish-American Literature to the 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 440, Introduction to Transformational-Generative Grammar and Syntax</td>
<td>3</td>
</tr>
<tr>
<td>Ling. 461, English Structure for Teachers of English to Speakers of Other Languages</td>
<td>3</td>
</tr>
</tbody>
</table>

3. Completion with a grade of C or better of a minimum of 15 hours of study of a natural language. All hours offered in satisfaction of this requirement must be in a single language and at the 200 level or above. Students selecting English must include the following courses: Eng. 485, Ling. 460, 461. All courses not specifically listed here must be approved in advance by the undergraduate adviser.

4. Completion of any courses which are prerequisite to electives to be offered in the major.

5. Completion of elective courses to be offered in the major with a grade of C or better. A large number of courses appropriate to this area of the major are taught in various university schools, departments, and programs, such as anthropology, communication, communication disorders and speech science, computer science, education, linguistics, modern languages, philosophy, sociology, and psychology. A list of suggested courses, periodically updated, is available from the undergraduate adviser. In any case, courses submitted in satisfaction of this requirement must have the prior approval of the undergraduate adviser. A total of 6 hours of elective courses is required, except as specified below.

For students choosing English to satisfy the natural language requirement, Ling. 460 and 461 also satisfy 6 hours of the general linguistics requirement. Such students must take a total of 12 hours of approved electives to fulfill the total of 45 hours for the major.

Depending on the choice of courses, a student can finish the B.A. in linguistics with either a theoretical or an applied emphasis. Since there is a great deal of latitude for individual choice, students majoring in
linguistics should consult the undergraduate adviser at the beginning of each registration period.

Language study and some other courses in the major can 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 the undergraduate adviser prior to going abroad. For information on study abroad programs, consult the Office of International Education.

GRADUATE DEGREE PROGRAMS

Students wishing to pursue graduate work in linguistics should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog and the departmental directives for the M.A. and Ph.D. degrees listed below.

Prerequisites. B.A. degree in linguistics or a B.A. or B.S. in other fields provided that the following prerequisites are satisfied.

1. Ling. 200 (Introduction to Linguistic Science) or the equivalent.

2. It is expected that an applicant will have considerable knowledge (e.g., college junior level proficiency) of and about one or more languages other than his native language. This knowledge may have been gained by formal study of the language(s), by residence in a country where the language(s) is (are) spoken, or by some other means. The Department of Linguistics may require formal study of foreign languages by graduate students whenever their knowledge in this area is found to be deficient.

3. It is desirable, but not required, that an applicant have had some courses in disciplines, some of whose concerns are close to the concerns of linguistics; for example, in anthropology, sociology, psychology, phonetic sciences, communication disorders, mathematics, computer science, or philosophy.

4. Graduate Record Examination scores are required except under very special circumstances.

5. A 3.0 undergraduate grade-point average.

Students must always satisfy prerequisites 4 and 5.

Master's Degree

Completion of an M.A. degree will normally call for a minimum of three semesters of study.

The requirements for the M.A. degree are as follows:

Plan I

1. Language requirement:
   a. The student must demonstrate a reading knowledge of one language other than English.
   b. The other language must be French, German, or another language accepted by the graduate adviser. French is strongly recommended.
   c. Foreign students whose native language is not English may offer English as a foreign language for purposes of this requirement.

2. The following courses, or equivalents:

   Semester Hours
   
   Ling. 633, Phonological Analysis and Theory 3
   Ling. 634, Methods of Grammatical Analysis 3

A student who has already taken any of these courses (or equivalents) as an undergraduate must earn an equal number of credits in other linguistics courses.

3. Additional work amounting to a minimum of 18 hours which will include (a) 4 to 6 thesis hours, (b) at least 6 hours of courses designated Ling. in this catalog, and (c) up to 6 hours of electives approved in advance by the graduate adviser.

4. Successful performance in a comprehensive examination in general linguistics, based upon a current M.A. reading list prepared by the department. A section on a specialized area may be included if the student so desires.

5. Completion of a thesis acceptable to the student's committee. Although the thesis may be completed in absentia at least a draft of it must be available for discussion during the comprehensive examination.

Plan II

Plan II includes all items listed in Plan I except item 5. If the student is allowed by the department to choose Plan II, the course requirements are 30 hours of graduate work, distributed as follows: (a) a minimum of 24 hours of course work to be chosen from courses labeled Ling. (Ling. 633 and 634 are included in these 24 hours); and (b) up to 6 hours of additional course work approved in advance by the graduate adviser.

Doctor's Degree

A student previously admitted only to an M.A. program must apply for admission to a Ph.D. degree program whether the student receives the M.A. degree or not. The department ordinarily admits to the Ph.D. program only students who have completed the M.A. in linguistics or in another field, although a student without the M.A. might be admitted to the Ph.D. program in some special cases. In any event, the department reserves the right to require that any individual student satisfy all the M.A. requirements through Plan I before acceptance into the Ph.D. program. Students proceeding directly to the doctoral degree may apply for the M.A. degree upon passing the doctoral preliminary examination, providing that all M.A. requirements except the comprehensive examination have already been met.

A committee of three faculty members will be appointed at the beginning of the second year of full-time work. This committee will guide students as to their course work and foreign language requirements, and will determine other details of their programs as the need arises.

Preliminary Examination. Every student planning to pursue a Ph.D. program must take a preliminary examination. An M.A. degree will not substitute for the preliminary examination, which will be offered once or twice a year, and will consist of language data problems and some general essay questions. A student may repeat the examination only once.

Requirements for the Ph.D. (subject to possible revaluation and readjustment by the student's committee) follow. All of the requirements, and the Graduate School language requirement, must be satisfied before the student will be admitted to the comprehensive examination.

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1. Language Reading Ability. The student shall demonstrate ability to read linguistic literature in two of the following: French, German, Russian. All language examinations will be administered by the department.

2. Knowledge of a Related Area. All students will demonstrate more than superficial acquaintance with some field related to linguistics. The field may be anthropology, computer science, mathematics, sociology, psychology, phonetic sciences, or another field approved by the graduate adviser or the student's advisory committee. The requisite knowledge may be gained by taking at least 8 hours of nonintroductory courses in that field, or it may be the result of work completed before entering the program. Under no circumstances will experience or independent reading alone substitute for formal course work as preparation for satisfying this requirement. Demonstration of this knowledge may be in any one of these ways:
   a. The student will pass a four-hour (half-day) examination in which solutions to problems of linguistics are approached through the materials and methodology of the related field.
   b. The student may present a research paper on a problem approved by the advisory committee. This paper may not be a survey of those areas or problems which the related field has in common with linguistics.
   c. The student may present a master's degree in anthropology, psychology, sociology, mathematics, or computer science.
   d. The student may present for approval to the graduate adviser or committee some other evidence that he has the required knowledge. This option is appropriate for a student with a master's degree in a field not listed in "c," or with unusually advanced accomplishments.

3. Knowledge of Non-Native Language. All students will demonstrate a thorough acquaintance with a non-native language, a language family, or a language area, equivalent to at least 8 hours of nonintroductory courses. This knowledge may be demonstrated in one of the following ways:
   a. Students will pass a four-hour (half-day) examination in the structure and history of the language, family, or area they have chosen.
   b. Students may prepare a research paper demonstrating understanding of the structure or history of the language, family, or area of their choice.
   c. Students may present a master's degree in the language or literature of their choice.

4. The following courses, or equivalents: Ling. 633, 634, 641, 642, 643, 697.

5. Three courses selected from the following list. Any of these may be repeated for credit and offered as two separate courses for purposes of this requirement, unless otherwise specified by the student's adviser: Ling. 717, 724, 738, 740, 741, 750, 787.

6. Additional credits in linguistics or electives offered by the department or by other departments, as recommended by the student's committee. Some credit hours earned at linguistic institutes may be accepted on the recommendation of the committee.

7. The comprehensive examinations, usually conducted in English and at the conclusion of course work, in (a) general linguistics and (b) a specialization of the student's choice, e.g., African, Amerindian, Chinese, Classical, Germanic, Japanese, Romance, Slavic, etc., as well as applied linguistics, history of linguistics, mathematical linguistics, phonetic sciences, psycholinguistics, etc. Comprehensive examinations may be repeated once. They may also be passed conditionally, i.e., subject to specifically stated conditions.

8. A final examination and a dissertation suitable for publication. Normally the dissertation will be directed by a member of the Linguistics Department. If the student wishes to write under the direction of someone outside the department, the topic and director must be approved by the department chairman. The dissertation committee, which is selected by the student, consists of the director and four additional members. At least one member of the committee, but no more than two, must be chosen from outside the Department of Linguistics. This committee will meet formally with the candidate to consider a dissertation prospectus no later than one year after the student's formal advancement to candidacy. The prospectus will normally consist of a review of the literature relevant to the topic and a description of the research plan and expected results. The final form of the prospectus must be approved formally (with amendments as necessary) by the entire dissertation committee. The same committee will usually serve as the examining committee for the dissertation defense.

Students who are working on their dissertations must be registered for thesis in the term or terms in which they are doing research and/or writing. For these hours a grade of IP is automatically awarded. After the submission of the dissertation and a successful final examination (defense of thesis), the grade of IP is changed to either A or B, as determined by the committee.

MATHEMATICS

Office in Engineering Classroom Building. Room 2-38
Campus Box 426
Professor John H. Hodges, Chairman

BACHELOR'S DEGREE REQUIREMENTS

The Department of Mathematics offers degree programs leading to the B.A. degree in mathematics in the College of Arts and Sciences, the B.S. degree in applied mathematics in the College of Engineering and Applied Science.

The undergraduate degree require the completion of at least 30 hours of mathematics for the B.A., all with a grade of C or better, and a 2.0 grade-point average or better in all courses in mathematics, including three semesters of calculus and 18 hours of mathematics courses numbered above 300. The 18 hours must include Math. 313 and 6 hours of mathematics courses numbered above 400 (Math. 587 may not be counted in these 6 hours). Math. 435, 436 do not count toward minimum hours for B.A. degree.
Mathematics majors may not use mathematics courses to satisfy either the humanities or the natural sciences requirement of the college.

Students seeking the B.A. degree may choose a program with emphasis on preparation for graduate work, one with a background in computer science, one with emphasis on preparation for secondary teaching, or one with emphasis on statistics.

Students seeking information regarding the B.S. degree should refer to the Applied Mathematics section in the College of Engineering and Applied Science portion of this catalog.

Students should obtain a major requirement sheet from the Mathematics Department office.

Undergraduate students planning to do graduate work in mathematics should take Math. 314 and Math. 431-432, and should fulfill the College of Arts and Sciences language requirement with German, French, or Russian.

A student who is a candidate for a B.A. degree in mathematics or in distributed studies with mathematics as one area from the College of Arts and Sciences must complete with a grade of C or better at least 9 hours of upper division mathematics courses in the college, Boulder Campus.

No student may obtain more than 12 hours credit in mathematics courses numbered below 130.

GRADUATE DEGREE PROGRAMS

The Department of Mathematics offers degree programs leading to the M.A., M.S., and Ph.D. degrees in mathematics and applied mathematics. The Ph.D. in mathematical physics is also offered in cooperation with the Department of Physics. (See Mathematical Physics listed under Interdepartmental Programs in the Graduate School section of this catalog.)

The prerequisite for graduate work in mathematics is at least 30 semester hours in mathematics, including two semesters of advanced calculus, a semester of linear algebra, and a semester of either higher algebra or differential equations. The prerequisite for a graduate level minor in mathematics is three semesters of calculus.

Students desiring the Ph.D. must demonstrate a reading knowledge of two of the following languages: French, German, and Russian. Only 500- and 600-level courses will receive graduate credit. The details of the degree requirements are available in the department office.

MEVAL STUDIES

Office in Helms Building, Room 191
Campus Box 226
Professor Edward P. Nolan, Program Chairman

The Committee on Medieval Studies is founded on the conviction that the European Middle Ages represents a cultural unity in which the Roman church, the medieval Latin language, the concept of the Holy Roman Empire, and the polarity of East and West created institutions transcending the normal boundaries of nation, language, and scholarly discipline. Medieval Studies is therefore necessarily interdisciplinary; and the committee's function is to make possible and encourage such interdepartmental cooperation.

The following courses in various departments are available to those students whose area of specialization within a given department is the medieval period and who wish to broaden their knowledge of medieval culture. With the approval of the major department, a coherent group of these courses may be accepted as a related field of study and as part of the requirements for an advanced degree. For additional details concerning these courses, see departmental listings.

Medieval Culture
M. St. 401-501-3. Medieval Culture I.
M. St. 402-502-3. Medieval Culture II.
Engl. 561-variable credit. Tutorials in Medieval Literature.
F.A. Hist. 507-3. Byzantine Art. (Class. 520)
Ger. 624-3. Early German Literature.
Hist. 615-3. History of Science From the Ancients to Sir Isaac Newton.
Hist. 688-3. The Medieval Middle East, 900-1600 A.D.
Hist. 691-3. Readings in Medieval History.
Hist. 723-3. Latin Paleography. (General Classics 723.)
Ital. 511-3. Dante: La Vita Nuova e Inferno.
Phil. 600-3. Medieval Philosophy.
Phil. 800-3. Philosophy of St. Thomas.

Medieval Languages
Engl. 692-3. Middle English.
Fr. 603-3. History of the French Language to 1300.
Fr. 604-3. History of the French Language From 1300 to the Present.
Fr. 605-3. Provencal.
Ger. 518-3. Old Norse.
Ger. 521-3. Introduction to Middle High German.
Slav. 503-3. Old Church Slavonic.
Span. 705-3. Spanish Historical Grammar.

MUSEUM

Office in Henderson Building, Room 207
Campus Box 218
Professor Peter Robinson, Director

Although no undergraduate major is offered in museum studies, courses listed in the Course Description section may be taken with the approval of the student's major department.

In addition to the above courses, graduate training in anthropology, botany, zoology, and paleontology is provided under the direction of museum faculty in cooperation with the anthropology, biology, and geological sciences departments. Areas of study include archeological theory and interpretation, southwestern archeology and ethnology, and early man in North America (Wheat, H.); plant taxonomy and phytogeography with specialties in lichenology and bryology.
vertebrate paleontology and Cenozoic stratigraphy (Robinson); lower vertebrate paleontology, African Tertiary faunas and paleoenvironments (Van Couvering); biology of mollusks, taxonomy of annelids and crustacea (Wu); and taxonomy of insects of Rocky Mountain region (Lenhartz).

Museum assistantships, research support from the Walker Van Riper Fund, and other financial assistance are available to selected students. Students interested in working toward advanced degrees in the above areas under the direction of museum faculty should write the appropriate professor, University of Colorado Museum, Campus Box 218, Boulder, Colorado 80309.

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.

Anth. 940-variable credit. Independent Study.
Anth. 960-variable credit. Guided Study.
Anth. 960-variable credit. Independent Research.
Anth. 800-0 to 8 (16 to 24 maximum). Doctor's Thesis.
EPOB 400-1 to 3. Independent Study in Biology.
EPOB 800-0 to 8 (16 to 24 maximum). Doctor's Thesis.
Geol. 920-variable credit. Independent Study in Geology.
Geol. 583-5. Field Problems of Vertebrate Paleontology.
Geol. 950-variable credit. Independent Study.
Geol. 960-variable credit. Research.
Geol. 800-0 to 8 (16 to 24 maximum). Doctor's Thesis.

MUSIC

The following courses offered in the College of Music are accepted for College of Arts and Sciences credit (see College of Music in Course Description section).

Mus. 382-3. Music Literature I.
Mus. 383-3. Music Literature II.

ORIENTAL AND SLAVIC LANGUAGES AND LITERATURES

Office in McKenna Building, Room 16
Campus Box 279
Professor C. Nicholas Lee, Chairman

The department has as its primary objective instruction in Oriental and Slavic languages and literatures in general, and Chinese, Japanese and Russian (each an undergraduate major program) in particular. Presently, Chinese or Japanese is required for Asian Studies majors concentrating on China or Japan, and Russian is recommended for majors in Central and East European Studies. Students majoring in those areas should consult the appropriate sections of this catalog. Students interested in East Asia are encouraged to consider a double major in (1) Chinese or Japanese and (2) Asian Studies. This double major may be easily accomplished within the four years and 124 semester hours normally required for the B.A. degree. Students interested in Russian are encouraged to consider a double major combining Russian with any other field of interest to increase career options (a combination with another modern foreign language is particularly useful for secondary teaching).

COURSES IN TRANSLATION

The Department of Oriental and Slavic Languages and Literatures offers a number of courses in translation. These courses generally require no previous study in the language, history, or culture of the area involved and are open to all interested students, whether majors in this department or not.

Chin. 481 and 482 and Jap. 483 and 484, provide the student with a basic familiarity with Chinese or Japanese literary history, focusing on major works and writers, as well as furnishing an excellent introduction to traditional Chinese or Japanese culture. These courses are open to all undergraduates. For further descriptions, see the Course Description section of this catalog.

Russian courses in translation at the 400 level can be counted toward an undergraduate or graduate minor in Slavic languages and literatures. Some of these courses in Russian are also listed as 500 level; only students who can do the reading in Russian may register for these double-listed courses on the 500 level. However, graduate students seeking a minor in Slavic may, with the approval of their department, receive graduate credit for any of the 400-level translation courses or Slav. 486 (Methods of Teaching Russian), Russ. 463-464 (Soviet and East European Science Fiction), Russ. 481 (Nineteenth-Century Russian Literature in English) and Russ. 482 (Twentieth-Century Russian Literature in English) are offered only in translation. For further description see the Course Description section of this catalog.

BACHELOR'S DEGREE REQUIREMENTS

Chinese or Japanese

The major consists of 38 hours in either Chinese or Japanese and intends to provide a thorough grounding in the modern language, sufficient to prepare the student for graduate studies; an introduction to the classical language and literature; and a basic familiarity with Chinese or Japanese literary history. For further information the student should request the appropriate major sheet from the department.

Students who have completed a Level III high school foreign language course have automatically satisfied the college graduation requirement in foreign language. This requirement may also be satisfied by completion of course 211 in the foreign language or by demonstration of equivalent proficiency by placement test. Students who have studied an Oriental language in high school and wish to continue with the same language must consult the department for placement. A student may not receive credit for a course at a lower level than that into which he or she is placed.
Students interested in study abroad will find further information under the section on Special Educational Opportunities.

All students planning a major in either Chinese or Japanese are encouraged to consider study abroad in the appropriate country in order to improve their language ability. The University of Colorado offers year-long study abroad programs in Kobe, Japan, and Taipei, Taiwan. For further information, contact the Office of International Education. Note, however, that not more than 20 hours of transfer credit from universities in this country or abroad, may be counted toward the major in Chinese.

Russian

Two options are available: (1) Russian language and literature emphasis and (2) Russian language and linguistics emphasis. In either case the student will normally complete 35 hours beyond the first year or 30 hours beyond the second year. Courses which must be taken in residence are Russ. 320, 401-402, 411-412, and either History of Russian (492) or Structure of Russian (493). For further information about major programs, students should request from the department its announcement, B.A. Degree, Major in Russian. For information about courses in translation and other courses for non-majors, contact the department.

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. 201 or 211. Students who think that they should be placed at a level different from the normal one should consult the department for advice.

Note: the preplacement coding on the advisement card is intended as a guide, and students may begin their college Russian at a level below the preplacement level without loss of credit, or above the preplacement level, if the department so recommends; thus it is very important to consult with the department before registering.

Students studying Russian may earn credit for courses taken in the summer or during the academic year in the U.S.S.R. after consultation with the department. Information on this program can be obtained through the Office of International Education.

GRADUATE DEGREE PROGRAM

The department offers an M.A. program in Russian. Students who wish to enter the department's graduate degree program should consult not only the following description of requirements for the master's degree, but also the Graduate School section and the detailed announcements and reading lists published by the department.

Master's Degree

Prerequisites. Knowledge of the Russian language (in most cases this prerequisite is satisfied by four years of college Russian or its equivalent) and a general knowledge of Russian history and literature.

Course Requirements. In general, students working toward the M.A. degree in Slavic are advised to follow Plan II (see the Graduate School section of this catalog); however, with the permission of the department, a thesis program (Plan I) may be followed.

Plan II. Before admission to candidacy a student must complete at least 30 semester hours of course work distributed among either three major fields or two major and two minor fields.

A major field consists of not fewer than three courses in (1) 19th-century Russian literature or (2) 20th-century Russian literature or (3) Slavic and Russian linguistics.

A minor field is made up of two or more courses from a related field of study, such as Polish literature, Russian or East European history, comparative literature, general linguistics, phonetic sciences, etc.

The choice of major and minor fields must be made in consultation with the department's graduate adviser.

Examination. A qualifying examination may be required during the first semester of resident study to determine whether the prerequisites have been satisfied.

After admission to candidacy, a student must pass a comprehensive examination, usually consisting of a written and an oral part. This examination will be conducted partly in Russian and will cover the reading list as well as course work.

Language Requirement. Before admission to candidacy, the M.A. student must demonstrate a reading knowledge of French or German. This requirement may be satisfied in any of the following ways:

1. By presenting three semesters of college-level credits in the language (or three units of high-school work).
2. By passing the Graduate School ETS Language Test.
3. By passing a departmental examination of comprehension of a text in linguistics or criticism of moderate difficulty in the language chosen. For details, ask for the departmental announcement on the Russian M.A. language requirement.

PHILOSOPHY

Office in Hellens Building, Room 169
Campus Box 232
Professor Robert Rogers, Chairman

BACHELOR'S DEGREE REQUIREMENTS

Students are cautioned to consult the current Schedule of Courses for the most accurate information on prerequisites since these sometimes vary with instructors.

Courses at the 100 level are open to all; courses at the 200 level are open to all who meet the prerequisites; courses at the 300 and 400 levels are recommended only for juniors and seniors; courses at the 500 and 600 level are recommended primarily for graduate students.

Courses may be taken in any order providing prerequisites, if any, are met.

A program for a departmental major must include History of Philosophy (Phil. 300, 301), Metaphysics and Epistemology (Phil. 335), Ethical Theory (Phil.
302), a logic course (Phil. 244 or 444), Twentieth-Century Philosophy (Phil. 404), and one course concerned with a single philosopher (or a substitute as approved by the student's adviser).

As an alternative philosophy major there are several topically oriented programs grounded in and coordinated by the Department of Philosophy which are interdisciplinary in nature. These currently include Law and Society, Dimensions of the Self, Philosophy and the Arts, and Political Ideas and Institutions. Two semesters in the history of philosophy are required for each of the topically oriented majors, as well as some core courses varying according to the topical emphasis. A student intending to complete a philosophy major in this fashion should see the appropriate adviser in the area or the department undergraduate adviser as early as possible.

GRADUATE DEGREE PROGRAMS

Applicants for admission to the Graduate School for work toward a master's or doctor's degree with a major in philosophy are expected to have had 18 or more semester hours in undergraduate courses in the subject.

Students wishing to pursue graduate work in philosophy should note Requirements for Advanced Degrees in the Graduate School section of this catalog and should obtain from the department a copy of the Graduate Program in Philosophy.

The department offers special M.A. programs in the History and Philosophy of Science and Major Philosophies: Traditional and Modern. In connection with the Center for the Study of Values and Social Policy, the department also offers an M.A. and Ph.D. in values and social policy. These programs include an internship and the possibility of nonacademic placement.

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 Philosophy Department.

PHYSICAL EDUCATION

Office in Clare Small Gym, Room 113
Campus Box 354
Professor Waldean A. Robichaux, Chairman

BACHELOR'S DEGREE REQUIREMENTS (B.S.P.E.)

Semester hours and grade-point requirements for the degree Bachelor of Science in physical education are the same as those for the B.A. degree, listed under the College of Arts and Sciences Area Requirements, General and Major Requirements, and Scholastic Dismissal.

A minimum of 32 and a maximum of 50 semester hours of credit in physical education may be counted towards the B.S.P.E. degree. The specific courses that may be counted to meet the above requirements are determined by the Department of Physical Education and Recreation and the dean of the College of Arts and Sciences. Information regarding the specific requirements of the various curricula options may be obtained from the departmental office.

KINESIOLOGY PROGRAM

Three Degree Plans: Exercise Science, Motor Behavior, and Sports Humanities. 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. The three program plans do not include teacher preparation. Generally students wishing to prepare for graduate work or careers utilizing a strong background in physical education should choose one of these program plans. Students pursuing these degree plans are strongly urged to include the College of Arts and Sciences foreign language requirement.

Combined Major

This degree plan allows a student to combine physical education courses with a minimum of 18 semester hours of course work in other areas or disciplines. Courses may be chosen from anthropology, biology, business, communication, dance, fine arts, history, journalism, philosophy, psychology, recreation, health sciences, and sociology. (No foreign language requirement.) The student's program must be planned in consultation with a physical education adviser. Double majors can be undertaken.

Teacher Certification

The teacher certification program emphasizes the knowledge, skill, and experience necessary for teaching physical education, health, and special physical education. Courses can be added for coaching and athletic training. Specializations are available for different levels of teaching (elementary, secondary, or both). (No foreign language requirement.) A 2.5 grade-point average is required for admission to all methods courses.

Education Courses Required

Physical education majors who have been accepted into the teacher education program must take certain required courses in teacher education for certification. Close planning with an adviser is essential.

Students should plan their programs so they can complete all general college and most physical education requirements prior to their final year. During the junior year students should check with their major adviser and the School of Education concerning the Teacher Education Program. A 2.5 grade-point average is required for admission to student teaching.

GRADUATE DEGREE PROGRAM

To obtain materials for application and for any additional information, address inquiries to the Graduate Committee of the Department of Physical Education and Recreation.

Departmental Requirements

Students may follow Plan I or Plan II for the degree program. The minimum requirement for Plan I may be
fulfilled by presenting 30 semester hours of approved graduate work including 4-6 semester hours of thesis. The minimum requirement for Plan II may be fulfilled by presenting 30 semester hours of approved graduate course work. Candidates for the master's degree may select Plan II only on the recommendation of the department.

Master of Science Degree (Physical Education)

Prerequisites. Entering graduate students must have an undergraduate preparation equivalent to the basic core course requirements in physical education and recreation at the University of Colorado or make up undergraduate deficiencies. Satisfactory scores on the Graduate Record Examination tests are also required for admission to the Graduate School for regular or provisional degree status. These scores should be submitted at the time of application for admission to pursue a graduate degree.

Deficiencies. If the undergraduate preparation does not include required basic core courses, the student may be allowed to pursue graduate study with the understanding that certain deficiencies must be made up. The nature and extent of these deficiencies will be determined by faculty members in the student's chosen program option.

Deficiencies in any area of the undergraduate major may be met by completing approved course work in the subject or by satisfactory examination. Courses taken to meet deficiencies may not be counted toward the master's degree. Graduate courses taken before removing deficiencies may be accepted for graduate degree credit only if prior approval of a graduate adviser has been granted.

Program Option Requirements. Students may elect to specialize in one of the four following program options: exercise science; motor behavior; sports humanities; recreation. A minimum of four courses in the stated program option are to be selected in consultation with the student's graduate adviser. Students who wish to pursue a general rather than specialized degree program may select, in consultation with a graduate adviser, a minimum of two courses from at least two of the four program options listed above.

Basic Requirements. In addition to the above program options minimum requirements, the following are required of all students for the Master of Science degree: P.E. 592 (Application of Statistics to Physical Education and Recreation), P.E. 690 (Methods of Research), P.E. 700 (Thesis) for students enrolled in Plan I, or additional course work in selected program options as specified by the graduate adviser for students enrolled in Plan II. A minimum cumulative grade-point average of 3.0 in all graduate work undertaken. Satisfactory performance on the Comprehensive Examination. Requirements for advanced degrees as stipulated by the Graduate School.

Comprehensive Examination. Candidates following Plan I are required to take an oral comprehensive examination covering the thesis as well as other work taken in major field of study. Candidates following Plan II are required to take a written comprehensive examination covering course work taken in major field of study.

Recreation

BACHELOR'S DEGREE REQUIREMENTS

1. A total of 124 semester hours passed.
2. A 2.0 (C) grade average on all University of Colorado work.
3. Forty semester hours of upper division work (courses numbered in the 300s and 400s). Note that all courses transferred from junior colleges carry lower division credit. Exceptions to this require the approval of the dean of the college.
4. The last 30 hours in residence in the college.

Area Requirements

Each student seeking the B.A., the B.F.A., or the B.S. degree must present two two-semester course combinations in each of the following areas: humanities, natural science, and social science. An area requirement may be satisfied in this college in one of two ways: (1) by taking one first-year course combination from the College List followed by one second-year combination for which the first-year combination is prerequisite; or (2) by taking one first-year combination in one department and one first-year combination in a different department.

Major Requirements

In addition to the general college requirements, students majoring in recreation must complete a minimum of 30 semester hours in the recreation area of which at least 18 semester hours must be in upper division courses. Courses fulfilling the nonrecreation suggested emphasis in the option selected by the student and the nonrecreation requirements are to be chosen in consultation with a department adviser. Description of courses may be found under Physical Education.

Recreation Requirements (All Majors)

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rec. 201. History and Philosophy of Leisure and Recreation</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 401. Program Planning</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 499. Introduction to Research in Physical Education and Recreation</td>
<td>3</td>
</tr>
</tbody>
</table>

Requirements for Recreation Options

Community Recreation

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rec. 212. Recreation Leadership Skills</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 310. Principles of Community Recreation</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 317. Fieldwork in Community Recreation</td>
<td>1-4</td>
</tr>
<tr>
<td>Rec. 403. Park and Recreation Areas and Facilities</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 405. Management and Evaluation</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 410. Administration of Community Recreation</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 415. Internship in Community Recreation</td>
<td>10</td>
</tr>
<tr>
<td>Rec. 440. Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>P.E. 502. Legal Aspects of Physical Education and Recreation</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 491. Independent Study in Community Recreation</td>
<td>1-3</td>
</tr>
</tbody>
</table>

Outdoor Recreation

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rec. 320. Principles of Outdoor Recreation</td>
<td>3</td>
</tr>
<tr>
<td>Rec. 327. Fieldwork in Outdoor Recreation</td>
<td>1-4</td>
</tr>
<tr>
<td>Rec. 403. Park and Recreation Areas and Facilities</td>
<td>3</td>
</tr>
</tbody>
</table>

Recreation major status and pre-registration approval are needed for all fieldwork and internships.
Rec. 406. Organization and Evaluation .................................................. 3
Rec. 409. Management of State and Federal Parks and Recreation .................. 3
Rec. 440. Financial Management of Parks and Recreation .................................. 3
Rec. 442. Planning of State and Federal Parks and Recreation ....................... 3
Rec. 422. Internship in Outdoor Recreation' ........................................... 10
Rec. 942. Independent Study in Outdoor Recreation ................................. 1-5
Five nonrecursion upper division courses to be decided in consulta-
tion with outdoor recreation adviser. A minimum of 3 credit
hours is required in fieldwork.

Therapeutic Recreation
Rec. 212. Recreation Leadership Skills .................................................. 3
Rec. 220. Principles of Therapeutic Recreation ....................................... 3
Rec. 337. Fieldwork in Therapeutic Recreation ...................................... 1-4
Rec. 430. Techniques of Therapeutic Recreation ..................................... 3
Rec. 434. Clinical and Community Aspects of Therapeutic Recreation .............. 3
Rec. 438. Internship in Therapeutic Recreation' ...................................... 10
P. E. 448. Gerontology in Physical Education and Recreation ...................... 3
Rec. 945. Independent Study in Therapeutic Recreation ............................. 1-5
Five nonrecursion upper division courses to be decided in consulta-
tion with therapeutic recreation adviser. Two 2-credit hour ex-
periences are required in fieldwork.

Commercial Recreation (Limited Enrollment)
Rec. 340. Principles of Commercial Recreation ...................................... 3
Rec. 337. Fieldwork in Commercial Recreation' ....................................... 1-4
Rec. 405. Organization and Evaluation in Recreation ................................ 3
Rec. 440. Financial Management in Recreation ....................................... 3
Rec. 448. Internship in Commercial Recreation' ..................................... 10
Rec. 944. Independent Study in Commercial Recreation ............................. 1-5
Econ. 201, 202. Principles of Economics .............................................. 3.3
Acct. 200. Introduction to Accounting (Financial Aspects) ......................... 3
Mktg. 300. Principles of Marketing .................................................... 3
Fin. 300. Basic Finance ........................................................................ 3
E Law. 300. Business Law ..................................................................... 3
A minimum of 2 credit hours is required in fieldwork.
All courses applied to the major must show a grade of C or better
(cannot be taken pass/fail).

PHYSICS
Office in Duane E-032
Campus Box 390
Professor Chris Tafuratos, Chairman

BACHELOR’S DEGREE REQUIREMENTS

Three curricula are available for students wishing to major in physics. Plan 1 (45 hours of physics courses) is
intended primarily for those students who plan to pur-
sue graduate studies in physics. Plan 2 (minimum of 36
hours of physics courses) is intended for students who
desire an undergraduate concentration in astrophysics,
atmospheric physics, or geophysics, or who want to
combine a physics major with work in other areas such
as applied mathematics, biophysics, chemical physics,
environmental sciences, philosophy and history of
science, premedicine, etc. Plan 3 (minimum of 26 hours
of physics courses plus 20 hours of education courses)
is a program designed specifically for students intending
to become secondary school teachers. Professional op-
opportunities in physics are available for students
graduating at the bachelor’s level in any of these plans.
Better students in plans 2 or 3 who may wish to go on
into advanced studies in physics can prepare
themselves to start graduate work by taking more than
the minimum number of courses listed for these plans.
Moreover, it is possible at any stage of their college
careers for students to transfer between plans, although
junior or senior students transferring into Plan 1 may
require an additional semester or two of study beyond
the normal four years.

These three curricula do not constitute all of the op-
tions open to the student; they have been the most pop-
ular ones in the past. In addition, the content of courses
and certain details of the requirements for the degree
are changed from time to time. As far as possible, the
division encourages students to pursue their own in-
terests in setting up their curricula. The final respon-
sibility for fulfilling the requirements for the degree
rests with the student.

For these reasons, students who plan to major in
physics should consult with their (divisional) advisers
at least once per semester. Even if first-year students
are only considering physics as a major, they are
strongly encouraged to visit a divisional adviser 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 col-
lege career can result in delay and complications later.

Eight hours of General Physics, Phys. 111 and 112,
are required of students in all three plans, preferably
in the freshman year for majors in Plan 1. It is possible,
with the approval of the adviser, for a student who
starts with Phys. 301 and then decides upon a physics
major to go directly into Phys. 112. Similarly, it is not
essential for students who have completed Phys. 302 to
take Phys. 112 and 114 before continuing with the re-
quirements listed below.

Students who have acquired the knowledge and skills
equivalent to those taught in Phys. 111 and 112 may
apply, following standard University procedure, for
permission to take an advanced standing examination.

For graduation, Plan 1 physics majors must present
credits in the following additional courses: 114, 213,
214, 215, 317, 318, 321, 322, 331, 332, 341, 491, 492, 493,
496, Chem. 202 or one year of general chemistry; Math.
130, 230, 240, and A.Math. 236 or Math. 313 and 443.
Instead of Phys. 496, students may substitute Phys. 455
or a 3-hour physics elective course. Recommended up-
ner division mathematics courses for Plan 1 majors in-
clude linear algebra, advanced calculus, complex
variables, and partial differential equations. It is also
recommended that Plan 1 majors take one or more
semesters of a biological science. Students who intend
to go on to do graduate work at the University of
Colorado are advised to complete the fourth semester of
a foreign language, inasmuch as this will fulfill the
language requirement of the Graduate School.

For graduation, Plan 2 physics majors must present
credits in the following additional courses: 114, 213,
214, 215, 317, 321, 322, 331, 332, 341; Chem. 202 or one
year of general chemistry; Math. 130, 230, 240, and A.
Math. 236 or Math. 313 and 443. In addition, a
minimum of 3 hours of electives must be taken from the
following courses: Phys. 318, 446, 451, 455, 461, 462,
491, 496, 601, 503, 504, 580, and 585. One or two credits
of Phys. 500 may also be taken to satisfy part of the
elective requirement.

¹Registration, major status, and preregistration approval are needed for all fieldwork and in-
ternships.

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A student in plan 2 is ordinarily required to satisfy an interdisciplinary requirement. The courses should be selected with the concurrence of the student's divisional adviser, usually prior to the junior year. These 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 advisers. Astro-Geophysics courses numbered 300 or above are acceptable to meet the Plan 2 interdisciplinary requirement.

Plan 3 for physics majors is offered only with the 20-hours-in-education plan, and is provided for the convenience of students going into secondary school teaching. In addition to the 8 hours of general physics listed above, students electing this major must also present credits in the following additional courses: Phys. 115, 213, 214, 216, 317, 321, and 331; Chem. 202 or one year of general chemistry; and Math. 130, 230, 240, and A.Math. 236 or Math. 313 and 443. Recommended elective mathematics courses for students in this plan include Introduction to Abstract Mathematics, Math. 272; Theory of Numbers, Math. 311; and Higher Geometry, Math. 321.

Combinations of courses which are recommended for meeting the College of Arts and Sciences area requirements are Phys. 101 and 102, Phys. 111 and 112, Phys. 301 and 302, A.G. 111 and 112, and A.G. 113 and 114; a more extensive list of possibilities is published in the Schedule of Courses.

GRADUATE DEGREE PROGRAMS

Graduate study and opportunities for basic research are offered in the areas of nuclear, solid state, high energy, and theoretical physics, magnetic resonance, spectroscopy, plasma physics, microwave spectroscopy, ultraviolet radiation, atomic physics, and low temperature physics. Research for the thesis for the M.S. or Ph.D. degree may be completed in any of these fields.

Doctoral programs in applied physics, chemical physics, geophysics, and mathematical physics are offered jointly with the Departments of Electrical Engineering, Chemistry, Geology, and Mathematics, respectively. For information on these programs, see the respective listings in this catalog (e.g., for information on the doctoral program in chemical physics see Chemical Physics).

Departmental Requirements

Students wishing to pursue graduate work in physics leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog. Following are special departmental requirements.

Master's Degree (M.S.)

Prerequisites. Entering graduate students must have a thorough undergraduate preparation in physics, equivalent to an undergraduate physics major at the University of Colorado. This preparation includes courses in general physics, analytical mechanics, electricity and magnetism, thermodynamics, quantum mechanics, and atomic and nuclear physics, as well as two semesters of general chemistry, and mathematics through differential equations and complex variables.

Language. The department has no foreign language requirement.

Course Requirements. There are two separate plans for obtaining the master's degree. Plan I includes a thesis (4 hours), Phys. 621 (Theoretical Mechanics), 625 (Introduction to Quantum Mechanics), 631 (Electromagnetic Theory), and 632 (Electromagnetic Theory) along with electives (5 hours) and mathematics (3 hours). Plan II (without thesis) includes Phys. 621, 625, 631, 632, and 628 (Introduction to Quantum Mechanics) or 655 (Theory of Atomic Spectra) or 656 (Atomic and Molecular Spectra) along with mathematics (6 hours) and electives (9 hours). All courses must be graduate courses numbered 500 or above.

Qualifying Examination. The Graduate Record Examination aptitude tests and advanced test in physics are normally used in place of a qualifying examination, and this examination is normally taken before the time of entry into Graduate School.

Preliminary Examination. Each candidate for the master's degree, whether by Plan I or Plan II, must pass the preliminary examination. This examination is given each fall and spring semester. For details, see discussion under Doctor's Degree.

Comprehensive-Final Examination. After the other requirements for the master's degree are completed, each master's degree candidate must take a comprehensive-final examination. If the student is following Plan I, in which a thesis is included, the final examination will cover the thesis. The comprehensive-final examination will be oral.

Doctor's Degree (Ph.D.)

Prerequisites. Same as for master's degree, above.

Languages. The Department of Physics strongly recommends that the Graduate School communication requirement be met by fourth-semester courses in a living language taken while the student is an undergraduate. The department has no tool requirement in foreign languages.

Qualifying Examination. Same as for master's degree, above.

Preliminary Examination. The preliminary examination consists of two three-hour parts. It will be given on one or two days of the registration period at the beginning of the fall semester. This examination will be a written examination on the material covered in the undergraduate courses leading to a B.A. or B.S. in physics at the University of Colorado, or comparable courses at other institutions. All incoming regular or provisional degree students in the department are required to take this examination in their first semester.

The preliminary examination is also given at the end of the spring semester and it must be taken and passed at this time by all students who failed it in the fall and wish to continue in a graduate degree program in the Department of Physics.

Comprehensive Examination. On the first and second weekends of the spring semester, the written part of the comprehensive examination will be given. The
examination will cover the material in the courses normally taken by all Ph.D. candidates in the first and second years of graduate study. The oral part will be given shortly after the written part. The performance on both written and oral examinations will be the basis for decision on passing or failure of the comprehensive examination. A student who fails the comprehensive examination on his first attempt may take the examination once more a year later.

Course Requirements. A minimum of 39 semester hours of graduate courses numbered 500 or above is required. The specific courses depend to a certain extent on the student’s background and field of specialization. However, the following courses are required of all Ph.D. students in physics: Phys. 621, 625, 626, 627, 631, 632, and 644. In addition, 6 hours of graduate mathematics are required (usually met by Phys. 503, 504 or 603, 604) and 12 hours of graduate electives. All of these required courses are offered every year; most of the other courses listed in the Course Description section are offered every other year or when there is sufficient demand. Further information can be obtained by writing to the Department of Physics.

Final Examination. The final examination is oral and covers the thesis.

POLITICAL SCIENCE

Office in Ketchum Building, Room 106
Campus Box 333
Professor James R. Scarr, Chairman

BACHELOR’S DEGREE REQUIREMENTS

Students majoring in political science must complete a minimum of 36 semester hours in this department, of which 30 hours must be with a grade of C or better. A minimum of 21 hours must be in upper division courses. No more than 45 hours in political science courses will count toward the 124 hours the College of Arts and Sciences requires for graduation. All undergraduate transfer students majoring in political science must accumulate a minimum of 45 grade points in upper division political science courses at the University of Colorado in order to qualify for the B.A. degree.

Specific Requirements

1. At least 9 hours must be completed with a grade of C or better in the following lower division courses:
   P.Sc. 110 (or 101 and 102)
   P.Sc. 201 (or 211 and 212), or 202
   P.Sc. 222
   P.Sc. 240

   Political science majors are not permitted the pass/fail option in any of the above courses. Majors cannot receive credit for P.Sc. 110 if they have received credit for P.Sc. 101 and/or 102 (and vice versa). Students cannot receive credit for P.Sc. 201 if they have received credit for P.Sc. 211 and/or 212 (and vice versa).

2. At least 6 hours of upper division courses must be completed with a grade of C or better in each of the three primary fields: American, International-Comparative, and Theory. No course may be used in satisfaction of more than one field requirement.

3. P.Sc. 439, History of Political Philosophy, is required with a grade of C or better. Political science majors are not permitted the pass/fail option for this course.

4. The following specific courses are required in related fields: Econ. 201 and 202, Principles of Economics. These two courses are in addition to the 36 hours required in political science and must be passed with a grade of C or better. Political science majors are not permitted the pass/fail option for these two courses.

Public Service Option

For students interested in a career in public service (government or private public-policy-oriented organizations) the Department of Political Science offers a special program designed to prepare students for such careers. This program is oriented toward the American political system; however, with special counseling students may organize their studies to emphasize another country or international organizations.

Students taking the public service option who intend to apply later for the graduate program in public policy analysis at this University should consult a political science adviser concerning the most expedient method of completing a combined curriculum.

1. Each student must complete a minimum of 30 hours in political science with grades of C or better and a minimum of 21 upper division hours in political science.

2. The following specific courses are required, with grades of C or better: P.Sc. 110 (or 101/102); P.Sc. 210; P.Sc. 432; Econ. 201 and 202.

3. At least one upper division course is required, with grade of C or better, in political theory and in the international/comparative field.

4. At least five courses from the following list, with grade of C or better, including at least one course in urban politics, at least one in state government, and at least one in federal government.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Sc. 407. Urban Politics</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 408. Municipal Government and Administration</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 409. Comparative Metropolitan Systems</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 432. Urban Policy Analysis</td>
<td>3</td>
</tr>
</tbody>
</table>

State Government

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>P.Sc. 405. Legislatures and Legislation</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 406. State Government and Administration</td>
<td>3</td>
</tr>
</tbody>
</table>

Federal

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Sc. 400. Government Regulation of Business</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 404. Advanced American Government</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 435. Environment and Public Policy</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 437. Public Priorities: Revenues and Program Expenditures</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 436. Bureaucratic Power in American Politics</td>
<td>3</td>
</tr>
</tbody>
</table>

Law

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Sc. 246. Introduction to the American Legal Process</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 246. Administrative Law</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 447. Constitutional Law I</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 448. Constitutional Law II</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 449. The Judicial System</td>
<td>3</td>
</tr>
</tbody>
</table>
5. A three-semester sequence must be completed, with grade of C or better, in two of the following three areas:
   Accounting — Acct. 200, 202, 322 (or 480) or a comparable sequence approved by the department.
   Computer Science — C.S. 210, 310, and 401 or a comparable sequence approved by the department.
   Mathematics/Statistics — Math. 107, Math. 108, Econ. 381 or a comparable sequence approved by the department.

6. The courses required in numbers 2 through 5 above may not be taken pass/fail.

7. P.Sc. 110 or 101-102 should be considered a prerequisite to all upper division courses.

GRADUATE DEGREE PROGRAMS

The Master of Arts degree in political science, the Master of Arts degree in political science (international studies), the Master of Arts degree in political science (public policy analysis), and the Doctor of Philosophy degree in political science may be earned in the department. 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. A contact person (temporary adviser) will be assigned to each student upon admission to the program. GRE aptitude scores are required of applicants.

Candidates wishing to pursue graduate degrees in political science should request the complete program requirements from the Department of Political Science.

The Plan II option for the Master of Arts degree is not offered in this department.

Departmental Admission Requirements

Minimum requirements for admission to the graduate program in political science are 18 semester hours of work in the subject, 9 hours of which must be in upper division courses. Deficiencies must be made up before the student will be admitted as a regular degree student, and the work involved will be in addition to the minimum requirements for the degree. Students wishing to minor in political science must present at least 9 semester hours in political science. The department may make exceptions to the above requirements in unusual cases.

Master of Arts in Political Science

Students desiring a graduate major in political science should present 18 semester hours of undergraduate work in the subject, 9 hours of which must be in upper division courses. Any deficiencies must be made up before the student will be admitted as a regular degree student and the work involved will be in addition to the minimum hourly requirements for the degree.

Political science is divided into seven fields: (1) American Government and Politics, (2) Comparative Politics, (3) International Relations, (4) Public Administration, (5) Law and Politics, (6) Political Philosophy, and (7) Empirical Theory and Research Methods. Students shall concentrate in any one of the fields and offer 3 semester hours of work in regularly scheduled political science seminars in each of three areas defined as follows: American, including (1), (4), and (5) above; International, including (2) and (3) above; and Theory, including (6) and (7) above.

Students are responsible for familiarizing themselves with all degree requirements, some of which are outlined in the Graduate School section of this catalog. In brief, the degree requirements include a minimum of 25 semester hours of graduate credit, encompassing (a) at least 21 semester hours at the 500 level or above, to include at least 12 semester hours of work in regularly scheduled political science seminars; and (b) 4 semester hours for the M.A. thesis. Students may offer up to 6 hours in (1) P.Sc. 599 and/or P.Sc. 699, and (2) up to 6 hours in a cognate discipline (graduate seminar, senior undergraduate course, or independent study), but not more than a total of 9 hours may be in (1) and (2) combined. The 9 semester hours may not be substituted for required seminars. The student must take work from at least four members of the graduate faculty.

Students shall select a faculty adviser from among the regular members of this 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 adviser must have general competence in the student’s primary field of emphasis and will serve as the first reader of the M.A. thesis. The second reader, who shall likewise have general competence in the topic of the M.A. thesis, must be associated intimately with the thesis from its inception and in no case after the student begins writing. The completed draft of the thesis must be in the hands of the second, and third readers at least four weeks prior to the comprehensive-final examination.

The purpose of the thesis is to build on mastery of the substantive materials for the chosen topic in order to apply one or more conceptual/analytic devices to those materials and to end with a sophisticated, systematic conclusion.

Each candidate for a master’s degree is required to take a comprehensive-final examination after the other requirements for the degree have been completed. This examination may be given near the end of the last semester of residence while the candidate is still taking required courses for the degree, provided satisfactory progress is being made in those courses. The examination will be oral and last approximately two hours. It will concentrate on the student’s field of emphasis as well as the M.A. thesis. The Comprehensive-Final Examination Committee will have three members, including the faculty adviser (in 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 adviser; the third committee member may be a Graduate faculty representative from a cognate discipline. Satisfaction of the examination requires the affirmative vote of each of three committee members.
M.A. comprehensive-final examinations shall normally not be given during the summer months. In exceptional circumstances, a student may petition the Graduate Curriculum Committee of the department, showing cause why this rule should be waived. Such a petition shall be received no later than April 15.

Master of Arts in Political Science (International Studies)

The degree requirements consist of at least 25 semester hours of work at the 500 level or above. These hours must include the following:
1. Four semester hours for the M.A. thesis.
2. At least 3 hours of seminar work in each of three fields of concentration (one field must be in international relations and one must be in comparative politics). P.Sc. 599 and 699 cannot be counted as a seminar.
3. Additional credit to total the number of hours required by the student's adviser.

The M.A. degree shall be awarded by the Political Science Department upon the recommendation of an M.A. Comprehensive-Final Examination Committee of at least three faculty members who shall examine the candidate orally in three fields of concentration, to include international relations, comparative politics, and one other. The entire examination is approximately two hours long. The student must take courses from at least four members of the department. A minimum 3.0 grade-point average is required.

All students in this program must pass a three-year proficiency test in a foreign language approved by their advisers. In exceptional cases the Committee on Graduate Studies may accept other evidence that the student has acquired a good working knowledge of a foreign language.

Master of Arts in Political Science (Public Policy Analysis)

This is a two-year (and two summers) Master of Arts program with thesis, requiring 42 hours of credit, including 36 hours of course work divided among a core curriculum (including a quantitative methods requirement), geographical context courses, and one topical area of specialization. The remaining 6 hours include 2 hours of internship credit and 4 hours of thesis credit. The student must take work from at least four members of the graduate faculty and must take work in his or her specialization from at least two members of the graduate faculty.

The core curriculum consists of 21 required seminar hours including the quantitative methods requirement. Seminar hours include Public Policy Analysis, Problems of Public Policy Analysis Workshop, Research Methods, Political Theory and Public Policy, and Legal Foundations of Public Policy Analysis (3 hours each). Foreign students may substitute an additional context course for the legal foundations course.

Quantitative methods (6 hours) is fulfilled by taking one course in intermediate statistics and one course in advanced analytic methods, selected from lists of appropriate courses approved by the department. If these courses require prerequisites which the student does not have, these prerequisites must be added to the minimum of 42 hours required to complete the program. Specific courses within each list must be selected in consultation with a specialization adviser, and any departure from the lists must have the approval of the program administrator.

The geographical context component consists of 3 required seminar hours selected from the following list:
1. P.Sc. 501 (American Politics);
2. P.S. 502 (Colorado Politics) or a seminar in state politics;
3. P.Sc. 509 (Metropolitan Politics) or a seminar in local politics;
4. P.Sc. 536 (Intergovernmental Relations);
5. P.Sc. 511 (Political Development);
6. P.Sc. 515 (Political Economy of Marxist Socialist States), or a seminar in the politics of industrial democracies;
7. Area seminars including P.Sc. 510 (Comparative Politics - Western Europe), P.Sc. 513 (Latin American Politics), P.Sc. 519 (Comparative Politics - Sub-Saharan Africa), P.Sc. 561 (Political Systems of China, Japan, and Korea);
8. P.Sc. 521 (International Relations).

The topical specialization component consists of 12 required hours. The following specializations are offered:
1. Energy, Environmental and Natural Resource Policy
3. Communications Policy
5. Mediation, Arbitration and Conflict Management
6. Human Rights Policies
7. Legal Policy
8. Foreign and Defense Policy
9. Human Resources and Social Policy
10. Land Use and Growth Management Policies
11. Science Policy

Course work in the specialization may include a maximum of 3 hours of P.Sc. 699 (Graduate Research Topic) and a maximum of 3 hours of P.Sc. 599 (Topics in Political Science).

The administrator of this M.A. program shall appoint advisers for each specialization who conduct qualifying interviews with students in that specialization and work out their degree plans with them during their first semester in residence. Students may change their specialization during their first year in the program but must then draw up a new degree plan with an appropriate specialization adviser.

The internship must be within the area of specialization. The departmental director of internships assists students in securing relevant internship positions.

The thesis is a research report on a real-world policy problem and provides a concrete demonstration of the analytical skills, intellectual perspective, and substantive knowledge acquired in course work. When possible, the practical experience gained in the internship will be utilized in the thesis. As a general rule the research report will be somewhat shorter (but not less analytical) than the standard M.A. thesis. The thesis must be supervised by the thesis adviser and the second reader, both of whom must be rostered in the student's area of specialization. The thesis adviser and the second reader must be associated intimately with the thesis from its inception and in no case after the student begins writing. The completed draft of the thesis must be in the hands of all readers at least four weeks prior to the comprehensive-final examination.
Each candidate is required to take a comprehensive-final examination after the other requirements for the degree have been completed. This examination may be given near the end of the last semester of residence while the student is still taking required courses for the degree, provided satisfactory progress is being made in those courses. When possible, comprehensive-final examinations taken during the summer should be scheduled during the week prior to the beginning of the fall semester. At no time will the oral examination be scheduled until the thesis is found substantially acceptable to the first two readers. The oral examination covers the entire program, and will last approximately two hours. Satisfaction of the examination requires the affirmative vote of each of the three committee members.

Doctor of Philosophy

An applicant must have a master's degree in political science or in a related field from this University or from another accredited institution before entering the Ph.D. program.

The Department of Political Science requires at least 42 hours of course work (with a grade of A or B) beyond the bachelor's degree for the Ph.D. Except for 3 semester hours which may be taken at the senior undergraduate level in a cognate field at this University, all 42 hours must be at the 500 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 42 minimum hours must include at least two seminars in each of the three fields which the candidate presents for the written comprehensive examination. Furthermore, each student's program shall include at least one seminar in each of the following three categories: (1) American (American government, public administration, law and politics); (2) International Relations/Comparative Politics (comparative politics, international relations); (3) Theory (political philosophy, empirical theory and methodology).

Twenty-seven hours must be taken in political science. Of this 27, 24 must be in regularly scheduled seminars, not more than 6 hours of which may be transferred from another accredited institution. Not more than 6 hours of P.Sc. 599 and 699 (Graduate Research Topics) combined will be allowed toward the degree. The maximum amount of work which may be transferred to this University for the Ph.D. is 10 semester hours, but the Department of Political Science will accept 5 additional hours in-house.

Preliminary Examinations. Preliminary examinations must be taken at the beginning of the second semester of residence in three fields. Students will choose three subfields in which they shall be examined for the Ph.D. preliminary examination. A student failing in only one field shall be re-examined in that one field; a student failing in two or more fields must repeat all three examinations during his or her next semester in residence. Failed examinations mean automatic exclusion from the political science graduate program.

Advisory Committee. The role of the Advisory Committee is crucial. Its function is to guide students in their progress through their degree programs. Students shall select a chairman for their Advisory Committee before the end of the semester during which the requirements for the Ph.D. preliminary examination are fulfilled. Normally this will be by the end of the second semester in residence. Exceptions will occur if a part or all of the preliminary examination must be retaken. If a student does not select a chairman of his or her Advisory Committee during the time specified, the departmental chairman shall designate such a chairman 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 chairman of the committee within two weeks after the selection of the advisory chairman. The Advisory Committee shall meet with the student at least once during each academic year to review the student's progress and to assist in planning the student's future course of study.

Changes in the composition of the Advisory Committee may be made by the Graduate Curriculum Committee, upon petition from the student or one or more members of the student's Advisory Committee.

Language Requirement: The department requires fulfillment of the Graduate School Communication Requirement 1.

Statistics Requirement. Each student shall be required to take at least two courses from among those designated by the Graduate Curriculum Committee. The Graduate Curriculum Committee will distribute a list of these courses on an annual basis.

Comprehensive Examinations. Comprehensive examinations shall consist of a written and an oral part. The written examination shall cover the three fields of concentration selected by the student; the oral examination will be a rigorous comprehensive test of the student's knowledge of the major field of emphasis, including the location of that field in a broad comparative, philosophical, and methodological context.

For the purpose of the comprehensive examination, the discipline of political science is divided into the seven fields listed above. In the preparation of the student's comprehensive examination, each member of the Advisory Committee, in conjunction with not less than two other members of the department who are rostered in the same field of concentration, shall design a written examination which shall seek to measure the candidate's range of knowledge over the field involved, as well as the capacity to engage in sophisticated analysis of specific problems identified with that field. The student shall demonstrate close familiarity with the literature of the three fields chosen for the written examination and shall consult frequently in this regard with the members of the department who are rostered in those fields. Students must receive a pass or high pass from at least two members of the three-member committee in each field to pass that examination.

A student who fails to pass the written comprehensive examination in any field, shall be allowed to take
that written comprehensive examination again during the following semester. If the student fails this second examination, he or she shall automatically be dismissed from the department’s graduate program.

No student may be permitted to take the oral part of the comprehensive examinations until he or she has passed the written part.

The oral part of the comprehensive examination shall be scheduled within two weeks after the student has passed the written examination. Normally, this examination shall be administered by the three persons who prepared the student’s written examination in the major field of emphasis, plus two additional members selected by the Graduate Curriculum Committee from the faculty roster for this field of emphasis. To insure comprehensiveness where appropriate, one member of the oral examining committee, representing the student’s major field of concentration, may be drawn from outside of the department. If a student fails the written examinations, the oral examination will be canceled in accordance with departmental rules. At least five of the five members of the examining committee must concur for a student to pass this examination. A student may retake the oral part of the comprehensive examination once, after a lapse of not less than eight months. To the extent possible, this reexamination will be conducted by the same examiner(s). If the student fails this second examination, he or she shall automatically be dismissed from the department’s graduate program.

Dissertation Requirements and Final Examination.

A dissertation based on original investigation and showing mature scholarship and critical judgment, as well as familiarity with tools and methods of research, is required. A candidate for the Ph.D. shall select a dissertation topic in consultation with a dissertation adviser 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 adviser shall submit the topic, along with the names of the second reader and other faculty consulted in its selection, to the departmental chairman for approval. These steps must be completed at least eight months prior to the dissertation defense.

Once the dissertation has been accepted tentatively by the first two readers, a final oral examination will be conducted by the dissertation committee. Approved by the dean of the Graduate School, the committee shall consist of not fewer than five representatives from those departments in which a student has worked, including at least one professor outside the Political Science Department but who is a member of the University of Colorado graduate faculty.

The examination is open to the public. More than one dissenting vote from the committee will disqualify the candidate in the final examination.

Graduate Minor in Political Science

Graduate students who choose to minor in political science should consult the College of Arts and Sciences section for the descriptions of 400-level courses, since minors but not majors are eligible to receive credit for 400-level courses.

PSYCHOLOGY

Office in Muenzinger Building, Room 244
Campus Box 346
Professor David A. Chissors, Chairman

BACHELOR’S DEGREE REQUIREMENTS

A major in psychology requires a minimum of 30 hours with grades of C or better. Required courses or courses to count in the 30 hours may not be taken pass/fail. In addition, the average of all work in psychology must be at least 2.0. A grade of D in a required psychology course will not fulfill the requirement although the college will accept the credit hours.

Psychology majors must complete each of the following requirements:

1. Psy. 100.
2. Psy. 210 or 310.
3. At least one course from each of the following lists:
   a. Psy. 414, 416, 420.
4. At least two courses from the following list:
   Psy. 405, 410, 425, 438, 465, 488.
5. Psy. 400 or 451.

Transfer students must take at least one course from requirements 3a, 3b, and 4 in this department on the Boulder Campus.

Students intending to major in psychology are advised to include college algebra in their lower division schedules.

GRADUATE DEGREE PROGRAMS

Departmental Requirements

Students wishing to pursue graduate work in psychology leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog. The M.A. is considered as a step to the Ph.D., and students who do not intend to pursue the latter degree are not admitted. Following are special departmental requirements.

Requirements for Minors in Psychology

For the M.A. degree a minimum of 6 hours is required as a minor.

The prerequisite for a minor in psychology is 9 hours of undergraduate psychology.

Statistics cannot be included in either prerequisites or requirements for minors in psychology.

Doctor’s Degree

Prerequisites. Students who wish to become candidates for the Ph.D. degree must show evidence of having covered the work equivalent to that required for a master’s degree.

Language Requirements. No foreign language is needed for the Ph.D. beyond the one required by the Graduate School.
RELIGIOUS STUDIES
Office in Woodbury Building, Room 205
Campus Box 292
Professor Robert C. Lester, Chairman

Religious studies is a humanistic discipline, centrally concerned with the history and phenomenology of religions and religious experience. The religious studies major is ideally suited to those seeking a broad, liberal arts education pursuant to humanistically oriented vocations, such as secondary school teaching or social work, or to graduate work in religion, theology, and several areas of the humanities and sciences such as sociology, psychology, medicine, fine arts, law, and journalism.

BACHELOR’S DEGREE REQUIREMENTS

1. Satisfaction of the regular college requirements for the Bachelor of Arts degree.

2. At least 36 hours in courses on religion, including R.St. 162, 260, 262, and 495.

SOCIOLOGY
Office in Helene Building, Room 290
Campus Box 235
Professor Ray P. Cuzzort, Chairman

BACHELOR’S DEGREE REQUIREMENTS

A minimum of 30 semester hours and maximum of 45 semester hours in sociology. All hours in sociology being counted toward the major must be with grades of C or better; at least 18 hours of these courses must be in upper division credit. Pass/fail grades are not acceptable in satisfying the 30 semester hours for a sociology major. Not more than 8 semester hours of independent study may be counted toward the 30 semester hours in the major and not more than 16 hours may be counted toward the bachelor’s degree.

Courses required for the major are Introduction to Sociology I and II (Soc. 211 and 212), plus one of the following 6-credit-hour courses: Research Methods in Sociology (Soc. 463) and Field Experience in Sociology (Soc. 464). Students should contact the departmental office for further clarification of major requirements.

GRADUATE DEGREE PROGRAMS

Departmental Requirements

Students wishing to pursue graduate work in sociology leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog.

The following are additional requirements for admission to the graduate degree programs of the department.

A combined grade-point average of at least 3.0 (B) for all courses in sociology undertaken as an undergraduate or graduate student prior to admission.

Satisfactory scores (as determined by the department) on the Graduate Record Examination including both the verbal and quantitative sections and at least one advanced test. This examination may be taken at any location in the United States certified by the Educational Testing Service and the results may be sent to the department by the Educational Testing Service or the institution administering the examination.

For the purpose of course selection in relation to a graduate student’s declaration of the major areas of concentration, a student is advised to consider the following groupings of courses which are classified into four areas: theory, methods, institutions, and applications. Courses that can be taken in each area are:


Methods: 502, 503, 504, 505, 506, 507, 510, 603, 611, 663.


Applications: 535, 546, 599, 583, 584, 599, 626, 689.

Master’s Degree

The department offers the M.A. degree in two general types: (1) an in-transit M.A. for students in the Ph.D. program who have satisfied course requirements (24 hours) and passed the Ph.D. comprehensive examination (or an M.A. comprehensive final examination) or have written an M.A. thesis; (2) an emphasis in applied sociology (now being developed by the department Graduate Committee), designed as a shorter program preparing students for work in areas of human services, computer science, evaluation research, conflict management, and basic social research methods. Requirements include a certain number of graduate-level courses taken on the Boulder campus, an internship, and a comprehensive examination or thesis.

The Doctorate

A detailed description of the Ph.D. program is given in the Graduate Handbook available from the graduate secretary of the department. The main requirements are:

1. Minimum of 54 semester hours of approved graduate work, all of which must be 500 level or above. At least 24 of the 54 hours must be taken in the Sociology Department of the University of Colorado at Boulder.

2. The following required courses must be included in the 54 hours minimum: 6 semester hours of sociological theory (Soc. 500 and 501); 6 semester hours of methods and statistics (Soc. 502 and 503); and 3 semester hours of research practicum (Soc. 504, 505, 506, 507).

3. By the time a student accumulates 24 hours of graduate credit in the department, he or she must pass the preliminary examination.

4. Students must also pass the comprehensive examination. They become eligible for this examination only after they have satisfied requirements 1, 2, and 3 above, and have chosen three areas of specialization. (See the Graduate Handbook of the department for details.)

5. Students must demonstrate at least second-year college proficiency in a foreign language.

6. The student must write a Ph.D. dissertation. A student may not enroll for Soc. 800 (Doctor’s Thesis) before the semester in which the comprehensive examination is passed.

7. Satisfying requirements 1-6, the student must pass the Ph.D. final examination.
All inquiries about the graduate programs of the department should be addressed to Chairman, Committee on the Graduate Program, Department of Sociology.

SPANISH AND PORTUGUESE

Office in McKenna Building, Room 128
Campus Box 278
Professor Anthony Lozano, Chairman

Students who have completed a Level III high school Spanish or Portuguese course have automatically satisfied the college graduation requirement in foreign language. This requirement may also be satisfied by completion of Span. or Port. 211 or by demonstration of equivalent proficiency by placement test. Students who have studied Spanish in high school and wish to continue with the language will be placed according to their high school record and verbal SAT and/or ACT scores. A student may not receive credit for a course at a lower level than that into which he is placed.

BACHELOR'S DEGREE REQUIREMENTS

1. A total of 35 credit hours in Spanish courses (at the 200 level or above), including the following minimum distribution: (a) at least 9 hours in upper division courses primarily devoted to language theory and practice (Span. 301-302, 303-304, 305, 401-402, 403-404, 405, 495); (b) at least 8 hours in upper division literature courses including at least one course treating Spanish peninsular literature and one treating Spanish American literature; (c) at least 12 hours in courses numbered 400 or above, taken on the Boulder Campus.

2. A total of not more than 6 hours from the following courses may apply to the Spanish major: Span. 211-212, 400, 421, 464, 491-492.

3. An additional 6 hours in courses from one or more of the following areas: (a) courses listed in the Latin American Studies program (e.g., history, art history, political science, etc.); (b) courses in Chicano Studies; (c) linguistics; (d) upper division courses in another foreign language or comparative literature; (e) Port. 101-102.

4. A major with emphasis on International Spanish for the Professions is offered with the same requirement as paragraph 1, except that 12 hours in business Spanish courses (303-304, 406-407) will be substituted for the literature courses. (See department for additional requirements. This is a controlled enrollment program with limited space. The student must apply for admission at the beginning of the fourth semester.)

Students planning to acquire certification for teaching at the secondary level should note that the School of Education will require Span. 495 (Methods of Teaching Spanish) and that the 3 credit hours earned in that course will count toward the major and will be subject to the 45-hour maximum from one department allowed by the College of Arts and Sciences for the B.A. degree. This means that students who begin the major program with Span. 101 and who intend to include secondary certification in their B.A. program must include Span. 495 in their electives in Spanish.

To be admitted to practice teaching of Spanish, majors must take the language-skills tests of the Modern Language Association Proficiency Tests for Teachers and Advanced Students of Spanish and make satisfactory scores.

Students wishing to receive teaching certification in Spanish must have completed 8 credits chosen from Span. 305, 405, 408.

Students must see a departmental adviser prior to registration for their final semester. Failure to do so may result in a delay of their graduation. Students considering entering graduate school for an advanced degree in Spanish, either at the University of Colorado or at any other institution, should see a departmental adviser as early as possible.

The department strongly recommends that all majors include some study in a Spanish-speaking country in their major programs. The University of Colorado offers full-year and semester programs in San Jose, Costa Rica, Xalapa, Mexico, and Seville, Spain; a year-long program in Lima, Peru, and an intensive language program also in Xalapa, Mexico. For students who have completed through Port. 212 or demonstrated equivalent proficiency, a semester program in Rio de Janeiro is available. Credit earned will normally count toward satisfaction of the major requirements, but the student should see an adviser before enrolling in a foreign program to assure full transfer of credit. Credit for work done in special programs offered by foreign universities will be evaluated on an individual basis. It should be noted that courses taken abroad and designated as Spanish will also be subject to the 45-hour maximum rule of the College of Arts and Sciences.

Students interested in study abroad will find further information under Special Educational Opportunities. A Spanish Language Floor Program located in the Williams Village dormitories is available for students who wish to acquire conversational practice. Entrance requirements are three years of Spanish in high school, three semesters in college, or equivalent fluency. For further information please see Housing section.

Students who present transfer work or credit earned in CU Study Abroad programs to satisfy major requirements will be expected to complete their last 12 credits, including at least 6 at the 400 level, on the Boulder Campus.

For comparative literature, Chicano studies, Latin American studies, and linguistics courses see those sections.

GRADUATE DEGREE PROGRAMS

Departmental Requirements

Students wishing to pursue graduate work in Spanish leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog. Application for admission should include official statements of the Graduate Record Examinations. Students with exceptional educational backgrounds and recommendations who have not had an opportunity to take these tests may be admitted with the understanding that they will take them at the earliest opportunity.
Master's Degree

Prerequisites. The following are required for graduate study in Spanish:
1. Competency in speaking, understanding, reading, and writing Spanish.
2. A general knowledge of Hispanic literature and civilization.

Language Requirement. The student will demonstrate as early as possible, but at least one full semester before taking comprehensive examinations, a communication knowledge (as defined by the Graduate School) of a foreign language other than Spanish.

Areas of Concentration. The Master of Arts in Spanish is offered in three areas of concentration: one with an emphasis on literature, one with an emphasis on language and linguistics, and one in advanced teaching methodology.

Minor Fields. For the major in Spanish, the student may elect two courses (4-6 hours) in a minor field. The following fields of minor concentration are recommended: comparative literature, anthropology, linguistics, English, education, Latin American studies, fine arts, philosophy, history, methodology, Greek, Latin, music, or another language or literature.

Required Courses. Span. 642 (Seminar: History of the Spanish Language) is a required course for all areas of the M.A. degree. For the literature emphasis, 614 (Seminar: Spanish Literature, Medieval Period) is an additional required course. For the M.A. with an emphasis on language and linguistics required courses in addition to the above are 640 (Seminar: Spanish Linguistics, Phonology), 641 (Seminar: Spanish Linguistics, Syntax), and 643 (Seminar: Hispanic Linguistics).

The department should be consulted regarding required courses in the area of teaching methodology.

Examinations. A comprehensive written and oral final examination will be given during the student's last semester of residence.

Doctor's Degree

Prerequisites. Fluency in speaking, understanding, reading, and writing Spanish; a general knowledge of Hispanic literature and civilization.

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 examinations.

Language Requirement. The student will demonstrate as early as possible, but at least one full semester before taking comprehensive examinations, a communication knowledge (as defined by the Graduate School) of a foreign language and a reading knowledge of a second language in addition to Spanish. The languages will be chosen by the student in consultation with the advisory committee.

Areas of Concentration. The Ph.D. in Spanish is offered in three areas of concentration: 1) Spanish peninsular literature; 2) Spanish-American literature; 3) Spanish language and linguistics.

Required Courses. Students in all areas of concentration are required to take Span. 705 (Spanish Historical Grammar).

THEATRE AND DANCE

Office in Theatre Building, Room 201
Campus Box 261
Professor Martin T. Cobin, Chairman

BACHELOR'S DEGREE REQUIREMENTS

Majors are available for the B.A. and B.F.A. degrees in dance and theatre. Students are urged to consult with an undergraduate adviser in the appropriate field to obtain both advice and the most current information concerning program opportunities and expectations.

Dance

Students majoring in dance must complete a minimum of 40 hours in the dance area. Courses fulfilling college requirements as well as general electives are to be chosen in consultation with and approved by a department adviser. The following are required for the dance major:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dnce 181-188</td>
<td>Dance Techniques: Ballet</td>
<td>2</td>
</tr>
<tr>
<td>Dnce 191-198</td>
<td>Dance Techniques: Modern</td>
<td>12</td>
</tr>
<tr>
<td>Dnce 197</td>
<td>Recreational Dance Forms</td>
<td>1</td>
</tr>
<tr>
<td>Dnce 214</td>
<td>Improvisation</td>
<td>2</td>
</tr>
<tr>
<td>Dnce 280</td>
<td>Beginning Composition</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 360</td>
<td>Musical Accompaniment for Dance</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 413</td>
<td>Children's Dance</td>
<td>3</td>
</tr>
<tr>
<td>or Dnce 415</td>
<td>Methods of Teaching Dance</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 490</td>
<td>Intermediate Dance Composition</td>
<td>3</td>
</tr>
<tr>
<td>or Dnce 490</td>
<td>Advanced Dance Composition</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 491</td>
<td>History and Philosophy of Dance</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 492</td>
<td>Dance in the 20th Century</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 493</td>
<td>Performance Events</td>
<td>2</td>
</tr>
</tbody>
</table>

A minimum of 3 credits to be selected from additional dance theory and/or technique courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dnce 314</td>
<td>Movement Analysis Practicum</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 475</td>
<td>Dance Practicum</td>
<td>1-3</td>
</tr>
<tr>
<td>Dnce 492</td>
<td>Dance Repertory</td>
<td>3</td>
</tr>
<tr>
<td>Dnce 493</td>
<td>Independent Study</td>
<td>1-3</td>
</tr>
<tr>
<td>Dnce 598</td>
<td>Studio Concert</td>
<td>1-3</td>
</tr>
</tbody>
</table>

A minimum of 6 credits in theatre are to be selected from the following:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thtr 270</td>
<td>Introduction to Theatre</td>
<td>3</td>
</tr>
<tr>
<td>Thtr 273/373</td>
<td>Acting I</td>
<td>3</td>
</tr>
<tr>
<td>Thtr 276</td>
<td>Stagecraft</td>
<td>3</td>
</tr>
<tr>
<td>Thtr 375</td>
<td>Costuming</td>
<td>3</td>
</tr>
<tr>
<td>Thtr 476</td>
<td>Directing</td>
<td>3</td>
</tr>
<tr>
<td>Thtr 479</td>
<td>Theatre Practice (Music Theatre)</td>
<td>3</td>
</tr>
<tr>
<td>Thtr 483</td>
<td>Touring Theatre — Dance</td>
<td>3-22</td>
</tr>
<tr>
<td>Thtr 486</td>
<td>Lighting Design</td>
<td>3</td>
</tr>
</tbody>
</table>

Theatre

 Majors must complete a minimum of 45 semester credits, as follows:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thtr 273</td>
<td>Acting I</td>
<td>3</td>
</tr>
<tr>
<td>Thtr 276</td>
<td>Stagecraft</td>
<td>3</td>
</tr>
</tbody>
</table>

or

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thtr 377</td>
<td>Costuming</td>
<td>3</td>
</tr>
</tbody>
</table>

College of Arts and Sciences / 79
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thtr. 471</td>
<td>History of Theatre I</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 491</td>
<td>History of Theatre II</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 321</td>
<td>Pracicum in Costuming</td>
<td>1</td>
</tr>
<tr>
<td>Thtr. 322</td>
<td>Pracicum in Technical Theatre</td>
<td>1</td>
</tr>
<tr>
<td>Thtr. 323</td>
<td>Pracicum in Management</td>
<td>1</td>
</tr>
<tr>
<td>Thtr. 324</td>
<td>Pracicum in Acting</td>
<td>1</td>
</tr>
<tr>
<td>Thtr. 325</td>
<td>Directing</td>
<td>3</td>
</tr>
<tr>
<td>Electives in theth (up to 6 credits) may be practical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives in dance</td>
<td></td>
<td>9</td>
</tr>
<tr>
<td>Electives in dramatic literature</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>(The 6 credits from dramatic literature shall be from the following: Engls. 120, Engls. 397, Engls. 398, Engls. 431-437, or any approved foreign language dramatic literature.)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Students wishing to qualify for teaching certification must complete the major theatre requirements (Thtr. 490, Comm. 436) as well as the professional education requirements. See School of Education.

Bachelor of Fine Arts Degree

The Bachelor of Fine Arts degree is offered in dance (performance or dance production) and in theatre (acting or technical theatre). These degrees meet the needs of highly talented students with professional objectives who desire and can profit from considerable specialization at the undergraduate level. Such a program is not in the best interests of all students and the departmental capacity to provide the program is necessarily limited. Formal application for admission should be made in the sophomore year and those with real or potential interest in applying should identify themselves to the B.F.A. advisers as early as possible in their college studies as possible. The requirements for the B.F.A. in theatre are listed below. Students should contact the Dance Division office for information concerning requirements for the B.F.A. in dance.

Requirements for the Bachelor of Fine Arts Degree in Theatre

The B.F.A. in Theatre offers preprofessional training to a limited number of highly talented students aiming at professional careers. Admission will be limited not only in terms of student capacity but also to insure the type of individual attention necessary for effective training. Interested students should identify themselves as early as possible and formal application should be made at the beginning of the third semester. Selection will be based on talent, academic record, motivation, letters of recommendation, and audition-interviews. Auditions will be held during the third semester. Only applicants currently enrolled in the departmental program will be considered. All normal college requirements must be met and the program assumes a normal total of 124 credits for graduation.

The major requirements consist of a basic core of 38 credits in theatre, 3 credits in interpretation, and 2 credits in dance followed by a specialized sequence which meets the approval of the officially designated B.F.A. advisers in acting, costuming, or technical theatre, resulting in theatre credits of 68-67 plus additional requirements outside theatre but related to the area of concentration.

The B.F.A. basic core curriculum is as follows:

### Theatre Performance Semester Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dnce. Dance Technique</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Intpr. 359</td>
<td>Oral Interpretation of Literature: Poetry</td>
<td>3</td>
</tr>
<tr>
<td>Intpr. 365</td>
<td>Voice</td>
<td>3</td>
</tr>
<tr>
<td>Intpr. 432</td>
<td>Dramatic Interpretation: Tragedy</td>
<td>3</td>
</tr>
<tr>
<td>Intpr. 453</td>
<td>Dramatic Interpretation: Comedy</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 373</td>
<td>Acting II</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 473</td>
<td>Acting III</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 484</td>
<td>Acting IV</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 424</td>
<td>Practicum in Acting and Interpretation</td>
<td></td>
</tr>
<tr>
<td>(Must include regular section, summer repertory, senior project)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thtr. 482</td>
<td>History of Costume I</td>
<td>3</td>
</tr>
<tr>
<td>or (whichever not taken in core)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thtr. 487</td>
<td>History of Costume II</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 376</td>
<td>Advanced Stagecraft</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 377</td>
<td>Costume</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 476</td>
<td>Scene Design</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 477</td>
<td>Costume Design</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 485</td>
<td>Lighting</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 421</td>
<td>Practicum in Costume</td>
<td>3</td>
</tr>
<tr>
<td>Thtr. 422</td>
<td>Practicum in Technical Theatre</td>
<td>3</td>
</tr>
</tbody>
</table>

**GRADUATE DEGREE PROGRAMS**

**Departmental Requirements**

Students wishing to pursue graduate work in theatre and dance for advanced degrees should read carefully both Requirements for Advanced Degrees in the Graduate School section 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 dance on the basis of their...
academic records and recommendations. Students admitted who are unable to offer a substantial number of semester hours of work in the area of their intended specialization or allied fields must expect that a significant number of additional courses and semester hours will be required of them in order to make up deficiencies.

Qualifying 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. The results of this examination might prompt the faculty to recommend that the student withdraw from the program.

Adviser and Graduate Committee. For every student who declares an intention to work toward an advanced degree, an adviser and committee will be designated so that a degree plan may be designed prior to 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.

Master's Degree

Course Requirements. All master's degree candidates are required to complete Th.Dn. 601 or its equivalent.

Plan I With Thesis. After any undergraduate deficiencies have been removed, students under Plan I must earn 30 semester hours, all of which must be at the 500 level or above. Four to 6 thesis credit hours may be counted toward the 30-hour requirement.

Plan II With Project (Creative and/or Analytical). After any undergraduate deficiencies have been removed, students under Plan II must earn 30 semester hours, all of which must be at the 500 level or above. Three project credit hours must be counted toward the 30 hours.

Doctor's Degree

Doctoral candidates in theatre and dance will normally be expected to earn 40 semester hours of course work beyond the master's degree, all of which must be at the 500 level or above. Candidates will be required to complete Th.Dn. 601 or its equivalent.

Specific requirements will be determined by the candidate's advisory committee within the framework of Graduate School and departmental requirements and policies.

The Graduate School requires a fourth-semester proficiency in a foreign language or passing the GSFLT. Doctoral candidates should also consult the Graduate School description of dissertation hour requirements.

WOMEN STUDIES

Campus Box 325
Assistant Professor Lee Chambers-Schiller, Chairwoman

The University of Colorado offers a Women Studies Program, the purpose of which is to provide an interdisciplinary approach to the study of women in society. The program offers core interdisciplinary courses and promotes the development of women studies courses in other departments and programs. In addition, the program encourages the integration of women's perspectives in the traditional curriculum. Students should consult the Schedule of Courses or the Women Studies brochure for a complete listing of classes in women studies and cross-listed courses in other departments and programs. There are two options available to students interested in concentrating on women studies. A student may develop an Individually Structured Major with a faculty advisory committee and approval of the dean of the College of Arts and Sciences. The program also offers a Certificate Program in Women Studies which requires a minimum of 24 hours in women studies: 12 hours in women studies core courses, 6 hours in cross-listed humanities courses, and 6 hours in cross-listed social sciences courses. The women studies director should be consulted in developing either option. The program offers research materials, a library for university and community use, as well as colloquia, workshops, and other cultural and educational events. Frontiers: A Journal of Women Studies is published in association with the program.

PREHEALTH SCIENCES

Students with vocational interest in a health field apply to that professional program after completion of one to three years of college work, which must include specific preprofessional courses. Most University of Colorado professional health programs are offered at the Health Sciences Center in Denver. Preprofessional work can be completed on the Boulder Campus, where preprofessional advising is available from faculty members and from the dean who is the pre-health sciences adviser.

Each student must recognize that admission to a preprofessional program on the Boulder Campus does not guarantee later admission to the professional program. At the time of actual application to the professional program, the student will be judged on several factors, including performance in undergraduate courses. For this reason, no required course may be taken on a pass/fail basis. Some fields require specific preprofessional examinations before application. For most fields, interviews are an essential part of the application process. In all cases, admissions committees will be concerned with the student's personal qualities, including: compassion, coping abilities, decision making, intellectual capabilities, interprofessional relations, 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 (including medical activities), so that they can be more certain of their motivations for health careers.

Most of the professional programs at the University of Colorado have strong preference for, or are restricted to, Colorado residents. Students from other states usually can obtain at Boulder the preprofessional
courses required by their state schools, but should check with those schools in advance. Students are encouraged to apply both to their state schools and to private professional schools to increase their chances of gaining acceptance to the professional program of their choice.

During the preprofessional years, personal intellectual development will cause many students to change professional goals. Since traditionally there are more applicants for these programs than there are spaces available, many students will be forced to change goals because of nonacceptance to the field of their choice. Under these circumstances, wise students will plan college programs to give themselves the greatest flexibility in considering other vocations.

Most students in certain fields (dentistry, health administration, medicine) will complete an undergraduate degree before entering the professional program. Other fields (child health associate, dental hygiene, medical technology, nursing, pharmacy, physical therapy, etc.) do not require an undergraduate degree. Students actually entering these latter programs are not required to satisfy degree requirements on the Boulder Campus. However, wise students will, while working to satisfy preprofessional requirements, also protect themselves by satisfying requirements for an undergraduate degree at Boulder. Care in selection of courses will permit the same courses to be used to satisfy several sets of requirements. For example, Chem. 101 and 104 will satisfy minimal requirements for such fields as child health associate, dental hygiene, nursing, and physical therapy, but will not be accepted for the other health fields. On the other hand, Chem. 103, 106, and 331 will permit the student to apply to any health program and will also satisfy degree requirements for any major requiring chemistry.

None of the professional programs specify the college or academic department within which preprofessional courses must be taken. Generally, there is no advantage of one college or academic department over another. For example, premedical and predental students can be found majoring in both science and non-science departments of the College of Arts and Sciences, as well as in such colleges as engineering, business, and music. Therefore, students would be well advised to examine their academic strengths and weaknesses, as well as interests and vocational alternatives, in planning a program of study. Students are urged to consult with advisers in their possible major departments as well as with advisers in the prehealth fields.

A summary of current preprofessional requirements for the University of Colorado programs follows, together with the number of openings in the program and information on the time the student normally applies. This information may change without notice. Students are therefore advised to obtain current requirements on the programs and admission requirements from the health sciences adviser, or from the program office at the Health Sciences Center. There are other medical fields which are not specifically available at the University of Colorado. Check with the Health Sciences Advising Office for details.

**CHILD HEALTH ASSOCIATE**

Minimum 60 semester hours.

<table>
<thead>
<tr>
<th>Required</th>
<th>Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry, general (Chem. 101, 104)</td>
<td>2</td>
</tr>
<tr>
<td>Biology (EP0B 121 and 123, 122 and 124 or MCDB 105, 106)</td>
<td>2</td>
</tr>
<tr>
<td>Psychology</td>
<td>2</td>
</tr>
</tbody>
</table>

Suggested: Behavioral and child psychology, cultural anthropology, English, humanities, sociology.

Application deadline December 15; 20 positions. Many applicants will have much more than minimal college requirements.

**DENTAL HYGIENE**

Minimum 60 semester hours.

<table>
<thead>
<tr>
<th>Required</th>
<th>Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expository writing</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics (College Algebra Math. 101)</td>
<td></td>
</tr>
<tr>
<td>Psychology</td>
<td>1</td>
</tr>
<tr>
<td>Speech (Comm. 102)</td>
<td>1</td>
</tr>
<tr>
<td>Sociology</td>
<td>1</td>
</tr>
<tr>
<td>Chemistry, general, with laboratory, (Chem. 101, 104)</td>
<td>2</td>
</tr>
<tr>
<td>Biology, general, with laboratory.</td>
<td></td>
</tr>
<tr>
<td>(EP0B 121 and 123, 122, and 124 or MCDB 105, 106)</td>
<td>2</td>
</tr>
</tbody>
</table>

Application normally at beginning of sophomore year; deadline December 15; 10 positions open. Dental Hygiene Aptitude Test required.

**DENTISTRY**

Minimum 90 semester hours; undergraduate degree normally obtained before entrance.

<table>
<thead>
<tr>
<th>Required</th>
<th>Semesters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemistry, general (Chem. 103, 106)</td>
<td>2</td>
</tr>
<tr>
<td>Chemistry, organic (Chem. 331, 332)</td>
<td></td>
</tr>
<tr>
<td>Biology, general (EP0B 121 and 123, 122 and 124 or MCDB 105, 106)</td>
<td>2</td>
</tr>
<tr>
<td>Physics, general (with laboratory)</td>
<td>2</td>
</tr>
<tr>
<td>Mathematics (minimum college algebra and trigonometry)</td>
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<tr>
<td>Literature</td>
<td>2</td>
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<tr>
<td>Expository writing</td>
<td>1</td>
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</tbody>
</table>

Application normally between junior and senior years with deadline December 1. 25 positions open. Dental Admission Test required.

**HEALTH ADMINISTRATION**

Requires baccalaureate or advanced degree with a well-balanced undergraduate program. Prerequisites of financial accounting, microeconomics, and basic statistics, as well as the Graduate Record Examination, must have been completed in the last five years. The selection committee is seeking candidates with (1) scores at least as high as the 50th percentile on all three sections of the GRE; (2) undergraduate grade-point average of at least 3.0; and (3) some health care experience.

Application deadlines: (1) preapplication — December 31; (2) full application — February 28.

**MEDICINE**

Most applicants will enter medical school with a baccalaureate degree or at least 120 hours.

<table>
<thead>
<tr>
<th>Required</th>
<th>Semesters</th>
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<tbody>
<tr>
<td>Chemistry, general (Chem. 103, 106)</td>
<td>2</td>
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<tr>
<td>Chemistry, organic (Chem. 331, 332)</td>
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</tr>
<tr>
<td>Biology, general (EP0B 121 and 123, 122 and 124 or MCDB 105, 106)</td>
<td>2</td>
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</tbody>
</table>

For especially qualified students, Chem. 107, 108 may be substituted.

For chemistry majors, Chem. 335, 536 will be substituted.

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Physics, general, with laboratory .................................................. 2
Mathematics (minimum college algebra and trigonometry) ................. 2
Literature .......................................................... 2
Expository writing ......................................................... 1

Application normally between junior and senior years with deadline November 1. Students normally take the Medical College Admissions Test in spring of the junior year and should be completing science requirements at that time. Approximately 100 positions are open. Admission is usually limited to Colorado and Wyoming residents and to Native Americans from states adjacent to Colorado.

MEDICAL TECHNOLOGY

Minimum 90 semester hours required.

Required  Semester Hours
Chemistry, with laboratory, usually
   general chemistry (Chem. 103, 104) and
   organic (Chem. 331, 332) ........................................ 16
Biology, with laboratory. Must include microbiology and
   immunology (Normally EPOB 340. Students may
   substitute EPOB 410 with instructor's permission.)
   Remaining credits from general biology (EPOB 121
   and 122, 123 and 124 or MCDB 105, 106),
   physiology, anatomy, histology, or embryology ............ 16
Mathematics. College algebra; familiarity with the principles of calculus is desirable ...... 6-10

Recommended:
   Physics, with laboratory (usually Phys. 301, 302), biochemistry,
   physical chemistry, English, speech or communications, social
   sciences, physical education, foreign language, introduction to
   statistics.

Normal application in fall of junior year with application deadline
February 1. University of Colorado students who are Colorado resi-

dents have priority for the program. Minimum science GPA 2.75; 21
positions open. Students must meet clinical training prerequisites es-
blished by the Board of Registry of Medical Technologists of the
American Society of Clinical Pathologists and the American Society
of Medical Technology. Program leads to degree of Bachelor of
Science in Medical Technology.

NURSING

Minimum 60 semester hours.

Required  Minimum Semester Hours
Biology, general, as pre, for
   microbiology and physiology (EPOB 212 and 123,
   122 and 124 or MCDB 105, 106) .................................. 8
Microbiology (EPOB 340) ........................................... 8
Human anatomy (EPOB 342) .......................................... 3
Chemistry (Chem. 101 and 104, Chem. 103 and 104,
   or Chem. 103, 106) .............................................. 8
Physiology (EPOB 345) .............................................. 6
Sociology, general (Soc. 211) ........................................ 3
General psychology (Psy. 100) ........................................ 3
Developmental psychology (Psy. 264, 466, or
   468 plus Psych. 230, 415, or 445) ............................ 6
Anthropology (Anth. 104) ............................................ 3
Statistics .......................................................... 3
English composition (A & S 100, 101, 102, or 103) .............. 2
Humanities (two-semester sequence in
   literature, philosophy, art, music,
   foreign language, dance, fine art, humanities,
   political science, history, or theater) ......................... 6

The remainder of the 60 semester hours may be selected from any
academic discipline with the exception of commercial and vocational
courses and doctrinal courses in religion. Because of the number of
science prerequisite courses, the beginning prenursing student has
two choices: (1) take both biology and chemistry during the freshman
year, or (2) take one of these courses, preferably biology, during the
summer session either preceding or following the freshman year. Ap-
lication during November of sophomore year with February 1
deadline. 125 positions open.

PHARMACY

Although the School of Pharmacy is located on the Boulder Campus, two academic years of preprofessional study are required before ad-
mission to the professional program.

Required  Semester Hours
Chemistry, general (Chem. 103, 104) .................................. 10
Chemistry, organic (Chem. 331, 332) ................................ 8
Biology, general, with laboratory
   (EPOB 121 and 122, 123 and 124, or MCDB 105, 106) ....... 8
Mathematics (college algebra and
   trigonometry or calculus) ........................................ 5
Physics, general, with laboratory (Phys. 301) ......................... 5
Economics, micro (Econ. 203) ...................................... 2
English composition ................................................ 6
Communication, verbal .............................................. 3
General education (20 semester hours)
   Psychology and/or sociology .................................. 6-8
   Humanities ....................................................... 6-8
   Natural or social sciences .................................... 6-8

Application during sophomore year, deadline March 1 or until quota
is filled; 70 positions open. For prepharmacy advising, consult the
School of Pharmacy, Eliot Building, West 191.

PHYSICAL THERAPY

Minimum 90 semester hours required. The professional program at
the Health Sciences Center constitutes the senior year.

Required  Semester Hours
Biological sciences .................................................. 14
   General biology (EPOB 121 and 122, 123 and 124
   or MCDB 105, 106)
   Anatomy (human preferred—EPOB 342)
   Physiology (human preferred—EPOB 343)
   (prep., 1 yr. of chemistry)
   Humanities (3 hrs. must be in English composition) .......... 12
   Psychology ...................................................... 6
   Social science .................................................. 6
   Kinesiology (P.E. 454) ......................................... 3
Physics, general (recommended content to include mechanics, heat,
   electricity, magnetism, sound, light and x-rays,
   usually Phys. 301, 302) .................................... 8
Chemistry, general, with laboratory (Chem. 101-104) ............. 8

Only Colorado and WICHE students are eligible for the program.
Application will be accepted in the junior year after completion of at
least 75 hours and the majority of the prerequisite courses. The
deadline for applications is January 2 for entrance in June of the
same year. 32 positions available. Minimum GPA 2.6. For advising
consult the Department of Physical Education.

PREOPTOMETRY COURSE REQUIREMENTS

General biology or zoology (MCDB 105 and 106 or
   EPOB 121-123 and 122-124) ................................... 1-1 year
General chemistry (Chem. 103 and 106 or Chem. 107 and 108) 1 year
General physics (Phys. 301 and 302 or Phys. 111, 112, and 114) 1 year
English (expository writing or creative writing
   and/or literature) ............................................. 1 year
College mathematics (Math. 101 or 101 and 102 or 110) 1-1 year

There are additional course requirements, however, which vary with
each school or college. You will need to check catalogues for specific
schools to be certain of individual requirements. All schools require
applicants to take the OCAT, which is given each spring and fall.

Because of regional campus course differences, number of hours does not agree exactly with
School of Nursing publications.
Pre-Dentistry Course Requirements

General biology (MCDB 105 and 106 or EPOB 121-123 and 122-124 plus upper division courses as desired) .......... 1-2 years
General chemistry (Chem. 103 and 106 or Chem. 107 and 108) 1 year
Organic chemistry (Chem. 331 and 332 or 335 and 336 for chemistry majors) .......................... 1 year
General physics (Phys. 301 and 302 or 111, 112 and 114) 1 year
English (expository writing or creative writing and/or literature) ............................................. 1 year

Students should check catalogs for schools for the specific requirements. Application is made to all schools through AACPMAS, an application service. Applicants are required to take the MCAT, which is given each spring and fall.

Pre-Veterinary Medicine Course Requirements

General biology (MCDB 105 and 106 or EPOB 121-123 and 122-124) ........................................ 1 year
Cell biology (MCDB 312) ........................................... ½ year
Developmental biology (MCDB 465 and 466 or EPOB 374 and MCDB 466) .............................. 1 year
Genetics (EPOB 320) .............................................. ½ year
Microbiology (EPOB 340) ........................................ ½ year

General chemistry (Chem. 103 and 106 or Chem. 107 and 108) 1 year
Organic chemistry (Chem. 331 and 332 or Chem. 335 and 336) 1 year
Biochemistry (Chem. 481 and 482 or 581 and 582) 1 year
Calculus (Math. 130 or 135 or 182) .................................. ½ year
Physics (Phys. 111, 112, and 114 or 301 and 302) 1 year
English composition (Engl. 100 or A&S 101 or 102 or 103 or 104 or Engl. 119 or Engl. 200 and others) ½ year
Public speaking (Comm. 102 or 103) 1 year

The above requirements are specific to Colorado State University. Students should check with other schools for their requirements. CSU also requires students to take the Graduate Record Examination morning tests in October of the year in which application is made.

Pre-Law

The assistant dean of the College of Arts and Sciences serves as chairman of a faculty committee of advisers for students interested in the study of law. These faculty members, who have a special interest and expertise in the theoretical and practical aspects of the law and judicial systems, are available for consultation with all undergraduates on the Boulder Campus. See the Office of the Dean of Arts and Sciences for further information.
College of Business and Administration and Graduate School of Business Administration

William H. Baughn, Dean

INFORMATION ABOUT THE COLLEGE

History and Purpose

The College of Business and Administration and Graduate School of Business Administration serve the need for competent and responsible administrative personnel, for continued education of those already in such positions, and for research.

The college was admitted to membership in the American Assembly of Collegiate Schools of Business in 1938.

The college participates on a continuing basis in the Executive Program for the Gas Industry, the Institute for Organization Management, the Colorado School of Banking, the National Installment Banking School, the School of Bank Marketing, the School for International Banking, and many activities of the Center for Conference and Management/Technical Programs. The college also assists in the presentation throughout Colorado of a Certificate Program in Real Estate. The faculty also participate in many continuing education, government, and company educational programs.

The Executive-in-Residence program provides business leaders in residence to work with students and faculty during the school year.

The Business Alumni Advisory Council serves as a direct link with the business community to promote understanding, cooperation, and mutual gain in a variety of education-industry activities.

Career Opportunities

Graduates occupy positions and perform widely varied functions in:

- Advertising
- Banking
- Information systems
- Consumer credit and mortgage financing
- Credit administration
- Financial management
- Industrial selling and purchasing
- Insurance
- International business
- Investments
- Management accounting
- Management consulting
- Marketing management
- Marketing research
- Minerals land management
- Operations research
- Personnel management
- Production management
- Public accounting
- Real estate
- Retailing
- Selling and sales management
- Traffic management
- Transportation
- Wholesaling

Others hold positions of responsibility in fields as diverse as business journalism, public relations, city planning, chamber of commerce and trade association management, college administration, and government.

Facilities and Research Activities

The Business Building is a total educational environment designed for the specific needs of business students. The facilities include computer terminals, the William White Business Library, organizational laboratories, lounges, varied classrooms, all faculty and administrative offices, and the Business Research Division.

The college offers its undergraduate and M.B.A. programs on the Denver and Colorado Springs campuses also.

The Business Research Division provides facilities and trained personnel for research on business and economic problems. Established in 1915, the unit serves as the research arm of the college. The division serves Colorado and the surrounding region to improve the general economic welfare of the area and to gather and disseminate business and economic information; encourages research by faculty members and graduate students; and develops closer relationships between students, faculty, and businessmen.

Through its monthly publication, The Colorado Business Review, the division provides basic business information concerning Colorado. Other publications include compilations of business and economic data, industry surveys, studies of special problems in business management, and regional community studies.
Honors Program

Upon recommendation of the faculty, students who demonstrate superior scholarship are given special recognition at graduation.

Students must achieve an overall grade-point average of 3.3 and a grade-point average of 3.5 in all business courses taken at the University of Colorado to be considered for cum laude.

Those who achieve an overall grade-point average of 3.5 and a grade-point average of 3.7 in all business courses taken at the University of Colorado will be considered for magna cum laude.

Beta Gamma Sigma

Membership in Beta Gamma Sigma is an honor which must be earned through outstanding scholastic achievement. Such membership is one of the highest scholastic honors that a student in a school of business or management can attain.

To be eligible for Beta Gamma Sigma membership, a student must rank in the top 5 percent of his or her junior class, the top 10 percent of his or her senior class, or rank in the top 20 percent of those students receiving master’s degrees. Also, students completing all requirements for the doctoral degree conferred by a business school are eligible for Beta Gamma Sigma. It should be noted that Beta Gamma Sigma chapters may be chartered only in those schools of business and management accredited by the American Assembly of Collegiate Schools of Business.

Student Organizations

Opportunity for association in activities to stimulate professional interests and to gain recognition of scholastic attainment is provided by the following student organizations:

- AIESEC, international business association.
- Beta Alpha Psi, national honorary and professional accounting fraternity.
- Beta Gamma Sigma, national honorary scholastic fraternity in business.
- Beta Sigma, coeducational professional business fraternity.
- Black Business Student Coalition.
- B.R.E.C., Buffalo Real Estate Club.
- CBSA, Chicano Business Students Association.
- COSPA, Colorado Society for Personnel Administration (Student Chapter), for students interested in personnel or industrial relations.
- CUAMA, student chapter of the American Marketing Association.
- Delta Phi Epsilon, honorary graduate fraternity in business education.
- Delta Sigma Pi, professional business fraternity.
- DBA Association, for doctoral students in business.
- MBA Association, for master’s students in business.
- MEIS, Minority Employment Information Service, nonprofit student organization to locate minority jobs.
- Phi Chi Theta, professional business and economics fraternity.
- Sigma Iota Epsilon, professional and honorary management fraternity.

S.A.M.L., Student Association of Miners Landmen.

W.I.B., Women in Business.

The Student Board represents students in planning and administration of the school’s activities. The board of 12 members is elected annually. Graduate students also honor the outstanding teacher of the year.

ACADEMIC POLICIES—UNDERGRADUATE

The academic policies, rules, and regulations of the college are given below. All students are responsible for knowing and following the provisions set forth in this catalog. Any questions concerning those provisions are to be directed to the college office. The college cannot assume responsibility for problems resulting from a student’s failure to follow the policies stated in the catalog or from misadvice given by someone other than a staff member of the college. Similarly, students are responsible for all deadlines, rules, and regulations stated in the Schedule of Courses.

Advising and Records

All business students receive their academic counseling from a staff of advisors in the Office of the Dean. During the semester, advisers are available Monday through Friday from 9 to 11:30 a.m. and 1:00 to 3:00 p.m. During preregistration and registration periods, the advisers are available at the registration area. Individual advising and scheduling is not possible during registration periods. Advisement and scheduling assistance should be obtained throughout the semester.

Students may look at their progress sheets any time during advising hours, and a copy will be provided upon student request.

Students are encouraged to discuss with the faculty of the college the various majors available as well as career opportunities.

Attendance Regulations

Classroom attendance is left to the discretion of the instructor. Students are responsible for determining each instructor’s policy on attendance.

Standards of Performance

Students are held to basic standards of performance established for their classes with respect to attendance, active participation in course work, promptness in completion of assignments, correct English usage both in writing and in speech, accuracy in calculations, and general quality of scholastic workmanship.

In general, examinations are required in all courses and for all students, including seniors.

To be in good standing, students must have an overall grade-point average of not less than 2.0 (C = 2.0) for all course work attempted and a 2.0 for all business courses attempted. This applies to work taken at all University campuses. Physical education activity courses and remedial course work are not included in the overall average.

When semester grades become available, students below the acceptable standard will be notified of (1) probationary status or (2) suspension. Students are
responsible for being aware of their academic standing at all times and late grades and/or notification does not waive this responsibility. College rules governing probation and suspension are as follows:

1. Any student whose overall grade average or business course average is less than a 2.0 shall be placed on probation immediately. A student may be removed from probation when the overall average and the business average have been raised to 2.0.

2. A student shall remain on probation as long as the student maintains normal degree progress each semester as determined by the college and obtains no grade below a C; such probationary status may continue for a maximum of four regular semesters, provided these provisions have been met. Failure to meet these provisions will result in indefinite suspension.

3. Indefinitely suspended students may attend the University of Colorado summer school in order to improve their grade average in the area of deficiency, but may not attend any division of the University for at least two regular (fall and spring) semesters.

4. A student who has been under indefinite suspension for two semesters may apply for readmission to the College of Business and Administration. If the student is readmitted, that readmission will be on a probationary status. After being readmitted under such probationary status, any student who fails to comply with the requirements of the probation will be subject to permanent suspension.

5. Any student who is placed on suspension more than once will be permanently suspended from the College of Business.

6. Any student earning all failing grades or no academic credit for the semester will not be permitted to register without the dean's approval.

7. Official combined-degree students are required to maintain the same standards of performance as College of Business students in order to be continued in the combined business program.

Credit

To receive credit, all courses must be listed on the student's dean's page by the Office of Admissions and Records. Credit is then evaluated by the College of Business to determine degree acceptability.

Courses completed at any University of Colorado campus are credited toward degree requirements, if appropriate to the degree program.

TRANSFER CREDIT

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. Transfer work from regionally unaccredited institutions will not apply. In general, the college will limit transfer credit for business courses taken at a lower division level to such courses as the college offers at that level.

Actual equivalent courses usually may be substituted for required courses. However, students must verify with advisers that courses are equivalent. Careful checking is required. A course given at another institution may have the same name and same textbook as a required business course and still be taught with a nonbusiness emphasis or other variations that gives it little value for business.

Business students desiring to take work at another institution or another campus of the University of Colorado and apply the work toward the B.S. degree in business must have prior approval of the College of Business. Generally, only elective credit is acceptable in transfer from other institutions once the student has enrolled in the college.

All courses in the area of emphasis must be taken at the University of Colorado unless written approval is given by the appropriate division head. Transfer students must take 30 hours of business courses in residency after admission to the College of Business. For a detailed explanation of transfer credit, see the General Information section.

CORRESPONDENCE CREDIT

Only 30 semester hours of credit, 9 of which may be in business, taken through correspondence study will be counted toward the B.S. degree in business. Required business courses and area of emphasis courses cannot be taken by correspondence. All correspondence courses are evaluated to determine their acceptability.

CREDIT BY EXAMINATION

Advanced Placement (CEEB). For students who make scores of 3, 4, or 5, college credit will be given where appropriate.

College Level Examination credits (CLEP) are acceptable toward degree requirements up to 30 hours. Specific information is available in the Office of the Dean, Room 230.

CLEP credit will be applied in the same manner as transfer credits. For credit, students must rank in the 66.7 percentile based on national available norms. Generally, CLEP credit is only appropriate for (a) prebusiness requirements and (b) nonbusiness electives. A maximum of 6 hours of credit in any one course area is allowed. CLEP may not be used in course areas where credit has already been awarded. General Examinations are not acceptable.

Credit for CLEP subject examinations must have prior approval in writing by the Office of Undergraduate Studies.

ROTC CREDIT

Students who are enrolled in and complete the ROTC program may apply a maximum of 12 semester hours of advanced ROTC credit toward nonbusiness elective requirements and toward the 120-semester hour total degree requirement for the B.S. degree in business. No credit toward degree requirements is granted for basic (freshman and sophomore) ROTC courses. The ROTC adviser can provide more detailed information.

SPECIAL SOURCES OF CREDIT

The college reserves the discretion of accepting or rejecting all special sources of credit which do not have prior approval of the dean. A maximum of 6 hours of
theory physical education, recreation, or dance credits can be accepted toward graduation.

Up to 6 hours of experimental studies or independent study programs can be accepted toward graduation. A maximum of 3 hours of this type of credit may be taken in any one semester.

Independent Study Credit. Junior or senior business students desiring to work beyond regular business course coverage may take variable credit courses (1-3 semester hours) under the direction of an instructor who approves the project, but the student must have prior approval of the Dean.

Information and request forms are available in the Office of Undergraduate Studies.

To receive credit for independent study and experimental studies courses, students should obtain the dean’s approval prior to registering for the courses. Further information and forms are available in the Office of Undergraduate Studies.

No credit is given for work experience or cooperative education programs.

STUDY ABROAD CREDIT

Transfer credit from study abroad programs is applied as nonbusiness elective credit. Students planning to attend study abroad programs should meet with a College of Business adviser, Business Building Room 230, and have their selections of classes approved before leaving campus. Information on the various study abroad programs is available at the Office of International Education.

NO CREDIT

Because of space limitations, business classes may not be taken on a no credit basis.

Adding and Dropping Courses

See the General Information section for University-wide Drop/Add policy.

Administrative Drop. Instructors may recommend to the Office of Undergraduate Studies that students who fail to meet expected course attendance or pre-requisites be dropped from the courses.

Withdrawal

Students may withdraw without discredit at any time prior to the start of the final examination period.

Students who leave the University before the end of the semester should obtain a Withdrawal Form from the dean’s office and follow the instructions on the form. The completed form must be turned in to the Office of Admissions and Records, Regent Administrative Center.

Students who withdraw during the semester are not assured admission the following semester but will be considered on an individual basis, according to the space available.

Registration for Business Courses

Students may register only for those courses for which they have the stated prerequisite training. Junior standing is required for all business courses numbered 300-499. Priority is given to students officially in the business program.

Scholastic Load

The normal scholastic load of an undergraduate in business is 15 semester hours with a maximum of 17 hours during the fall/spring semesters. A maximum of 6 hours may be taken during a five-week summer session with not more than 12 hours total during the ten-week summer session.

Grading and Point System

See the General Information section for University-wide grading system and pass/fail policy.

Students in the college may not use courses taken on a pass/fail basis to satisfy required business or nonbusiness courses, or business elective courses. Nonbusiness electives only may be taken on a pass/fail basis. A maximum of 16 hours of pass/fail credit may be applied toward the B.S. degree in business; transfer students may take 1 hour of pass/fail for every 8 hours 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 may be repeated, but the F will be included in the grade-point average.

UNDERGRADUATE DEGREE PROGRAMS

Admission of Freshman Students

See General Information section for information and application procedures.

Prospective students in business are encouraged to pursue a broad college preparatory program in high school, with particular emphasis on English, mathematics, the social sciences, and speech.

Candidates for the Bachelor of Science (Business) degree normally enter as freshmen.

The college expects entering freshmen to present 15 units of the secondary course work. Completion of two units of algebra and two units of English composition is strongly recommended.

Intrauniversity Transfer

The largest single group of students admitted to the College of Business each year is the intrauniversity transfer classification. An undergraduate student who is enrolled on the Boulder Campus of the University and who wishes to transfer to the College of Business may submit a completed Intrauniversity Transfer Application to the college upon completion of at least 15 semester hours of graded course work at the University of Colorado. October 1 is the deadline for spring admission and March 1 for fall admission. 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.

Combined Programs and Double Majors

Official combined programs are available only in conjunction with the College of Engineering, the Col-
lege of Environmental Design, the School of Journalism, and the School of Pharmacy. Combined and double degree programs require approval of the deans of both colleges. Before a combined degree student will be admitted to courses in the College of Business, the student must obtain permission and complete an application for admission form from the College of Business. Failure to do so may preclude the student from taking any business course. Students enrolled in other colleges which require business courses as a part of their curricula will be admitted to business classes on a space available basis.

Requirements for the B.S. (Business Degree)

The student alone is responsible for the fulfillment of these requirements. Questions concerning graduation should be directed to the College Office of Undergraduate Studies (Room 230).

Students must file an Intent to Graduate Form with the dean's office and have a senior audit before registering for their last semester.

GENERAL REQUIREMENTS

The Bachelor of Science (Business) degree requires:

1. Total Credits. A minimum of 120 acceptable semester hours of credit, of which at least 54 hours must be in nonbusiness courses (including 9 hours of upper division work) and at least 51 hours in business courses. The remaining 15 hours may be in either.

This credit cannot include remedial work, repetition of courses, courses failed, activity physical education, recreation, and dance courses. However, a minimum of 6 hours of theory physical education, recreation, and/or dance may be used. Advanced ROTC work is acceptable only if the ROTC program is completed.

A maximum of 60 semester hours taken at junior colleges may be applied toward the B.S. degree in business.

The student is responsible for having incomplete grades removed four weeks prior to graduation.

2. Residence. Completion of at least 30 semester hours in business, usually in the senior year, after admission to the College of Business, and to include the 12 hours in the area of emphasis.

3. Grade Average. A minimum scholastic grade average of 2.0 (C) for all courses attempted at the University acceptable toward the B.S. (Business) degree, 2.0 for all business courses, and 2.0 in the four required areas of emphasis courses.

DEGREE PROGRAM

The following sequence of courses is a guide to registration.

Freshman Year                     Semester Hours
A.S. 100, 102, 104, 106. Composition ........................................... 3
Comm. 101, 102, 203, 215. Communication ........................................ 3
Math. 107 and 108. Mathematics* ..................................................... 6
P.Sc. 100. American Government and 3-hr. 100-300 level P.Sc. .......... 6
Soc. 211, 119, 191, 250. Introductory Sociology or Anth. 104 ...... 3
Natural science* .................................................................................. 6
Nonbusiness electives ........................................................................ 3

Sophomore Year
Econ. 201, 202. Macro/Micro Economics ........................................... 6
Psy. 100. General Psychology ................................................................. 3
Socio-humanistic elective ................................................................... 3
B.A. 200. Business Information and the Computer .............................. 3
Q.M. 201. Business Statistics ............................................................... 3
Nonbusiness electives .......................................................................... 9

Junior Year
B.A. 300, 302, Business Law ............................................................... 3
Wx. 300, Principles of Marketing ........................................................ 3
Fin. 306. Basic Finance .......................................................................... 3
Or Mg. 330. Introduction to Management and Organization .......... 3
Pr. Mg. 309. Production and Operations Management .................. 3
Nonbusiness electives .......................................................................... 3
Business electives .............................................................................. 12
Either business or nonbusiness electives .......................................... 6

Senior Year
B.A. 350 or 450, Business Policy ......................................................... 3
B.A. 411, Business and Society or B.A. 410, Business and Government .. 3
Area of emphasis .................................................................................. 12
Business electives .............................................................................. 3
Either business or nonbusiness electives .......................................... 9

AREA OF EMPHASIS

Each candidate for the B.S. (Business) degree must complete the prescribed courses in an area of emphasis comprising 12 semester hours taken at the University of Colorado. A 2.0 average is required for the four required area courses.

Although only one area of emphasis will be listed on the student's official records, students so desiring may accomplish the effect of a dual area of emphasis by careful selection of courses.

Accounting

Accounting courses are offered in several fields of professional accountancy at the intermediate, advanced, and graduate levels. They provide preparation for practice in one or more of the following fields:

- Financial accounting
- Tax accounting
- Auditing
- Data processing and control systems
- Managerial accounting
- Teaching and research
- Accounting

In all of these fields a thorough knowledge of the social, legal, economic, and political environment is needed. A high degree of analytical ability and communication skill is indispensable. Courses in English composition, speech, and ethics and logic are desirable. Courses in statistics and information systems, beyond the required College of Business core courses, are highly recommended.

The undergraduate area of emphasis in accounting consists of 12 hours beyond Acct. 200 and 202:

*Math. 107 and 108 hours of college level calculus are required. There are no substitutions for Math. 107. However, Math. 105, 106, or 107 will satisfy the calculus requirement.

**Includes junior college credit in statistics, physical, biology, chemistry, physics, and geography, social science, and natural science, 101, 102, 103.
Information Science

The information science area is designed for those who wish to prepare themselves for careers as professional administrative data processing managers in business and government. The student develops those technical skills and administrative insights required for the analysis of information systems, the design and implementation of systems, and the management of data processing operations. The emphasis is on management information systems—systems for the collection, organization, accessing, and analysis of information for the planning and control of operations. The automation of data processing is also studied extensively.

The undergraduate area of emphasis consists of 12 hours beyond B.Ad. 200 and Q.M. 201, and I.S. 215.

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<thead>
<tr>
<th>Required Courses: (12 Hours)</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>I.S. 350. Database and Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>I.S. 465. Systems Analysis and Design</td>
<td>3</td>
</tr>
<tr>
<td>I.S. 470. Computerware</td>
<td>3</td>
</tr>
</tbody>
</table>

International Business

In recent years, companies have completely re-oriented their thinking, planning, and operations to capitalize on the opportunities offered in the world marketplace. Every phase of business operation is affected by this reorientation, and individuals who offer the appropriate skills, training, and orientation are in great demand.

The program reflects the basic principle that effectiveness in international business is based on a thorough training in business administration. The international business program provides the opportunity to build on these skills.

Other courses emphasizing international affairs may be elected from the following departments: anthropology, economics, geography, history, political science, psychology, and sociology.

Students should note that B.Ad. 440 is offered only in the spring semester and the prerequisite is 6 hours of the required courses.

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ. 441. International Trade</td>
<td>3</td>
</tr>
<tr>
<td>plus three of the following courses:</td>
<td></td>
</tr>
<tr>
<td>B.Ad. 440. International Business Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Fin. 440. International Financial Management</td>
<td>3</td>
</tr>
<tr>
<td>Tr.Mg. 458. International Transportation</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 450. International Marketing</td>
<td>3</td>
</tr>
</tbody>
</table>

A second area of emphasis in business is highly recommended. The course requirements for the second area can be included as part of the business and free elective hours. Foreign language study is also recommended.

It is important for students who expect to be involved in international business to have an understanding of international relations, which may be gained in study abroad programs. Information on study abroad programs may be obtained from the Office of International Education. The College of Business will evaluate credit earned in such programs and determine degree acceptability.
Marketing

Marketing is concerned with analyzing the market for a product or service, planning and developing that product, determining the most appropriate distribution channels, pricing the product, and promoting it. The administrative policies and practices of any well-managed firm should be marketing-oriented toward the consumer.

The career opportunities in marketing reflect the businessman’s awareness of the importance of this field. Today many individuals are rising to top executive positions by the marketing route. There are more executive and other job opportunities for women in the marketing field than in any other single area outside teaching or secretarial work. One out of every four people gainfully employed in this country is in a marketing position.

Career opportunities abound in personal selling, advertising, sales management, marketing research, retailing, wholesaling, marketing by manufacturers, international marketing, etc.

Required Courses Semester Hours
Mk. 330. Marketing Research ............................................. 3
Marketing electives (beyond Mk. 300) ................................ 9

Students should note that the required course, Mk. 330, is not offered during the summer session.

Minerals Land Management

A student who plans to complete an area of emphasis in minerals land management should consult with the following outline in regard to courses, hours, restrictions, and options. These are in addition to the required core courses and nonbusiness courses. No required courses (business or nonbusiness) may be taken pass/fail.

Specific Required Courses Semester Hours
Geol. 101. Introduction to Geology ..................................... 4
Chem. 101 or 103. General Chemistry .................................. 4
Geol. 102. Introduction to Geology or
Geol. 103. Geological Development of Colorado and the West .................................................. 4

Course Options in Geology and Geography

A minimum of 7 hours of the following geology or geography courses taken in combination with the courses listed above. A minimum of 5 hours of geology must be included in the 7 hours.

Geol. 370. Environmental Geology .................................. 3
Geol. 404. Geohydrology .................................................. 3
Geol. 463. Principles of Geomorphology ............................ 4
Geol. 483. Introduction to Geophysical Prospecting .......... 4
Geol. 494. Mineral Resources and World Affairs ............. 3
Geog. 305. Map Interpretation ......................................... 5
Geog. 408. Geographic Interpretation of Aerial Photos .......... 3
Geog. 495. Natural Catastrophes and Geologic Hazards ......... 3
Geol. 436. Glacial Geology ............................................. 3

College of Business Courses

R.E. 390. Principles of Real Estate .................................... 3
Acct. 302. Managerial Accounting ..................................... 3
Acct. 441. Income Tax Accounting ..................................... 3

Area of Emphasis Courses—College of Business

The following courses comprise the area of emphasis:

Fin. 401. Business Finance I ............................................. 3
R.E. 473. Legal Aspects of Real Estate Transactions .......... 3
M.L.M. 485. Minerals Landman Administration .............. 3
M.L.M. 496. Oil-Gas and Mineral Law ............................. 3

Minerals Landman Administration and Oil-Gas and Mineral Law are given only once a year. These two courses are to be taken after all lower division requirements have been completed and the completion of 90 semester hours of work toward the M.L.M. major. These courses are open only to students who are regularly enrolled in the College of Business and Administration.

Suggested electives

R.E. 430. Residential and Income Property Appraising .... 3
Econ. 476, 478. Economics ............................................. 6
B.Law 412. Business Law ................................................. 3
C.E. 221. Plane Surveying ............................................. 3
C.E. 325. Photogrammetry and Contour Surveys ............. 3
I.S. 215. Data Processing ................................................. 3
I.S. 350. Database and Information Systems .................. 3

Organization Management

The organization management curriculum provides the foundation for careers in supervision and general management in a wide variety of organizations. It develops understanding and skill in management practice. The emphasis is on combining both the human resources and the appropriate operations technologies into productive organizations.

Required Courses Semester Hours

(The following two courses)
Or. Mg. 335. Managing Individuals and Work Groups ........ 3
Or. Mg. 457. Managing Complex Organizations ............... 3

(At least one of the following)
PHR 434. Labor and Employee Relations ......................... 3
PHR 485. Personnel Administration: Employment ............. 3

(At least one of the following)
Pr. Mg. 440. Planning and Control Systems 
- in Production and Operations Management .................. 3
Pr. Mg. 450. Transportation Operation and Management .... 3
PHR 455. Personnel Administration: Legal and Social Issues 3
PHR 441. Personnel Administration: Planning, Development and Compensation ........................................... 3
Pr. Mg. 444. Work Design, Measurement and Productivity Management ......................................................... 3
Pr. Mg. 447. Policy Analysis in Production 
and Operations Management ........................................... 3
Pr. Mg. 460. Purchasing and Materials Management ......... 3
B.A.S. 470. Small Business—Management and Operation .... 3

Personnel-Human Resources Management

Personnel-human resources management offers opportunities for students to develop professional competence in the areas of personnel administration and labor relations. Students gain understanding and skill in developing and implementing personnel systems including recruitment, selection, evaluation, training and motivation of employees, and union-management relations.

Required Courses Semester Hours

(The following four courses)
PHR 434. Labor and Employee Relations ......................... 3
PHR 485. Personnel Administration: Employment ............. 3
Public Agency Administration

Public agency administration is designed for a career in management of governmental or other nonprofit service organizations. The curriculum in public agency administration provides a foundation of core courses upon which the student can construct an area of emphasis which will focus on the type of service organization he desires to enter upon graduation.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acct. 480. Business and Governmental Budgeting and Control</td>
<td>3</td>
</tr>
<tr>
<td>PHR 433. Personnel Administration: Employment</td>
<td>3</td>
</tr>
<tr>
<td>Q.M. 401. Principles of Office Management</td>
<td>3</td>
</tr>
<tr>
<td>Q.M. 530. Operations Research</td>
<td>3</td>
</tr>
</tbody>
</table>

Real Estate

Real estate requires knowledge of real estate investments, urban land economics, real estate law, appraising, finance, taxes, management, sales, and accounting. Real estate is one segment of the economy where it is still possible for persons to be their own boss whether brokers, appraisers, developers, syndicators, or property managers.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>R.E. 300. Principles of Real Estate Practice</td>
<td>3</td>
</tr>
<tr>
<td>R.E. 430. Real Estate and Income Property</td>
<td>3</td>
</tr>
<tr>
<td>R.E. 464. Real Estate Finance</td>
<td>3</td>
</tr>
<tr>
<td>R.E. 473. Legal Aspects of Real Estate Transactions</td>
<td>3</td>
</tr>
<tr>
<td>R.E. 491. Property Development or R.E. 435. Real Estate Investments</td>
<td>3</td>
</tr>
</tbody>
</table>

It is strongly recommended that any student planning to sit for the Colorado broker's examination take all six of the real estate courses. Additional preparatory courses for a real estate career are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch.E. 240. Building Construction</td>
<td>3</td>
</tr>
<tr>
<td>M.L.M. 486. Minerals Landsman Administration</td>
<td>3</td>
</tr>
<tr>
<td>Fin. 441. Income Tax Accounting</td>
<td>3</td>
</tr>
<tr>
<td>Acct. 441. Income Tax Accounting</td>
<td>3</td>
</tr>
<tr>
<td>Fin. 453. Investment and Portfolio Management</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 310. Salesmanship</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 320. Consumer Behavior</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 470. Sales Management</td>
<td>3</td>
</tr>
<tr>
<td>B.Ad. 470. Small Business Management and Operation</td>
<td>3</td>
</tr>
<tr>
<td>Ins. 494. Principles of Insurance</td>
<td>3</td>
</tr>
</tbody>
</table>

Students should not take Arch.E. 240 until checking that the required percentage of their courses is in business.

Small Business Management and Entrepreneurship

Small business management provides understanding, knowledge, and skills in organizing and managing small business. The emphasis is on the managerial aspects of the wide range of activities required of the entrepreneur. A second area of emphasis in business is highly recommended. The course requirements for the second area can be included as part of business or free electives.

It is recommended that students take B.Ad. 452 (Small Business Strategy, Policy and Entrepreneurship) in satisfying their business policy require-
ment. Additional courses in management, finance, accounting, and marketing should be planned in consultation with the adviser to serve individual career needs.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.ad. 470. Small Business—Management and Operation</td>
<td>3</td>
</tr>
<tr>
<td>(Two or three of the following four courses)</td>
<td></td>
</tr>
<tr>
<td>Fin. 401. Business Finance I</td>
<td>3</td>
</tr>
<tr>
<td>Acct. 332. Cost Accounting</td>
<td>3</td>
</tr>
<tr>
<td>PHR 438. Personnel Administration: Employment</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 480. Marketing Policies and Strategies</td>
<td>3</td>
</tr>
</tbody>
</table>

**Recommended Electives**

The fourth course may be selected from the following.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHR 434. Labor and Employee Relations</td>
<td>3</td>
</tr>
<tr>
<td>Pr. Mg. 440. Production and Inventory Planning and Control</td>
<td>3</td>
</tr>
<tr>
<td>Pr. Mg. 447. Policy Analysis in Production and Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>Tr. Mg. 450. Transportation Operation and Management</td>
<td>3</td>
</tr>
<tr>
<td>Pr. Mg. 450. Purchasing and Materials Management</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 485. Physical Distribution Management</td>
<td>3</td>
</tr>
<tr>
<td>O. Ad. 440. Principles of Office Management</td>
<td>3</td>
</tr>
<tr>
<td>Fin. 402. Business Finance II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Transportation and Traffic Management**

The curriculum in transportation management includes the role of transportation in society and the problems of traffic management within specific industries as well as the management of firms in the transportation industry, such as airlines, urban transit firms, trucking firms, and railroads. International transportation management problems and policies are analyzed.

One of the recommended elective courses may be substituted with the permission of the adviser for one of the required courses if there is a schedule conflict, if the course is not available, or if a student demonstrates a career need for such a course.

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Any four of the following six courses)</td>
<td></td>
</tr>
<tr>
<td>Tr. Mg. 450. Transportation Operation and Management</td>
<td>3</td>
</tr>
<tr>
<td>Tr. Mg. 452. Problems in Traffic Management</td>
<td>3</td>
</tr>
<tr>
<td>Tr. Mg. 456. Air Transportation</td>
<td>3</td>
</tr>
<tr>
<td>Tr. Mg. 457. Urban Transportation</td>
<td>3</td>
</tr>
<tr>
<td>Tr. Mg. 458. International Transportation</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 485. Physical Distribution Management</td>
<td>3</td>
</tr>
</tbody>
</table>

**Recommended Electives**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHR 434. Labor and Employee Relations</td>
<td>3</td>
</tr>
<tr>
<td>PHR 438. Personnel Administration: Employment</td>
<td>3</td>
</tr>
<tr>
<td>Tr. Mg. 451. Survey of Transportation: Law and Freight Claims</td>
<td>3</td>
</tr>
<tr>
<td>Pr. Mg. 460. Purchasing and Materials Management</td>
<td>3</td>
</tr>
<tr>
<td>B.Ad. 470. Small Business—Management and Operation</td>
<td>3</td>
</tr>
</tbody>
</table>

**Combined Programs**

Numerous career opportunities exist for persons trained in both a specialized field and management. For this reason students may be interested in combined programs of study leading to completion of degree requirements concurrently in two fields. Such combined programs have been arranged for engineering and business, pharmacy and business, environmental design and business 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. Generally, at least five years will be needed for such combined programs. No substitutions are allowed on this program.

Students desiring to transfer from combined programs to the College of Business must apply and will be considered as intra-university transfers.

For students in combined programs, the requirements for the degree in business are as follows:

1. An application for admission to the combined program, which must be filed with the College of Business and approved by the deans of both colleges.

2. Completion of at least 48 semester credits in business and economics, to include Econ. 201 and 202 (6 semester hours), required courses in business (30 semester hours), and a business area of emphasis (12 semester hours).

3. Completion of at least 30 of these semester hours at the University of Colorado while concurrently enrolled in the College of Business.

4. Completion of nonbusiness requirements in mathematics, communications, and the social and behavioral sciences in a degree program approved in advance by the College of Business. In addition, for some courses and areas of emphasis, there are prerequisite requirements which must be met.

5. At least a 2.0 grade average must be earned in all courses undertaken in the College of Business, the area of emphasis, and the University of Colorado.

6. Any combined degree student who does not make reasonable progress toward the completion of the business degree requirements, as determined by the College of Business, may be dropped from the program.

7. The number of students accepted in any combined degree program may be numerically limited and is dependent upon existing demand each semester.

Shown below is the combined engineering-business program. For other combinations, students must consult with the business dean’s office.

The requirements for all combined business and engineering programs are as follows:

**Required Nonbusiness Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phys. 111. General Physics</td>
<td>4</td>
</tr>
<tr>
<td>Math. 100-230. Analytic Geometry and Calculus</td>
<td>10</td>
</tr>
<tr>
<td>Econ. 201. Principles of Microeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 202. Principles of Macroeconomics</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 120/130/140. Introduction to Fiction/Drama/Poetry</td>
<td>6</td>
</tr>
<tr>
<td>Political science elective (100/200 level)</td>
<td>3</td>
</tr>
<tr>
<td>P. Sc. 110. The American Political System</td>
<td>3</td>
</tr>
<tr>
<td>Psy. 100. General Psychology</td>
<td>3</td>
</tr>
<tr>
<td>Socio-humanistic elective selected from business list</td>
<td>3</td>
</tr>
</tbody>
</table>

**Required Business Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acct. 200. Introduction to Financial Accounting</td>
<td>3</td>
</tr>
<tr>
<td>B.ad. 200. Business Information and the Computer</td>
<td>3</td>
</tr>
<tr>
<td>Q. M. 201. Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 300. Principles of Marketing</td>
<td>3</td>
</tr>
<tr>
<td>Fin. 300. Basic Finance</td>
<td>3</td>
</tr>
<tr>
<td>Pr. Mg. 300. Production and Operations Management</td>
<td>3</td>
</tr>
<tr>
<td>Or. Mg. 330. Introduction to Management and Organization</td>
<td>3</td>
</tr>
<tr>
<td>B. Law 300. Business Law</td>
<td>3</td>
</tr>
</tbody>
</table>
GRADUATE DEGREE PROGRAMS

The graduate programs leading to the Master of Business Administration degree are offered through the faculty of the Graduate School of Business Administration. Graduate programs leading to the Doctor of Business Administration and Master of Science are offered through the University's Graduate School. Master's degree programs in business are accredited by the American Assembly of Collegiate Schools of Business. Daytime master's courses are offered in Boulder. Evening master's courses are offered in Denver and Colorado Springs.

Requirements for Admission—Master's Programs

Admission to the master's programs will be determined by the following criteria:

1. The applicant's academic record.
2. The applicant's scores on the Graduate Management Admission Test (GMAT). This test is given four times each year at numerous centers throughout the world. For information and to make application for the test, write to the Educational Testing Service, P.O. Box 966, Princeton, New Jersey 08541.

In general, students failing to meet minimum standards are not admitted on provisional status. Seniors in this University who have satisfied the undergraduate residence requirements and who need not more than 6 semester hours of advanced subjects and 12 credit points to meet their requirements for bachelor's degrees may be admitted to the Graduate School of Business Administration by special permission of the director of graduate studies.

Completed applications, including GMAT scores, two official transcripts from each college attended, and a $20 nonrefundable application fee should be in the Office of Graduate Studies, Graduate School of Business Administration, by March 1 for summer, by April 1 for fall admission, and by October 1 for spring admission or until quote is filled. Applications received after these dates will receive lower priority.

Personal interviews are not required or encouraged.

BACKGROUND REQUIREMENTS

Students applying for graduate programs in business need not have taken their undergraduate degrees in business. For those students the M.B.A. or M.S. degree programs provide a series of 3-semester-hour fundamental background courses. These include: B.Ad.

Semester Hours

Introduction to Accounting (Financial/Managerial) .................. 6
Statistics ................................ by qualifying examination only
Principles of Marketing ............................................. 3
Introduction to Management and Organization ......................... 3
Finance ............................................................... 3
Business Law ......................................................... 3
Operations Research .................................................. 3
Principles of Economics (Macro/Micro) ............................... 6
Remedial work is required of all applicants accepted for the M.B.A. and M.S. programs who do not have the mathematical and programming skills.

Students entering any of the graduate programs are required to take either B.Ad. 502 (Fundamentals of Business Statistics) or to pass satisfactorily a qualifying examination covering this subject matter.

Master of Business Administration

The Master of Business Administration program is devoted to the concepts, analytical tools, and communication skills required for competent and responsible administration. The administration of an enterprise is viewed in its entirety and within its social, political, and economic environment.

In addition to the background requirements for a master's degree listed above, the candidate for the M.B.A. degree must complete the specific requirements of the M.B.A. curriculum (30 semester hours) as follows:

CORE REQUIREMENTS

a. Functional Courses

Two of the following four functional courses are required:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A. 600</td>
<td>Finance (Fin.)</td>
<td>3</td>
</tr>
<tr>
<td>B.A. 610</td>
<td>Marketing (Mark.)</td>
<td>3</td>
</tr>
<tr>
<td>B.A. 620</td>
<td>Logistics (Logistics)</td>
<td>3</td>
</tr>
<tr>
<td>B.A. 630</td>
<td>Economics (Econ.)</td>
<td>3</td>
</tr>
</tbody>
</table>

b. Business and Its Environment

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A. 610</td>
<td>Business, Government, and Society</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A. 613</td>
<td>Business and Economic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>B.A. 620</td>
<td>Administrative Accounting</td>
<td>3</td>
</tr>
<tr>
<td>(Accounting students should substitute Acc. 533)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A. 640</td>
<td>Organizational Behavior</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.A. 650</td>
<td>Administrative Policy</td>
<td>3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AREA OF EMPHASIS</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
</tr>
</tbody>
</table>
Areas of emphasis include accounting, finance, management science, marketing, office administration, organization management, personnel management, production and operations management, and transportation management.

For students taking an area of emphasis in accounting, Acct. 322, 323, and 332 or their equivalent are prerequisites for all graduate-level accounting courses. Acct. 333 is substituted for B.Ad. 620. Acct. 628 and two other graduate-level accounting courses are required in the area of emphasis.

Requirements for an area of emphasis in finance are Fin. 601, 602, and either Fin. 633 or 655.

Requirements for an area of emphasis in marketing are Mk. 600, 605, and one additional graduate marketing course. Candidates pursuing their area of emphasis in management science normally elect either a decision science option or an information science option. Those electing the decision science option will be required to take Mg.Sc. 601, 602, and Q.M. 520. Those electing the information science option will be required to take I.S. 645, 650, and either I.S. 565 or 570.

Students taking other areas of emphasis should consult the division head concerning the requirements.

No thesis is required in the M.B.A. program. In the total program there must be a minimum of 30 semester hours of graduate course work and a minimum of 24 semester hours of course work at the 600 level. Independent study is normally not acceptable for credit in the final 30 semester hours of the M.B.A. program.

**Master of Science**

The Master of Science degree affords opportunity for specialization and depth of training within a particular major field and a related minor field.

**MAJOR FIELDS**

For detailed information concerning requirements and recommended programs for each of the major fields, students should consult the following professors:

- Accounting: Professor Jensen
- Finance: Professor Melcher
- Management science and information systems: Professor Plane
- Marketing: Professor Cates
- Management and organization: Professor Beatty

**MINOR FIELDS**

With the approval of the student's adviser and the director of graduate studies, minor fields may be chosen from business subjects, or from other graduate departments.

Fields available in the College of Business for selection as a minor are:

- Accounting Personnel-human
- Finance Resources management
- Management science Production and operations
- and information systems management
- Marketing Transportation management
- Organization management

**MINIMUM REQUIREMENTS**

The minimum requirements for the M.S. degree, after all undergraduate background deficiencies have been removed, may be met by Plan I or Plan II.

The student's degree program should have approval in advance by the advisory committee and the director of graduate studies.

**Plan I.** The requirement is 30 semester hours of graduate credit including a thesis (4 to 6 hours credit) based upon original research by the candidate. A minimum of 21 semester hours credit is required of all candidates and, including the thesis, must be earned in a major field. Not fewer than three courses, normally 9 semester hours, but not fewer than 6, must be completed in a minor field. A minimum of 16 hours must be at the 600 level.

**Plan II.** A minimum of 30 semester hours of graduate-level course work must be completed. Requirements must be met in both a major and a minor field. No thesis is required. Of the 30 semester hours of graduate-level course work, a minimum of 16 hours must be at the 600 level.

All M.S. students must pass written comprehensive examinations covering major and minor fields during the last semester they are enrolled. The candidate's committee may require an oral final comprehensive examination subsequent to the written examination.

**General Information—Master’s Programs**

The M.B.A. program is a two-year curriculum with the possibility of waiver, for properly prepared students, of all or part of the first year. The student must request course exemption and should be prepared to support the request for waiver. Up to 25 credit hours (first-year program) of course work may be waived.

**Advising.** All graduate students should report first to the graduate student adviser in the Office of Graduate Studies for the purpose of ascertaining deficiencies and principal field of interest. The division heads of each area serve as faculty advisers.

During the first term of residence, each student should prepare a degree plan. This plan, with appropriate signatures, should be filed in the Office of Graduate Studies.

**Course Load.** The normal course load for graduate students is 12-15 semester hours.

**Minimum Hours Required.** A candidate for a master's degree in business must complete a minimum of 30 semester hours of graduate work plus any deficiencies. A maximum of 6 semester hours of graduate work can be transferred from another AACSB accredited master's program.

**Comprehensive Examination.** A comprehensive examination is not required for students pursuing the Master of Business Administration degree program. Each candidate for a Master of Science degree is required to take a comprehensive-final examination after the other requirements for the degree have been completed. This examination is given near the end of the candidate's last semester of residence. Students must be registered when they take this examination. Comprehensive examinations are given in November, April, and July.

**Minimum Grade-Point Average.** A minimum cumulative grade-point average of 3.0 must be achieved in courses taken after the student's admission to the graduate program. Effective fall semester 1974
all courses taken as a special student at the University of Colorado count towards the overall grade-point average for students who are later admitted to any graduate program in business. If the cumulative grade-point average falls below 3.0, a student will be placed on academic probation and given one regular semester (summer terms excluded) in which to achieve the required 3.0 cumulative average. Failure to achieve the required average within the allotted time period will result in dismissal.

Work receiving the lowest passing grade, D, may not be counted toward a degree, nor may it be accepted for the removal of deficiencies. A student may repeat a course once for which he or she has received a grade of D or F. Both the original grade and the grade for the repeated course count in the computation of the grade-point average.

To earn a grade of W (withdrawal) in a course, a student must be earning a grade of C or better in that course. Students will not be permitted to withdraw from courses after the tenth week of the semester.

An IF grade shall be a valid grade only until the middle of the second semester (summer terms excluded) following that in which the grade of IF is given. By the end of that interval, the instructor concerned shall have turned in a final grade of A, B, C, D, or F. If no reports are received from the instructor within the allotted time the IF shall be converted to an F.

Time Limit. All work, including the comprehensive final examination, should be completed within five years. Work done earlier will not be accepted for the degree unless validated by a special examination. Candidates for the master's degree are expected to complete their work with reasonable continuity.

Doctor of Business Administration

The highest level of formal study available in business administration is afforded by the Doctor of Business Administration (D.B.A.) program. It is intended to develop both the breadth and depth of comprehension, the understanding of related disciplines, and the command of research methodology required for graduate and undergraduate university teaching for high level staff positions, and for extension of knowledge in these fields. The positions for which a D.B.A. program helps prepare the student demand the highest level of excellence in intellectual attainment. The requirements of the program are therefore severe and the standards exacting.

Field requirements for the D.B.A. degree at the University of Colorado are broadly conceived and designed to encourage study in the cognate disciplines. Candidates' degree programs are prepared in detail after a careful review of their career objectives and a thorough appraisal of their preparation.

REQUIREMENTS FOR ADMISSION—D.B.A. PROGRAM

To preserve the individualized character of the D.B.A. program and its quality goals, the number of candidates is closely limited, and candidates are admitted only after careful screening.

The graduate committee of the school, in reviewing applications, will consider:

1. The applicant's undergraduate and graduate academic records.
2. The applicant's scores on the Graduate Management Admission Test. For information and to make application for the test, write to the Educational Testing Service, P.O. Box 986, Princeton, New Jersey 08541.
3. Recommendations from not fewer than three persons qualified to advise the committee concerning the applicant's capacity for doctoral study and research.
4. Information obtained from the applicant concerning his or her career objectives.

Students are admitted for study in specific major fields for doctoral work.

REQUIREMENTS FOR DEGREE—D.B.A. PROGRAM

Students in the doctoral degree program must fulfill the following requirements:

Prerequisites. Completion of the graduate fundamentals courses for the M.B.A. program as outlined in this catalog.

Advising. The newly accepted D.B.A. student should counsel with division heads in the various disciplines to determine a major field. Assignments of faculty members working with doctoral students on their programs must be decided upon by the end of the first semester. This is to be coordinated with the division head and the associate dean for Graduate Studies. The committee shall include two members from the student's dissertation field and at least one member from each other field of specialization, with one faculty member, normally from the dissertation field, to act as chairman of the Advisory Committee. The student shall obtain the signatures of the members of the committee (thereby signifying their willingness to act) on the appropriate forms, one copy to be given to the chairman of the Advisory Committee, and the other to the Office of Graduate Studies.

At the end of the first term of residency, each student should prepare, with the approval of the Advisory Committee, a degree plan. The signatures of the division department) heads of the dissertation field and other field(s) will be required on all degree plans and applications for candidacy for D.B.A. students. The signature of the division head of the dissertation field signifies the approval of the entire degree plan. The plan with appropriate signatures should be filed in the Office of Graduate Studies.

Qualifying Examinations usually in the form of faculty interviews, are normally given prior to enrollment in the program, or during the first two months. These examinations are given in the student's major area for the purposes of insuring the candidate's qualifications, progress, and needs in the program. The results of the examination will be used to advise and qualify the candidate for further work at the doctoral level.

Fields of Study. Preparation in two or more fields of study, including:

1. One of the following fields in business, which must be the dissertation area:
2. One or more other fields, which may be in the above business fields or an approved and related field outside the College of Business and Administration.

Analytical and Conceptual Tools. Demonstration of the required level of competence in:
1. Quantitative analysis for business decisions. Students must demonstrate competence in mathematical and statistical processes as applied to business decision making. Minimum competence in quantitative analysis will normally be gained by completing B.Ad. 502, B.Ad. 507, and Q.M. 620.
2. Microeconomic and macroeconomic theory: at least one course each in intermediate microeconomic and macroeconomic theory (Econ. 407 and 408), one graduate-level course in economics to be approved by the student's advisory committee, and a course in business conditions (B.Ad. 560).
3. Dissertation research methodology: (B.Ad. 790, Doctoral Seminar in Dissertation Research, and the research internship would be expected to provide this competence).

Research Internship. Doctoral students are required to participate in a research internship under the direction of a faculty member. The research internship is decided upon with the student's program committee. At the end of each of these research internships, a research paper is presented to the faculty member and to all faculty members in the area of emphasis of the doctoral candidate.

Credit by Transfer. Resident graduate work of high quality earned in another institution of approved standing will not be accepted for transfer to apply on the doctorate until after the student has established in the Graduate School a satisfactory record in residence. However, such credit must be transferred before the student makes application for admission to candidacy for the degree. Such transfer will not reduce the minimum residence requirement at this University, but it may reduce the amount of work to be done in formal courses.

Requests for transfer of credit to be applied toward an advanced degree must be made on the form specified for this purpose and submitted to the Graduate School.

The maximum amount of work which may be transferred to this University for the D.B.A. degree is 10 semester hours.

Residence. The minimum residence requirement is six semesters of scholarly work beyond the attainment of an acceptable bachelor's degree. As the word is used here, residence is not limited to, or defined as, mere attendance in campus classes. Residence may be earned for course work completed with distinction, for participation in seminars, and for scholarly research performed on campus or elsewhere under the auspices of the University of Colorado.

Not more than two semesters of residence credit toward a D.B.A. degree may be allowed for an acceptable master's degree.

All students in the doctoral program are expected to be full-time students on the Boulder campus (at least during residency and prior to completing comprehensive examinations). Courses at the 600 level or above are expected to be taken on the Boulder campus. Doctoral students are expected to be available to participate in colloquia and other informal academic discussions. One year of residency must include two consecutive academic (not summer) semesters on the Boulder campus, the timing to be determined by the student's program committee.

Course Load. During each semester in one academic year a student must carry a minimum course load of 8 semester hours. Each semester's work must include at least three courses on the Boulder Campus. (This academic year normally will satisfy two full semesters of residence credit.) During this academic year the student's total nonstudy work load of any kind, on-campus or off-campus, must not exceed half time.

Minimum Grade-Point Average. It is expected that high standards of academic excellence (a minimum grade-point average of 3.3) will be maintained in all work undertaken.

To drop a course without discredit a graduate student must be earning a grade of C or better in that course.

It is recommended that all students be employed in a teaching or research capacity in the College of Business and Administration or the Graduate School of Business Administration. Doctoral students are not encouraged to be employed elsewhere during full-time residency.

Admission to Degree Candidacy. A student must make formal application for admission to candidacy for the D.B.A. degree on forms supplied by the Office of Graduate Studies in the first month of the semester in which the comprehensive examination is to be attempted.

Comprehensive Examination. Before admission to candidacy for the D.B.A. degree, the student must pass a comprehensive examination in the dissertation field and the other field(s) of specialization. This examination may be oral, written, or both, and will test the student's mastery of a broad field of knowledge, not merely the formal course work he has completed. The oral part of the examination is open to any member of the faculty.

The written part of the examination will be evaluated by such faculty members as determined by the division in which the field is undertaken.

The oral part of the examination shall be conducted by an examining board consisting of at least five members, and shall follow the written exam as soon as practicable. A successful candidate must receive affirmative votes from the majority of the members of the examining board. In case of failure, the examination may be attempted once more with the approval of and after a period of time determined by the examining board.

Comprehensive examinations for the D.B.A. degree will be given twice each year; in November, and April. A student may attempt the examination during the last semester of residency while still taking required courses for the degree provided satisfactory progress is being made in those courses. It is strongly recommended that

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adequate time for review be allowed. Therefore, a student might be well advised to consider taking the comprehensive during the semester following completion of all course work.

All field examinations must be attempted during one examination period and the student must be registered at the time of the examination.

Dissertation. A dissertation based upon original investigation and showing mature scholarship and critical judgment as well as competence in the use of methods and tools of research, must be written on a subject approved by the candidate's dissertation committee. The Dissertation Committee shall consist of at least three members (normally two from the dissertation field and one from the other field(s) of specialization). One member, normally from the dissertation field, will act as chairman of the Dissertation Committee. The student shall obtain the signatures of the members of the committee (thereby signifying their willingness to act) on the appropriate forms, one copy to be given to the division head and the other to the Office of Graduate Studies. Membership of the Dissertation Committee may be the same as, or different from, the membership of the student's Advisory Committee.

A student must register for a total of 30 semester hours of doctoral dissertation credit with up to 10 credits in any one semester. The specific number must be approved by the student's adviser. Not more than 10 of these credits may be obtained before the semester the student takes the comprehensive examination.

Dissertation credit does not apply toward the 30 semester hours of required credit specified in Article VII, Section 2, of the Rules of the Graduate School, and will not be included in calculating the student's grade-point average.

One formally approved, printed or typewritten copy of the dissertation and two original abstracts must be filed in the Graduate School Office at least two weeks before the date on which the degree is to be conferred. A second formally approved, printed or typewritten copy of the dissertation must be filed in the Office of Graduate Studies, Graduate School of Business Administration.

Final Examination. After the dissertation has been accepted by the Dissertation Committee, a final examination on the dissertation and related topics will be conducted. This examination will be wholly or partly oral. The oral portion will be open to anyone. The examination will be conducted by a committee of at least five members. It will consist of the candidate's Dissertation Committee and two members selected by the director of graduate studies after consultation with the chairman of the Dissertation Committee and the candidate. One person, who must be a member of the graduate faculty, shall come from the University at large. More than one dissenting vote from the Dissertation Committee will disqualify the candidate in the final examination.

Arrangements for the final examination must be made in the Office of Graduate Studies at least two weeks in advance. The examination must be scheduled no later than two weeks before the date on which the degree is to be conferred. The student must be registered at the time he attempts the final examination.

Time Limit. All work for the degree must be completed within seven years after the student is admitted to the Graduate School for the D.B.A. program. If a student fails to complete all requirements for the degree within four years of the date on which the preliminary comprehensive examination was passed, a second examination similar in extent to the first will be required before the candidate may take the final comprehensive examination. If this second examination is failed, it may be attempted once more after a period of time determined by the examining board.

Foreign Language. There is no foreign language requirement for the Doctor of Business Administration degree.
INFORMATION ABOUT THE SCHOOL

Purpose

The School of Education provides study and research opportunities for persons involved in teaching and the study of education. Through its graduate and undergraduate certification programs, it prepares teachers, administrators, educational specialists, and researchers for all levels of education. Its faculty and students participate in research efforts which develop new knowledge and understanding of the educational process. An extensive in-service program helps teachers stay abreast of new developments in the field.

Scholarships and Awards

The School of Education has some scholarships and awards for its students which are administered through the school. Graduate students in education are eligible to compete for the Graduate School Fellowships, and both graduate and undergraduate students are eligible for University-wide financial assistance. The following are available exclusively to students in education:

The Elizabeth Anne Wilson Memorial Assistantship. Awarded each year to an outstanding female graduate student with an emphasis in elementary education.

The Phi Delta Kappa Scholarship. This scholarship is awarded each year by the University of Colorado chapter of Phi Delta Kappa to an outstanding graduate student in education.

The Emery and Evelyn Fitzsimmons Stoops Scholarship is awarded yearly to an outstanding student in education. Competition for the award is automatically open to students having a 3.5 or better grade-point average.

The Harry M. Barrett Memorial Scholarship. Granted by Kappa Delta Pi and limited to seniors preparing to teach, the scholarship varies in amount from $25 to $50 per year.

Applications for these awards should be made on forms available from the Office of the Dean, Education 124, prior to March 1 of each year for the summer or academic year following that date.

Student Organizations

The Associated Students in Education is an organization which represents the undergraduate certificate-seeking student body. Its officers are elected each fall, and they serve as liaison between the students in certification programs and the Associated Students of the University of Colorado. The organization also performs vital advising and student assistance functions.

The Association of Graduate Students in Education is a similar organization for graduate students. Its officers are elected in the fall.

Advising

Undergraduate students may obtain certification and adviser information in Education 132 (Director of Teacher Education) or Education 247 (Office of Field Experience) or Education 246 (Advising Office).

Graduate students are assigned individual advisers and are required to submit a formal program of studies, approved by those advisers, before the end of the first full term of study. (Graduate students may obtain program information from the Graduate Office, Education 130, or from their advisers.)

Certification

Each state, including Colorado, requires public school teachers to be certified as a qualified teacher by its state Department of Education. Certification requirements vary from state to state and from teaching area to area.

The University of Colorado at Boulder, through the School of Education, offers course work leading to initial certification (Type A) in:

- Elementary Education
- Secondary Education
- Drama
- English
- Foreign Language (French, Spanish, German, Russian, Latin)
- Mathematics
- Science
- Social Studies
- Speech
- Elementary/Secondary (K-12)
- Art
- Health
- Music
- Physical Education

Teacher certification at the University of Colorado, while administered by the School of Education, is an all-University function. Many academic departments provide course work which supports the varied options available to the teacher in training.

Underlying the University's program of teacher certification is the assumption that all teachers should:
1. Be professionally competent.
2. Possess personal qualities essential to effective teaching.
3. Have a liberal education.
4. Know well the subjects they teach.

The objectives of the University relative to teacher education are the following:
1. To provide programs of undergraduate and graduate studies designed to develop outstanding teachers, administrators, supervisors, and guidance counselors; college teachers and administrators; and researchers.
2. To conduct and direct educational research and to engage in writing and related creative endeavors.
3. To identify and attract into the teacher education program students who possess the intellectual abilities, leadership potential, and personal qualities essential for effective teaching.
4. To cooperate with other state, regional, and federal agencies to improve educational programs.

Accreditation

The teacher certification program, both undergraduate and graduate, is fully accredited by the North Central Association of Colleges and Secondary Schools, by the National Council for the Accreditation of Teacher Education and by the Colorado Department of Education.

GENERAL INFORMATION FOR STUDENTS SEEKING TEACHER CERTIFICATION

Admission Procedures

This section applies to all students (with or without baccalaureate degrees) pursuing a teacher certification program. Students who transfer to the University of Colorado from other institutions must meet the requirements for admission as outlined in the General Information section of this catalog.

Students should be aware that quotas have been established for each area of endorsement in teacher certification; therefore, there may be times when not all students who meet minimum requirements will be admitted to the certification program. An interview often is required prior to admission. Both elementary and secondary students seeking certification will be required to pass screening examinations in prescribed areas. All students should try to complete general education requirements prior to their final year of study.

STUDENTS ENTERING OR CURRENTLY ENROLLED AT THE UNIVERSITY OF COLORADO

Students seeking certification in the School of Education must be enrolled in an undergraduate degree program in one of the colleges or schools of the University. These students should apply for admission to the Teacher Certification Program in the spring semester of their sophomore year, or at least one semester before they plan to begin professional education work. Freshmen at the University should seek advising and other orientation information at the time of entrance or shortly thereafter. Students should seek ad-

vising as soon as they become interested in a Teacher Certification Program. Members of the School of Education faculty will advise these students.

Course work for the Teacher Certification Program at both the elementary and secondary levels may be completed during the junior and senior years, or the course work may be taken in a one-year program in the senior year or as post-undergraduate work. Students generally apply for the Teacher Certification Program in the spring semester of the sophomore year; however, students may apply anytime after having completed 56 semester hours toward the undergraduate degree. Students must have applied and been accepted into the Teacher Certification Program prior to being admitted in any of the methods courses in the Elementary Teacher Certification Program or T.Ed. 412 in the Secondary Teacher Certification Program. Application forms are available in Education 247.

TRANSFER STUDENTS

Students who transfer to the University of Colorado from another accredited institution must apply for admission through normal University channels. They must enroll in a degree program in one of the colleges or schools of the University and also apply for teacher certification in the School of Education. The last 30 hours of course work for certification must be taken while the student is officially enrolled as a student in the University.

FORMER STUDENTS

Former students may reenter the University according to general University policies; however, they must apply for entry into the Teacher Certification Program. Students previously admitted in education programs must also reapply for acceptance in the present certification program.

POSTBACCALAUREATE STUDENTS SEEKING CERTIFICATION

Students who already hold a bachelor's degree and wish to qualify for certification in elementary or secondary teaching must fulfill the same requirements as undergraduate students. Students desiring institutional recommendation for certification must complete at least 30 semester hours of work at the University of Colorado, and possibly as many as 40 semester hours of work may be required. The actual number of required hours will depend on the specific kinds of courses already completed. To complete the certification requirements in one calendar year, students must apply for admission to the Teacher Certification Program no later than February of the spring semester, and all prerequisites must have been met prior to starting the academic year. The certification program involves a combination of courses at the University and off-campus educational experiences in cooperation with the public schools.

State Certification Requirements

Each state has requirements for certificating or licensing teachers. These requirements vary from state to state and change from time to time. Students who
are interested in teaching in other states should familiarize themselves with the requirements of those states so that they may plan an appropriate degree program.

TEACHER CERTIFICATION

At the undergraduate level, the School of Education offers programs leading to elementary and secondary teacher certification. Students seeking certification may apply for admission to a certification program as early as April of the sophomore year, or when eligible as explained in the following section. The School of Education awards a diploma in education to the student who completes a bachelor's degree and a certification program at the University of Colorado.

Admission Requirements for the Elementary and Secondary Certification Program

Students may obtain application forms in the Field Experience Office, Room 247, Education Building, if the following requirements have been fulfilled:
1. A minimum of 56 semester hours, including work in progress, with a grade-point average of 2.5 at the University of Colorado, or at the institution granting the degree.
2. Designation of a major or a bachelor's degree from an accredited institution.
3. Completion of approximately two-thirds of the general education requirements as specified by the student's school or college.
4. Students enrolled in schools or colleges other than the College of Arts and Sciences and those holding degrees are required to have courses in the humanities, the natural sciences, and the social sciences.

GENERAL EDUCATION REQUIREMENTS

At the University of Colorado, general education requirements for graduation may vary in the separate schools and colleges. However, all certification students, as well as students with degrees must have a minimum of 40 semester hours in general education distributed in the broad areas of learning represented by the humanities, the natural sciences, and the social sciences.

Students seeking degrees at the University of Colorado should consult, as soon as possible, with an advisor in the college or school from which they expect to graduate. For advising in the certification programs, students should consult with the appropriate subject area or elementary education adviser in the School of Education.

MAJORS IN ACADEMIC AREAS

Students enrolled at the University of Colorado, Boulder, seeking both a bachelor's degree and certification in elementary or secondary teaching must complete a subject major or area-studies major in an academic department in the school or college in which they are enrolled. The School of Education does not offer degree programs at the undergraduate level. Only 30 semester hours of course work outside the College of Arts and Sciences may count toward graduation from the College of Arts and Sciences. (Elementary certification requires approximately 32 semester hours and secondary certification requires approximately 29 semester hours in the School of Education.)

The major selected is determined by the student's interest in teaching a certain subject or instructional level. Before selecting a particular major, students should see one of the certification advisers. Secondary students need to be aware that in many subject areas the teaching major requires additional courses or more hours than the academic major. Course requirements for teaching majors in English, mathematics, science, and social studies are explained at the end of this section. The requirements for teaching majors in other secondary fields are available in the offices of the certification advisers in other schools and colleges.

PROFICIENCY AND SCREENING

1. Communication
   During the sophomore or junior year, students must enroll in and complete the course Communication Principles in Instruction (Comm. 230).
2. Language Arts, Mathematics and Reading
   - Secondary
     a. Secondary students entering the certification program must perform satisfactorily on a proficiency test in mathematics or receive credit in a college level mathematics course. This requirement must be met prior to student teaching.
     b. The examination is administered each semester in October and February. Specific times and places will be announced.
     c. Proficiency in language arts and reading is determined while students are enrolled in T.Ed. 441, 442, or 443.
3. Language Arts, Mathematics and Reading
   - Elementary
     a. Elementary students entering the certification program must perform satisfactorily on proficiency tests in language arts, mathematics, and reading. These examinations must be passed prior to enrolling in the Reading Methods course.
     b. The examinations are administered each semester in October and February. Specific times and places will be announced.

Elementary Education Requirements for Certification

GENERAL REQUIREMENTS

While meeting the general education requirements of the student's school or college, the courses selected should complement the student's major and at the same time provide a broad background in general education which meets the University and the Colorado Department of Education standards. To ensure that all elementary certification students have learning experiences in subject areas taught in Colorado public schools, all students are required to include study of certain subjects in their programs. All subjects or
courses listed below meet all or part of the College List requirements in the College of Arts and Sciences.

**Humanities**—University requires 12 semester hours
Certification requires a minimum of one semester each in English language (composition) and literature.

**Natural Sciences**—University requires 12 semester hours
Certification requires a minimum of one semester in biological science and one semester in physical science selected from the following:
- Astronomy
- Chemistry
- Geology
- Physical geography
- Physical sciences
- Physics
- Physical anthropology

**Social Science**—University requires 12 semester hours
Certification requires a minimum of one semester in two of the following:
- American history
- Anthropology
- Cultural geography
- Economics
- Political science
- Sociology
- Social science

**Mathematics**—University requires none
Certification requires a minimum of 6 hours in college mathematics (MATH 111 and 112 are recommended).

### REQUIRED PROFESSIONAL EDUCATION AND RELATED COURSES

All courses in this program, except T.Ed. 460 and 470, are open to all students. However, students not in the certification program must obtain the consent of the instructors of methods courses for admission.

- **Comm. 230-2. Communication Principles in Instruction**
- **F.A. 363-2. Art for the Elementary Teacher**
- **Mus. 320-2. Music for the Classroom Teacher**
- **P.E. 401-2. Physical Education and Health for the Elementary Teacher**
- **T.Ed. 310-2. Educational Psychology—Elementary School**
- **T.Ed. 311-2. Child Growth and Development**
- **T.Ed. 446-2. Teaching Exceptional Child in Regular Classroom**
- **T.Ed. 448-2. Methods in Elementary Language Arts**
- **T.Ed. 422. Methods in Elementary Reading**
- **T.Ed. 468-2. Children’s Literature**
- **T.Ed. 460-4. Instructional Assistant**
- **T.Ed. 470-2. Student Teaching—Elementary**

1. **T.Ed. 309-2. Social Foundations of American Education**. This course may be taken during the sophomore, junior, or senior year. Experiences with media materials and skills are included in T.Ed. 309.

2. The requirement in studies to develop knowledge and skills in the teaching of art, music, and health and physical education may be satisfied by enrolling in the following:

- **F.A. 363-2. Art for the Elementary Teacher**
- **Mus. 320-2. Music for the Classroom Teacher**
- **P.E. 401-2. Physical Education and Health for the Elementary Teacher**

3. **These courses are prerequisite or corequisite to the methods courses, T.Ed. 422, 423, 424, and 456:**

- **T.Ed. 310-2. Educational Psychology—Elementary School**
- **T.Ed. 311-2. Child Growth and Development**
- **T.Ed. 446-2. Teaching Exceptional Child in Regular Classroom**

4. **Methods Courses. These four courses may be taken during the junior or senior year, but none may be taken before admission to the certification program. Students not in the certification program must have consent of instructor.**

### FIELD EXPERIENCE PROGRAM

While enrolled in T.Ed. 310 or 311, students will be assigned to public schools to serve as teacher assistants. Students will spend at least six hours per week in elementary school classrooms. This school experience must occur prior to the student teaching semester.

The **Instructional Assistant (T.Ed. 460)** and **Student Teaching—Elementary programs (T.Ed. 470)** are senior year programs and are offered both fall and spring. The number of students to be enrolled fall or spring will be controlled.

The semester is organized in the following manner:

1. In the mornings during the first half of the semester, the students engage in a school-based experience, T.Ed. 460. During the afternoon, students are enrolled in T.Ed. 420 and 421.

2. During the second half of the semester, the students will student teach all day, T.Ed. 470.

All required professional education courses are prerequisite for the student teaching semester. Students must apply for student teaching during the semester prior to the one in which they wish to teach. Check the Field Experience Office for specific dates in October and February.

### Secondary Education Requirements for Certification

#### GENERAL EDUCATION

There are no specific general education course requirements for certification in secondary education. While meeting the general education requirements of the student’s school or college, the courses selected should complement the student’s major and at the same time provide a broad background in general education which meets the University and the Colorado Department of Education standards.

### REQUIRED PROFESSIONAL EDUCATION COURSES

The following professional education courses are required of all students:

- **T.Ed. 410-3. Foundations of American Education**
- **T.Ed. 411-3. Educational Psychology and Adolescent Development**
- **T.Ed. 412-3. Principles and Methods of Secondary Education**
- **T.Ed. 413-3. Reading Writing in Content Areas**
- **T.Ed. 446-2. Teaching Learning Disabilities in Regular Classroom**
- **T.Ed. 471-8. Student Teaching—Secondary**
- **T.Ed. 472-4. Elective Assignment—Secondary**

#### Scope and Sequence of Courses

1. **T.Ed. 410, 411, 441, and 446** are open enrollment courses and may be taken during the sophomore,
junior, or senior year, or prior to admission to the Teacher Education Program.

2. T.Ed. 412, 471, and 472 and certain methods and materials courses (T.Ed. 452, 453, 454, and 455) are controlled enrollment courses.

3. T.Ed. 412. Students must be accepted and officially admitted to the Certification Program before enrolling in T.Ed. 412. Experiences with media materials and skills are included. While enrolled in T.Ed. 412, students are assigned to public schools to serve as teacher assistants. Students spend at least 40 hours in the schools prior to student teaching.

4. Student Teaching—Secondary (T.Ed. 471) is a senior year course. It is offered both fall and spring, but not in the summer. T.Ed. 471 is offered for one-half semester all day during the first half of the semester. All required professional education courses are prerequisites for student teaching, except T.Ed. 472 and the methods and materials courses. The methods courses may be taken concurrently. Some methods courses are offered in the fall only.

Students must apply for student teaching in the semester prior to the one in which they wish to do student teaching. Check the Field Experience Office for specific dates in October and February.

5. Elective Assignment—Secondary (T.Ed. 472) is a second field experience which is selected by the student with the consultation and approval of the student’s advisor and is taken in the second half of the fall and spring semesters following student teaching.

To receive the diploma or recommendation for teacher certification through the University of Colorado, Boulder, a student must complete a minimum of 30 hours of credit at the University of Colorado and a minimum of 20 hours of professional education, which includes student teaching.

REQUIREMENTS FOR TEACHING MAJORS

English

1. Each student enrolled in the University of Colorado must complete a departmental major in English. Several major course patterns may be followed, but each requires 36 semester hours. Students holding English degrees from other institutions should have their programs evaluated by the English adviser in the School of Education.

2. The English teaching major must total a minimum of 50 semester hours and include the following:

At least 6 semester hours of American literature
At least 6 semester hours of British literature
Engl. 200-3. Critical Writing
Engl. 484-4. History and Grammar of the English Language
T.Ed. 442-3. Developing Reading Skills in Junior and Senior High School
or
T.Ed. 443-3. Teaching Reading in Content Areas at Secondary Level
T.Ed. 444-3. Literature for Adolescents
T.Ed. 446-3. Advanced Composition for Secondary School English Teachers

Mathematics

1. Students seeking teacher certification in mathematics must complete one of the following two programs (2 or 3).

2. Mathematics Teaching Major: This teaching major requires the following courses (or their equivalent):

Math. 120-5. Analytic Geometry and Calculus I
Math. 220-5. Analytic Geometry and Calculus II
Math. 240-4. Analytic Geometry and Calculus III
Math. 313-3. Introduction to Linear Algebra
Math. 314-3. Introduction to Modern Algebra
Math. 321-3. Euclidean and Non-Euclidean Geometries
One course in computing (see 4 below)
One course in probability/statistics (see 5 below)
Electives to make a minimum in mathematics with 18 hours of upper division course work

3. Mathematics/Science Combinations: This program allows the student to combine mathematics and science as supporting fields. It requires 60 semester hours in mathematics and sciences. This program leads to certification in mathematics, but not in science. The program could fit into the individually structured major or the distributed studies major in the College of Arts and Sciences.

a. Mathematics

Math. 120-5. Analytic Geometry and Calculus I
Math. 220-5. Analytic Geometry and Calculus II
Math. 314-3. Introduction to Modern Algebra
Math. 321-3. Euclidean and Non-Euclidean Geometries
One course in computing (see 4 below)
One course in probability/statistics (see 5 below)
Electives in mathematics to make a minimum of 25 semester hours

b. Science (A minimum of 12 semester hours in each of two of the following fields):

Biology
Chemistry
Geology/Physical Geography
Physics

c. Electives in mathematics and the two chosen fields of science to total 89 semester hours

4. The requirements in computing may be fulfilled by completing at least one of the following: a course in computer science (except C.S. 413 or 414); Psych. 403; Soc. 491/591; Math. 465 or 466; E.E. 201 or 357; EDEE 203, 222, or 453; Env. D. 320

5. The probability/statistics requirement may be fulfilled by completing at least one of the following:

Math. 381, 481, 482, or 587; Educ. 505; Psy. 210, 387, or 588; Econ. 381, 481, or 536; Geog. 402 (GeoL 477); Soc. 418 or 491; Q.M. 201 or 300; Ch.E. 361 (EDEE 381).

All electives for certification in mathematics are subject to the approval of the mathematics education adviser in the School of Education.

Science

1. Each student enrolled in the University of Colorado must complete a science departmental major in one of the following: biological science, chemistry, environmental conservation, geography, geology, individually structured majors, or physics. In several of these departments there are a number of course patterns which lead to a major. Students holding degrees in science from other institutions should have their programs evaluated by the science adviser in the School of Education.

2. Students must complete two courses of college work in each of the following: biology, chemistry, earth science (geology or physical geography), physics and mathematics and/or computer science. Courses taken
to complete departmental majors may count here as well as meeting general education requirements where applicable.

3. Finally, each student must complete a concentration in one or more of the following areas:
   a. General science including 20 additional hours distributed among astronomy, biology, chemistry, earth science, physics, or mathematics.
   b. Biology, including genetics, physiology, ecology, microbiology, and organic or biochemistry. (A balance between botany and zoology is expected.)
   c. Chemistry, including qualitative/quantitative chemistry, organic and physical chemistry, modern physics, or calculus.
   d. Physics, including modern physics, mechanics, astronomy, electronics or electricity, and mathematics to level of differential equation.
   e. Geology, including preparation in historical and physical geology, mineralogy, astronomy, geomorphology, meteorology, stratigraphy, and physical geography.
   f. Earth-space science including 20 semester hours in areas such as astronomy, meteorology, geology, or physical geography, oceanography, mineralogy, and conservation of resources.

Social Studies

1. Each student enrolled in the University of Colorado must complete a social science/history departmental major in one of the following: anthropology, economics, geography, history, political science, psychology, sociology, or area studies. In several of these departments there are a number of course patterns which lead to a major. Students holding degrees in social science from other institutions should have their programs evaluated by the social science adviser in the School of Education.

2. In addition to the completion of one of the departmental majors listed above, the certification student must take enough additional work in history/social sciences to present a total of 60 semester hours. Courses identified as natural sciences are not acceptable unless such courses are presented within a departmental major (e.g., geography).

All social studies teaching majors must include, beyond the major, 9 semester hours in U.S. history, 9 semester hours in world history, 12 semester hours in another social science.

History majors must present, beyond the major, a minimum of 30 semester hours somewhat evenly distributed in three social sciences.

DEGREE ALTERNATIVES

While students will be enrolled in degree programs in other schools and colleges of the University, some degrees are more appropriate than others for those interested in teacher certification. This is especially true for those preparing to teach in the secondary schools. The University offers majors in subjects most commonly taught in the public schools; however, the state gives no teaching certificates in some academic fields. Therefore, students interested in a particular major should consult an adviser in the School of Education about selecting a teaching field.

COLLEGE OF ARTS AND SCIENCES

The College of Arts and Sciences is a four-year college that admits students as freshmen. Several undergraduate degrees are offered and may be pursued by students wishing to complete the typical major plan to teach on the elementary and secondary school level.

Requirements for the bachelor's degree in the College of Arts and Sciences vary somewhat, depending on the degree sought; therefore students are urged to study carefully the College of Arts and Sciences section to determine the requirements applicable to the particular degree they seek.

ACADEMIC POLICIES

Any student registered in the Teacher Certification Program who fails to maintain a 2.5 grade-point average may be placed on probation or may be suspended for a period of one academic year. Readmission is then subject to conditions determined by the dean. The same conditions apply to students in other colleges and schools who have been admitted to the Teacher Certification Program.

GRADUATE STUDY IN EDUCATION

Graduate study in education at the University of Colorado is administered through the Office of the Associate Dean, School of Education, and all inquiries regarding programs should be directed to the following address:

Associate Dean
School of Education, Campus Box 249
University of Colorado
Boulder, Colorado 80309

A wide range of professional and academic interests is served by these areas. The areas of study are as follows:

Administration, Supervision, and Curriculum Development

Master of Arts
Educational Specialist
Doctor of Education
Doctor of Philosophy

Encompasses programs of a general administrative type: principals, central administration, superintendent. This includes various facets of public school and community college administration.

ADMISSION TO SECONDARY STUDENT TEACHING K-12 CERTIFICATION

Students in art, music, or physical education may enroll in both elementary and secondary student teaching and the elective assignment. These students may receive certification K-12 in these areas of instruction.

1The Educational Specialist degree will be awarded only in conjunction with the Colorado Type D or E certificates.
Instruction and Curriculum in the Content Areas

Master of Arts
Educational Specialist
Doctor of Education
Doctor of Philosophy

Embraces mathematics and science education, English and social studies education, language arts, reading, and general curriculum studies in elementary and secondary education.

Educational-Psychological Studies

Master of Arts
Educational Specialist
Doctor of Philosophy

Includes educational psychology, guidance and counseling, school psychology, special education, and educational technology.

Research and Evaluation Methodology

Doctor of Philosophy

Covers the educational research, evaluation, and statistics area.

Social and Multicultural Foundations

Master of Arts
Doctor of Philosophy

Emphasizes history and philosophy of education, sociology of education, public policy, experiential education, and bilingual and multicultural education, teaching English as a second language.

Certification at Graduate Level

The University of Colorado at Boulder through the School of Education offers course work leading to certification in the following areas:

- Administration
- Elementary principal
- Junior high school principal
- Secondary school principal
- Superintendent
- Guidance and counseling
- Reading teacher and reading specialist
- Media specialist
- Special education
- Educable mentally handicapped
- Educationally handicapped

- School psychology
- Speech correctionist/language specialist
- Type B Certification
- Elementary education
- Secondary education
- Art, drama, English foreign languages
- Mathematics, music, physical education
- Science, social studies, and speech

Graduate Programs at Three Levels

Graduate study in education is offered at three levels: Master of Arts (M.A.) degree, Specialist in Education (Ed.S.) degree (in limited areas) Doctor of Education (Ed.D.) in limited areas), and Doctor of Philosophy (Ph.D.) degrees. Each level is discussed in the following pages. For many study areas, special advisory leaflets have been prepared which are available upon request from the School of Education Graduate Office.

Application for Admission

Prospective students who believe that they may qualify for admission to a graduate degree program should request application forms from the Graduate Office, School of Education. The completed form should be returned to the Graduate Office, School of Education. Prospective graduate students should also read the Graduate School portion of the catalog for additional information. Application papers and all supporting documents (including GRE test scores for the doctoral degree programs — see below) must be in the Graduate Office at least six months before the opening of the term for which the student is applying.

Applicants should request the Educational Testing Service to send their scores on the Aptitude Test (verbal and quantitative) of the Graduate Record Examination (GRE) to the Education Graduate Office. A doctoral applicant who has not taken the GRE should arrange to do so.

Maximum Load and Part-Time Study

A maximum of 15 semester hours in any one semester may be applied toward degree requirements. During the summer, 9 semester hours may be taken in a full summer session, 6 hours in a five-week summer term, and 3 hours in a three-week term. During the academic year, students will be regarded as having a full load if they are registered for not less than 6 semester hours in courses numbered 500 or above, or for thesis, and are not engaged in other employment more than half time.

Quality of Work

For all graduate degrees an average of B or better is required in all work taken for the degree. Transferred credits are not included in calculating an average. A mark of C may not be used on a Ph.D. program.

Any graduate course in which a mark of D or F is reported is failed and must be repeated and passed if it is required in a student’s degree program.

Students who do not maintain a B average or better may be suspended by the dean of the Graduate School upon the recommendation of the associate dean of the School of Education. Students may also be suspended from the Graduate School for continued failure to maintain satisfactory progress toward the degree sought.

Experience Required

With exceptions noted below, at least one year of teaching experience or an internship is ordinarily a prerequisite for admission to the master's or Ed.S. degree programs. However, teaching experience may sometimes be obtained during the period in which a student is studying for the degree. Graduate programs in secondary school guidance require completion of at least two years of teaching as a prerequisite to admission.

On the doctoral level, prior or concurrent experience appropriate to the field of specialization is required, except for degree programs which include an internship.

Teaching experience is not required as a condition of

1The Educational Specialist degree will be awarded only in conjunction with the Colorado Type D or E certificacies.
admission to programs in administration and supervision relating to higher education, college student personnel work, counseling in agency settings, educational research and statistics, educational technology-library administration, and social and multicultural foundations of education. However, experience appropriate to these professional fields of specialization may be and usually is required in lieu of teaching.

Master of Arts in Education

The Master of Arts degree is available, comprising one academic year or more of graduate work beyond the bachelor's degree. The minimum residence requirement for the master's degree is one academic year or the equivalent, and it may be satisfied by two semesters in residence, or three full summer sessions, or any combination equal to two semesters. (For part-time credit toward meeting the residence requirement, see the Graduate School section of this catalog.) The master's degree must be completed within five years (or six summers) of initial enrollment. The M.A. Plan II (nonthesis) degree requires a minimum of 30 semester hours. See Graduate School portion for discussion of Plan I and Plan II.

Most program areas have outlined a recommended or required program of studies, and students pursuing a degree are expected to follow the appropriate program unless they have appropriate substitutions arranged in advance with their advisers. (Note: The master's program in guidance and counseling is designed to start in the summer only. The special education program starts only at the beginning of the fall semester.) Pamphlets outlining the programs of studies in education are available from faculty or the Graduate Office in the School of Education.

In the final term of study (at least 10 weeks prior to graduation) each student must submit an Application for Admission to Candidacy for an Advanced Degree form. These forms are available in the Education Graduate Office. If a minor is included, the forms must first be signed by a representative of the student's minor department or program area. The forms must be signed by the student's adviser and submitted to the Education Graduate Office for School approval and then to the Graduate School for final approval. For time limits and other information see Graduate School section under Master's Degree.

EDUCATION AS A MINOR FIELD

In M.A. programs providing for majors outside the School of Education, students may include education as a minor if both their major department and the associate dean in the School of Education approve. For master's degrees, a minor in education consists of at least 6 hours of study in related courses. Not more than 2 semester hours may be transferred from another institution.

Students who propose to minor in education must have had sufficient undergraduate work in education to prepare them for graduate study in the field. Appraisal of undergraduate preparation will be made by the associate dean.

Specialist in Education (Ed.S.)

The Ed.S. degree program affords opportunities for graduate study in limited areas relating to certification extending one year beyond a master's degree. Areas in which the specialist degree may be earned are: curriculum, administration and supervision, instruction and curriculum in content areas, and education psychological studies. The program is intended to serve the needs and interests of a variety of career people in education who want specialized and up-to-date preparation beyond the master's degree but who do not plan to study for a doctorate.

ADMISSION REQUIREMENTS

Applicants for admission are required to have an acceptable master's degree and an undergraduate record which gives evidence of a good general education. The master's degree should be in a field which provides an appropriate foundation for the additional year of graduate study.

An undergraduate grade-point average of 2.75 or better on a 4.0 scale is required, and/or an average of 3.0 or better for the master's degree. Students being admitted on a provisional basis must submit Graduate Record Examination scores for the verbal and quantitative sections. At least one year or more of teaching or other appropriate experience is also required.

PROGRAM OF STUDY AND RESIDENCE

When applicants are admitted, they are notified of the appointment of a faculty adviser. The student and adviser formulate a program of study providing for 30 semester hours or more of course work. At least four semester hours must be at the 600 level.

Most program areas have outlined a program of studies appropriate for individuals pursuing Ed.S. study in their areas, and students are expected to follow those programs unless they have arranged appropriate substitutions in advance with their advisers. Pamphlets outlining the recommended programs of studies for the programs in education are available from faculty or the Graduate Office.

In the final term of study (at least ten weeks prior to graduation) each student must submit an Application for Admission to Candidacy for an Advanced Degree. These forms are available in the Graduate Office. If a minor is included, the forms must first be signed by a representative of the student's minor department or program area. Then the forms must be signed by the student's adviser and submitted to the associate dean and the Graduate School for final approval.

The Specialist in Education degree requires no thesis, but a final written comprehensive examination consisting of three four-hour sessions is required. The examination is typically given during the student's last term of study. However, it may be postponed until a later term providing the student registers for it and pays the required fee. A student who fails the comprehensive examination may request to be examined again after three months. Only one reexamination is permitted.
Two semesters, three full summers of study, or a combination equivalent to two semesters in residence are required.

TRANSFER OF CREDIT AND TIME LIMITS

The same regulations governing transfer of credit and time limits apply to the Specialist in Education as indicated for the master's degree except that transfer institutions where the work was taken must offer the Specialist in Education or an equivalent or higher degree in order for credit to be applied to this degree.

Doctoral Study in Education

In addition to the information included here, the student is referred to the Graduate School section of this catalog.

Two types of doctoral degree programs in education are offered under the auspices of the Graduate School and the School of Education. Prospective doctoral students may apply for admission to either program, the choice depending chiefly on their professional or career objectives. The Doctor of Education degree (Ed.D.) is intended primarily to meet the needs of career people in education for advanced study, e.g., teachers in schools, school or college administrators, guidance counselors and student personnel directors, and college or university professors of education. For one who plans to teach in an academic subject matter department and not to be involved in teacher education, a Ph.D. in the major subject field would be preferable. The Ph.D. is also appropriate for one who plans a career as a university professor of education or as a director of educational research in a state or city school system.

Doctoral programs require a period of study and research of two academic years (four semesters) or more beyond a master's degree (or in the case of some Ph.D. students three years beyond a bachelor's degree). At least two semesters of full-time study in residence during one academic year are required; the remainder of the residence requirement may be satisfied by any combination of study in academic years or summer terms, subject to the definition of full load stated earlier. For an Ed.D. student whose program calls for certain specialized study at some other university, residence credit for one semester may be earned elsewhere and counted toward meeting the minimum residence requirement, if the adviser and the associate dean approve.

Since the Ed.D. and Ph.D. programs differ only in certain aspects of content and not in procedures, they are discussed together in the following sections. Such differences as currently pertain are clearly pointed out.

ADMISSION REQUIREMENTS

Applicants for admission to doctoral study are expected to have a good liberal arts background, approximately 18 semester hours of undergraduate credit in education (same as for master's applicants except as noted earlier), or a master's degree in education, and an undergraduate average of 2.75 or better on a 4.0 scale. An average of 3.0 or better is expected on all graduate work completed. Ed.D. applicants must have an appropriate master's degree, preferably in the field of their proposed doctoral studies or closely related. Ph.D. applicants are not in all cases required to have a master's degree, although it is generally deemed preferable. The decision rests with the program area faculty. At least two years of professional experience relevant to the applicant's proposed study is required for most programs.

Satisfactory Graduate Record Examination scores (Aptitude Test) are a required part of the application for admission. An interview with a faculty admissions committee may be required.

DEGREE REQUIREMENTS

Doctoral students in some programs are expected to have had a course in statistical methods, a basic course in educational research, a graduate course in psychological foundations of education, and a graduate course in social foundations of education. If they have not had such courses, advisers may require one or more of them in addition to the courses approved for the degree sought. All doctoral students must include an intermediate statistics course (Educ. 600). All Ph.D. students must also include at least one course in experimental design and analysis (Educ. 601, 603, or 604), and this is required in some Ed.D. programs. Educ. 503 and 504 may not be used on the doctoral degree plan. Graduate courses in other departments may be included in any degree program if they are approved by the student's adviser and committee.

Most program areas have outlined a program of studies appropriate for individuals pursuing study in their areas, and students are expected to follow that program unless they have arranged appropriate substitutions in advance with their advisers. Pamphlets outlining the recommended programs of studies for the programs 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 either the Ed.D. or Ph.D. Ph.D. applicants who are admitted without a master's degree can expect to have about 70 semester hours of course work in their programs.

Prior to 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 advisers approve, they write a comprehensive examination. This 12-hour written examination is conducted by a committee nominated by the associate dean for instruction and appointed by the dean of the Graduate School. An oral examination may also be held if a student's committee requests it. The examination is focused chiefly on the student's area of specialization, conceived rather broadly. Students who fail the comprehensive examination may repeat it once, at a time to be determined by the examining committee.

\footnote{With approval and depending on type of doctoral research planned for the dissertation, a substitution of a two-course doctoral level research sequence in history, philosophy, or one of the social sciences may be substituted for the 600 series in education.}
In addition to the course work, a doctoral thesis for 30 semester hours of credit is required of each student. A student registers for Educ. 800 (Thesis) for the Ph.D., and Educ. 801 for the Ed.D., for three or more terms, but not more than 10 semester hours in any term; not more than 10 semester hours may be taken prior to the successful completion of the comprehensive examination. During the research for and the writing of a thesis, grades of IP (in progress) are reported; if the thesis is completed and accepted as satisfactory, a grade is reported for the student's record. When a student and the chairman of the advisory committee agree on a subject for the thesis, the student prepares a detailed prospectus and arranges for a meeting with the committee. (As a rule the advisory committee constitutes the thesis committee, but additional faculty in education and other departments may be asked to serve also.) When the committee approves the prospectus, the student may proceed with the research. Research involving human subjects must also have the approval of the University Committee on Human Research.

No continuing education work is permitted on either the Ed.D. or Ph.D.

TIME LIMITS

Ed.D. students are expected to complete their work and receive the degree within seven years beginning with the term of their first registration for doctoral courses. The time may be extended to ten years upon approval by the student's adviser and the associate dean, but credits more than seven years old must be validated by special examination. Transferred credit which becomes more than seven years old cannot be validated and hence cannot be counted toward meeting degree requirements. Ed.D. and Ph.D. students who do not complete their programs and receive the degree within four years of passing their comprehensive examination must retake that examination and pass it before they can take their final oral examination. See the Graduate School section for Ph.D. time limits.

When students have passed the comprehensive examination they are required to register each semester until the degree they seek is attained, and pay the standard fee as announced by the Graduate School.

The doctoral programs in business and physical education are cooperative programs between the College of Business and Administration, the Department of Physical Education, and the School of Education. Prospective students should consult both groups for advising.

CHECKING ON PROGRESS TOWARD A DEGREE

Doctoral study entails a long period of scholarly endeavor. Students are urged to confer with their advisers and with the associate dean in the School of Education about the various deadlines they must meet.

OPPORTUNITIES FOR ASSISTANTSHIPS

The School of Education has a limited number of assistantships which are administered by the dean of the School of Education on the recommendations of persons of the divisions and director of teacher education. Some assistantships involve the supervision of student teachers; others involve helping professors in their teaching or research. Stipends (not tax-free) in amounts set by the University are paid for all assistantships. Appointments are usually made in terms of one-fourth time (ten hours a week) or one-half time (20 hours a week). Inquiries should be directed to the Dean, School of Education.
INFORMATION ABOUT THE COLLEGE
Office in Engineering Center AD-1
George J. Maler, Associate Dean for Undergraduate
and Service Programs
Klaus D. Timmerhaus, Associate Dean for Graduate
and Research Programs; Executive Director of the
Engineering Research Center

The College of Engineering and Applied Science was
established by the Board of Regents in 1893.

Through engineering the resources of nature are used
for the benefit of humanity and the environment.
Engineers today are expected not only to be competent
planners and designers of technical systems, but
significant contributors to the betterment of their en-
vironment in the social and humanistic sense as well.
Engineering professional societies have committed
themselves to the principle that as mankind gains the
ability to build more powerful machines and more
useful devices there must be a strong and successful ef-
fort to protect natural resources and the environment.

An engineering career demands hard work, and so
does an engineering education. In return engineers have
excellent opportunities to work in various places, meet
new challenges, or move upward in management. The
engineer is generally well paid and usually in demand;
in the rare times when there is a surplus of certain
types of engineers, individuals usually have little dif-
ficulty finding attractive opportunities in other fields.

Currently, registration is required in all states for the
legal right to practice professional engineering.
Although there are variations in the state laws, gradua-
tion from an accredited curriculum in engineering, sub-
scription to a code of ethics, and four years of qualifying
experience are required. In addition, two days of ex-
aminations covering the engineering sciences and the
applicant's practical experience are required in most
states. Those who cannot qualify for registration are ex-
pected to work under experienced registered engineers.

The following programs in the college are now ac-
credited by the Accreditation Board for aerospace
engineering sciences, architectural engineering,
chemical engineering, civil engineering, electrical
engineering, engineering and technology (ABET),
industrial engineering, and mechanical engineering.
The college also offers degrees in electrical engineering and
computer science. Degrees in applied mathematics and
engineering physics are offered by the College of
Engineering and Applied Science in cooperation with
the mathematics and physics departments of the Col-
lege of Arts and Sciences. Accreditation by ABET has
not been sought for the programs in applied
mathematics and engineering physics in order to allow
students maximum flexibility in choosing engineering
course electives.

Within most departments several options are offered
(for example, mechanics in mechanical engineering
and construction engineering in architectural engineer-
ing), and most departments offer options emphasizing
computer aspects, bioengineering and premedicine.
Some options are oriented toward graduate study,
others toward engineering practice.

A listing of the fields in which engineers work would
have many hundreds of entries. The following list by
departments gives only a brief summary.

*The aerospace engineering sciences prepare engi-
neers for an industry that encompasses the design and
construction of both commercial and military aircraft
and the development and fabrication of space vehicles.
Advances in this technology have permitted the in-
dustry to enter also the fields of urban mass transit,
undersea exploration, bioengineering, nuclear engineer-
ing, laser technology, and many other emerging high
technology fields. An aerospace engineer often works at
the forefront of engineering with scientists in the fields
of mathematics, physics, chemistry, biology, etc.*

*Applied mathematics meets the need of modern
research, which is dependent upon advanced
mathematical concepts. Almost all concerns that are
engaged in industrial and scientific research today need
applied mathematicians, as do organizations involved in
computational work, statistical analysis, or
stochastics.*

*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 registra-
tion as a professional engineer.*

The architectural engineering curriculum is recom-
dended 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 of three areas of specialization offered: construction engineering, environmental engineering, or structural engineering.

Chemical engineers convert natural resources into industrial and consumer products in facilities that include refineries and gasification plants. Among their products are many that often are not identified with chemical engineering—oils, metals, glass, plastics, rubber, paints, soaps and detergents, foods, beverages, synthetic and natural fibers, nuclear and exotic fuels, medicines, and many others.

The department has recently revised and upgraded its bioengineering/premedical engineering program. It is very much interested in research directed toward ecologically sound development of chemical processes. It is also working effectively on energy problems and is stressing in its instructional program problems of energy conversion.

Civil and environmental engineering offers an interesting and challenging career to the student interested in the design and construction of buildings, bridges, dams, aqueducts, and other structures; in transportation systems including highways, canals, pipelines, airports, rapid transit lines, railroads, and harbor facilities; in the transmission of water and the control of rivers; in the development of water resources for urban use, industry, and land reclamation; in the control of water quality through water purification and proper waste treatment; in the construction and contracting industry; and in the problems concerned with man's physical environment and the growth of cities.

Computer science offers the master's and Ph.D. degrees in fields that include programming languages, operating systems, numerical analysis, information systems, and the theories of computation. Master's graduates typically take positions as systems programmers for computer manufacturers of software firms, advanced applications programmers in scientific research firms, or technically oriented systems designers in a commercial or government environment. Ph.D. graduates typically take positions in industrial research laboratories or in university teaching.

Electrical engineering offers professional possibilities that include teaching and research in a university; research in development of new electrical or electronic devices, instruments, or products; 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. There are numerous specialties within electrical engineering. Among them are the design of computer interfaces and computer software; electromagnetic fields, which are basic to radio, television, and related systems; communication theory and signal processing; electrical machinery; solid-state, integrated-circuit, and electron devices, energy and power, control systems and others.

The electrical engineering and computer science program is designed to provide entrance into the profession for students who wish to work in computer engineering. This includes design and construction of efficient software systems as well as an introduction to hardware design. Present interest is in the application of microprocessors.

The engineering physicist works where new kinds of engineering are being born, or where many fields are being used jointly. General knowledge of the diverse fields of physics provides the ability to deal with industrial problems that cannot be solved by a standardized procedure in a specialized field. The training prepares the student for a career in physics where there are many and varied opportunities in development work and industrial research. It is also basic for graduate work in physics and for specialized training in research.

Industrial engineering deals with the complex problems in fields that demand an integrated systems approach, such as manufacturing, health systems, and transportation. It utilizes mathematics, statistics, simulation, computer science, and operations research techniques to maximize the productive utilization of resources while minimizing human effort. Because they are concerned with people as well as things, industrial engineers have become a prime source of management talent.

Mechanical engineering is very broad in scope, not identified with or restricted to a particular technology, vehicle, device, or system but concerned with all such subjects, both individually and collectively. The objective of the undergraduate program is to prepare the student to meet and anticipate change, and to work with technologies as yet unknown. Typical starting assignments for the graduating senior include positions with oil, construction, and automotive industries.

Resource systems engineering (offered at the Colorado Springs Campus only) is a curriculum in systems engineering with a focus on resource development. It equips students to design or operate the large systems whose complexity has outgrown the intuitive and informal methods that served in the past. Engineers with this capability are needed in both industry and government. (See the University of Colorado at Colorado Springs Bulletin).

Educational Opportunities

Students have an opportunity to study engineering with many teachers who have national and international reputations and to work with superior facilities of the University of Colorado Engineering Center and Engineering Research Center. Recent years have seen the development of new instrumentation, integrated circuits, and solid state laboratories in electrical engineering, of several bioengineering laboratories, and the rapid computerization of these and other laboratories. All entering freshmen receive experience with digital computers. Each engineering department has laboratories suitable for research through the doctoral or postdoctoral level and others for undergraduate instruction and experimentation. Some are noted in the Graduate School section of this catalog. Details may be obtained from the departments concerned.
Engineering Minorities Program

Members of ethnic minorities who are fully qualified engineers are urgently needed. The Engineering Minorities Office provides tutoring, advising, and friendly counseling to minority students who request them. Funding of the office comes from gifts from private industry, and its innovative program has been widely studied by other universities. Enrollment of minority students is growing.

Prizes and Awards

Numerous prizes and awards are conferred upon outstanding students, usually during the honors convocation held during Engineers’ Days each spring.

Honors at Graduation

Honors at graduation are conferred in recognition of high scholarship and professional attainments. Honors and special honors are recorded on diplomas and indicated on the commencement program.

Scholarships, Fellowships, and Loan Funds

Money contributed to the University Development Foundation for assistance to engineering students is deposited in appropriate accounts and used according to the restrictions imposed by the donors. Numerous industries match employee contributions or offer scholarships and fellowships. About 180 undergraduate scholarships and grants are conferred. Awards are based on academic progress, financial need or both (see Financial Aid, General Information section).

For details students may contact the Office of the Dean of the college.

International Education

Since engineers frequently work in foreign nations, it is desirable that some engineering students familiarize themselves with foreign cultures by study abroad. Especially active programs in engineering are maintained by the University and the Instituto Tecnológico y de Estudios Superiores de Monterrey, Mexico, and the University of East Anglia and the University of Lancaster in England. Students may complete one or more semesters of engineering education abroad (see International Education).

Student Organizations

The following honorary engineering societies have active student chapters in the College of Engineering and Applied Science;

Chi Epsilon, civil and architectural fraternity
Eta Kappa Nu, electrical engineering society
Pi Tau Sigma, mechanical engineering fraternity
Sigma Gamma Tau, aerospace fraternity
Tau Beta Pi, engineering society

Student chapters of the following professional societies are well established:

American Institute of Aeronautics and Astronautics
American Institute of Architectural Engineers
American Institute of Chemical Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
Illumination Engineering Society
Institute of Electrical and Electronic Engineers
Society for Industrial and Applied Mathematics
Society of Manufacturing Engineers
Society of Women Engineers

The student SIAM chapter was the first in the country.

These societies meet frequently to present papers, speakers, films, and other programs of technical interest. A general student organization, known as the Associated Engineering Students, of which all students in the College of Engineering and Applied Science and its extensions are members, has supervision of matters of interest to the whole group through the Control Board, its legislative body. With the advice of the engineering faculty, the Associated Engineering Students (AES) publishes The Colorado Engineer.

The usual student activities and organizations, such as athletics, oratorical and debating societies, student publications, and musical, literary, and religious organizations, are open to students in all colleges and schools of the University.

ADMISSION REQUIREMENTS

Requisite Qualifications

The prospective engineering student needs to be able to work hard, should enjoy mathematics, and should have a keen interest in science and its methods. Sound curiosity about the principles governing the behavior of forces and materials and the ability to visualize structures and machines are necessary prerequisites. The ability to express ideas in both written and spoken form is of primary importance.

Too often, high school students and others regard the mere ability to make things with the hands as an indication of engineering ability. Manual and mechanical skills are valuable but, without the faculties mentioned, are not suitable qualifications for an engineer.

Freshmen

In order to enroll, the student must meet the requirements of the College of Engineering and Applied Science and the Boulder Campus requirements described in the General Information section of this catalog.

SUBJECTS REQUIRED FOR ADMISSION

<table>
<thead>
<tr>
<th>Required Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>English (literature, composition, grammar)</td>
</tr>
<tr>
<td>Algebra</td>
</tr>
<tr>
<td>Geometry</td>
</tr>
<tr>
<td>Additional mathematics</td>
</tr>
<tr>
<td>Natural sciences (physics and chemistry recommended)</td>
</tr>
</tbody>
</table>

*Applicants not meeting these requirements will be considered on an individual basis. A student who is not prepared should expect to make up deficiencies. Requirements must be completed before the student is eligible to graduate.

Students planning to do graduate work at the Ph.D. level are urged to take at least two units of a foreign language.

Fractional credits of less value than one-half unit will not be accepted. Not less than one unit of work will be accepted in a foreign language, elementary algebra, geometry, physics, chemistry, or biology.
Social studies and humanities
(foreign languages, additional English, history, and literature are included)
Electives

A unit of work in high school is defined as a course covering a school year of not fewer than 36 weeks, with five periods of at least 40 minutes each per week. (Two periods of manual training, domestic science, drawing, or laboratory work are equivalent to one period of classroom work.) This is equivalent to 180 actual periods per unit. Fractional credits of value less than one-half unit will not be accepted. Not less than one unit of work will be accepted in a foreign language, elementary algebra, geometry, physics, chemistry, or biology.

Electives may be chosen from any of the high school subjects (except physical education) which are accepted by an accredited school for its diploma and which meet the standards as defined by the North Central Association. However, not more than two units will be considered from drawing, shop, or other vocational work; courses that have descriptive geometry features may be considered for elective units beyond the recommended units.

Beginning students in engineering start their mathematics courses with analytic geometry and calculus. Makeup courses carry no credit toward fulfilling graduation requirements but are recommended for all students not fully prepared to begin the regular mathematics sequence.

In order to be prepared for the type of mathematics courses that will be taught, the student must be competent in the basic ideas and skills of ordinary algebra, geometry, and plane trigonometry. These include such topics as quadratic equations, graphic representation, simple systems of equations, logarithms, the trigonometric functions and simple applications, and the standard theorems of geometry including some solid geometry. Usually seven semesters are required to cover this material adequately in high school.

Recommendation of the High School Principal. It is urged that principals and high school teachers and counselors recommending students to the College of Engineering and Applied Science consider only those students who have shown evidence of the character, seriousness of purpose, and scholarly attainments that will lead to a satisfactory career in engineering. It is assumed in all cases that the students will have grades distinctly above average, especially in English, mathematics, and science. It is recommended that students take at least two units of a foreign language.

Students Who Do Not Meet Subject Requirements. Students with subject deficiencies may receive consideration for admission by the dean of the College of Engineering and Applied Science.

Students who have deficiencies should submit their complete applications to the Office of Admissions early in their last semester of high school.

All students who are admitted with subject deficiencies will be placed on probation and immediately put under the special supervision of the dean.

Transfer Students

Students transferring from other accredited collegiate institutions may be considered for admission on an individual basis if they meet the requirements outlined in the General Information section of this catalog and the freshman requirements for entering the College of Engineering and Applied Science.

Intrauniversity transfers within the same campus of the University to the College of Engineering will be considered on an individual basis if both of the following conditions are fulfilled:

1. Enrollment limitations permit.
2. The student's prior academic record must fulfill the admissions requirements of the College of Engineering and Applied Science.

Intercampus transfers of students from one campus of the University to another will be considered on an individual basis if the following conditions are fulfilled:

1. Enrollment limitations permit.
2. The student must have a minimum of 30 hours in an engineering curriculum at that campus, not counting transfer hours.
3. If an engineering student, the student must be in good academic standing with at least a 2.0 cumulative average for all courses attempted and for all courses that count toward graduation requirements. If the student is not an engineering major, his or her academic record must fulfill the admission requirements of the College of Engineering and Applied Science.

It is strongly recommended that incompatible campus academic sequences such as calculus and, if applicable, E.E. 213/214 be completed before transferring campuses. Students contemplating a transfer should check with their department on such sequences.

Both intrauniversity and intercampus transfers are subject to review by a faculty committee which evaluates the applicant's qualifications for academic success in engineering subjects.

The college seeks to identify applicants having a high probability of successful completion of their academic programs. Admission is based on evaluation of many criteria; among the most important are the general level of academic performance before admission to the college and other evidence of motivation, potential, scholarly ability, and accomplishment. These are indicated by trends in the student's record, by letters of recommendation from teachers and others qualified to evaluate the student, by accomplishments outside academic work, and by other relevant evidence.

The Committee on Admissions will set detailed standards for admission annually and may consider applicants on an individual basis.

TRANSFER CREDIT

After a prospective transfer student has made application and submitted transcripts to the University of Colorado, the Office of Admissions issues a Statement of Advanced Standing listing those courses that are acceptable by University standards for transfer. A copy of this statement is received by the Dean's Office after the student is admitted, and is made a part of the Dean's Office permanent record. The appropriate engineering faculty departmental representative will use this copy of the form to indicate which of those credits listed may be acceptable toward the 136-hour graduation requirement in the College of Engineering and Applied Science, and note the tentative acceptance of these credits by dating and initialing each acceptable course.
listed on the Statement of Advanced Standing. The student will be notified that the acceptance is tentative and is contingent upon satisfactory completion of a minimum of 30 semester hours at the University of Colorado Boulder Campus before the credits may be officially applied toward the degree requirements. It is the responsibility of the transfer student, after having completed the 30 semester credit hours at the University of Colorado Boulder Campus, to request final validation of the credits by the department and to have this validation noted on the Statement of Advanced Standing kept in the Dean’s Office.

If at any time a student wishes to have a course not previously accepted considered again for transfer, the student should consult with the departmental transfer adviser and complete a petition to the dean through the department chairman. It is recommended that departments clearly identify transfer students in their records so that when the time comes to evaluate credits for graduation, the Dean’s Office pages can be referred to for proper acceptance of transfer credits applicable toward degree requirements. All transfer credit must be validated by satisfactory achievement in subsequent courses.

NONTRANSFERABLE CREDITS

Students desiring to transfer credits from engineering technology programs should note that such credits are accepted only upon the submission of evidence that the work involved was fully equivalent to that offered in this college.

Some technology courses are given with titles and textbooks identical to those of some engineering courses. These may still not be equivalent to engineering courses because of emphasis that is nonmathematical or otherwise divergent.

In order to assist engineering technology students with transfer problems, the following guidelines have been established:

1. Courses on basic subjects such as mathematics, physics, literature, or history may be acceptable for direct transfer of credit if they were taught as part of an accredited program for all students and were not specifically designated for technology students.

2. Students who have taken technology courses (courses with technology designations) that may be valid equivalents for engineering courses have these options:

   a. They may petition faculty advisers to waive the course. The requirement for a course can be waived if a student demonstrates that, by previous course work, individual study, or work experience he has acquired the background and training normally provided by the course. No credit is given toward graduation for a waived course, but a strong student may benefit from the waiver by being able to include more advanced work later in his or her curriculum. Other students may profit by taking the course at this college instead and thus establishing a fully sound basis for what follows.

   b. Credit for a course may be given if the course work was done at an accredited institution of higher education. The University of Colorado department involved may recommend to the Dean’s Office that credit be transferred to count toward the requirements for a related course in their curriculum. Credit cannot be given for vocational-technical or remedial courses under rules of the University. (See general section on transfer of college-level credit.)

   c. They may seek credit for the course by examination. See Advanced Placement and College-Level (CLEP) Credit.

WORK EXPERIENCE

It is the policy of the College of Engineering and Applied Science at the University of Colorado Boulder Campus that any credits accrued in the official records of the student that were awarded for work experience (or for co-op experience) will not apply as part of the 136 semester hours required for an engineering degree in the college.

The grade-point average of an engineering student will include all academic courses attempted at the University of Colorado.

Former Students

Former students must meet the requirements outlined in the General Information section of this catalog. Records made at collegiate institutions while the student was a member of the armed forces will not necessarily be a determining factor in a student’s readmission to the University of Colorado, but all such records should be submitted. Students who have withdrawn will have a dean’s stop placed in their records and must obtain permission of the dean to reenroll in the College of Engineering and Applied Science. They must then submit applications for admission for consideration by the Committee on Admissions of the college.

Students who interrupt their course of study may be required to take any preparatory courses which have been added during their absence or to repeat courses in which their preparation is thought to be weak.

Advanced Placement

Advanced placement and college credit may be granted on the basis of the College Entrance Examination Board’s Advanced Placement Tests or by special examinations administered by the department involved. For students who have taken an advanced placement course in high school and who make scores of 4 or 5 in the CEEB’s Advanced Placement Examination, advanced placement as well as college credit will be granted. Students who make scores of 3 may be considered for advanced placement and college credit by the department concerned. All advanced placement and transfer credit must be validated by satisfactory achievement in subsequent courses, in accordance with standard transfer policies of the college.
Advanced placement credit for the freshman mathematics courses in calculus and differential equations will be limited to not more than 4 hours each. Equivalent mathematics courses from other colleges are usually accepted at full value.

College-Level Examination (CLEP) Credit

Prospective students may earn college-level credit through the College-Level Examination Program (CLEP) examinations, provided that they score at the 67th percentile or above. Departments will advise students of the credits accepted for such courses. The number of credits so earned must be within the limits of the number of elective hours of the individual department. A list of subjects in which CLEP examination credit will be accepted may be obtained at the College of Engineering and Applied Science. The currently approved list includes subjects in the fields of computing, business, science, mathematics, the humanities, and social sciences. (See also University regulations and instructions for obtaining additional information.)

DEGREES

Undergraduate Degree Programs

The College of Engineering and Applied Science offers four-year courses leading to the Bachelor of Science degree in:

- Aerospace engineering
- Electrical engineering
- Applied mathematics
- Electrical engineering and computer science
- Architectural engineering
- Engineering physics
- Chemical engineering
- Industrial engineering
- Civil engineering
- Mechanical engineering
- Computer science
- Resource systems engineering

Varied programs and options are offered in each of the above areas.

Joint Degrees

Joint Bachelor's Degrees in Engineering and in Other College Academic Programs at the University of Colorado Boulder Campus. Arrangements to obtain joint bachelor's degrees in engineering and in other college academic programs may be made through consultation with and approval of the appropriate deans and completion of a minimum of 30 additional semester hours beyond the largest minimum required by either college or school.

Bachelor of Science Degrees in Engineering in the College of Engineering and Applied Science at the University of Colorado Boulder Campus. Two Bachelor of Science degrees in engineering may be earned by obtaining the approval of both departments concerned and completing a minimum of 30 additional semester hours beyond the largest minimum required by either department (currently this would require 168 semester credit hours total). Transfer students desiring two bachelor's degrees must present a minimum of 60 semester credit hours taken at the University of Colorado College of Engineering and Applied Science (Boulder Campus), and must satisfy all other stipulations regarding total hours required and approval of all courses work by both departments concerned. Of the 30 additional hours for the second degree, a minimum of 24 shall be in courses in the department concerned or in courses approved in writing in advance by the department as substitutes.

Students desiring to pursue the double-degree program in the College of Engineering and Applied Science (Boulder Campus) must formally designate themselves double degree candidates by filing in the dean's office a petition signed by the chairman of both departments concerned prior to enrolling for the last 30 hours of work to be completed for the double degree.

A decision to earn a joint degree should be carefully weighed, since qualified students can obtain a master's degree for the same number of credits (see Graduate Study in Engineering).

Joint Degrees in Business. A student in the College of Engineering and Applied Science may be able to obtain a combined B.S. degree in engineering and B.S. degree in business. (See Combined Business and Engineering Curricula.)

Post-Arts Degree. A graduate of the College of Arts and Sciences may obtain an engineering degree in four semesters if such liberal arts courses as science and mathematics and such engineering courses as graphics and certain specialized subjects have been elected.

Premedicine Option

Each engineering department has an option by which a student may meet fully all requirements for entry into medical schools while also earning a degree in engineering. There is also a premedical option in engineering physics. Engineering departments will approve inclusion of appropriate biological and bioengineering courses in the student's program of technical electives.

The courses listed below are prescribed by medical schools and must be completed with superior grades. General overall requirements representative of those for entry into most medical schools are given. Students can meet these requirements by careful substitutions of electives in the engineering curriculum. In some cases where additional hours may be required, interested students should consult with the departmental chairman and the health sciences advisor on the Boulder Campus.

- General chemistry
- Organic chemistry
- General biology or zoology
- Literature (in English)
- English composition
- Physics
- Calculus
- Genetics (required for pre-dentistry only)

Various bioengineering courses are listed in this catalog. Students are expected to show a thorough knowledge of chosen subjects and a true understanding of the problems presented and the solutions that have been advanced. In addition, students must acquire understanding of mankind through the study of social-humanistic subjects. Study of courses that will be taken in medical school is strongly discouraged.

1Colorado Springs campus only.
2See appropriate chairman for possible substitution of courses.
To complete a premedical program in the College of Engineering and Applied Science, it is strongly recommended that the student follow a full four-year college course (with the equivalent of at least 136 semester hours) and earn an E.S. degree.

The Admissions Committee of the School of Medicine welcomes inquiries and visits from prospective students, particularly at the time of their first interest in medicine as their chosen profession.

The requirements for premedical programs are indicated under the departmental headings.

Combined Business and Engineering Curricula

Undergraduates with career interests in administration may be able to complete all of the requirements for both a B.S. degree in engineering and a B.S. degree in business by extending their study programs to five years, including one or two summer terms. It may be possible to start earning the 48 semester credits required in the College of Business and Administration in the second, third, or fourth year, depending upon the curricular plan for the particular field of engineering in which the student is enrolled.

It is also possible for qualified graduates (grade-point average of 3.0 or better) to complete the requirements for a master's degree in business within one year after receiving the baccalaureate degree in engineering. Before deciding upon the business option, a student should carefully consider, in consultation with departmental advisers, the relative advantages of the combined B.S. business-engineering curricula, the degree program of the Graduate School of Business Administration, and the M.S. degree program in the student's own discipline.

Combined business and engineering programs for which students may be able to qualify are available for students in all engineering departments.

An engineering student wishing to obtain a combined degree must submit a petition to both the College of Business and the College of Engineering and be approved as a combined degree student. Failure to do so will preclude the student from taking any business courses.

For students in combined programs, the requirements for the degree in business are as follows:

1. Completion of at least 48 semester credits in business and economics, to include Econ. 201 and 202 (6 semester hours), required courses in business (30 semester hours), and a business area of emphasis (12 semester hours).

2. Completion of at least 30 of these semester hours at the University of Colorado while concurrently enrolled in the College of Business.

3. Completion of nonbusiness requirements in mathematics, communications, and the social and behavioral sciences in a degree program approved in advance by the College of Business. In addition, for some courses and areas of emphasis, there are prerequisite requirements which must be met.

4. At least a 2.0 grade average must be earned in all courses undertaken in the College of Business and the area of emphasis.

Shown below is the combined engineering-business program. For other combinations, students must consult with the associate dean for undergraduate studies in the College of Business.

The requirements for all combined business and engineering programs are as follows (no substitutions are permitted):

<table>
<thead>
<tr>
<th>Courses</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Econ. 201 and 202, Principles of Economics</td>
<td>6</td>
</tr>
<tr>
<td>(should be completed during the student's sophomore or junior year.)</td>
<td></td>
</tr>
<tr>
<td>Acct. 200, Introductory Accounting</td>
<td>3</td>
</tr>
<tr>
<td>B. Ad. 200, Business Information and the Computer</td>
<td>3</td>
</tr>
<tr>
<td>Q.M. 201, Business Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Mk. 300, Principles of Marketing</td>
<td>3</td>
</tr>
<tr>
<td>Pr. 305, Basic Finance</td>
<td>3</td>
</tr>
<tr>
<td>Fr. Mg. 300, Operations Analysis</td>
<td>3</td>
</tr>
<tr>
<td>Or. Mg. 330, Introduction to Management and Organization</td>
<td>3</td>
</tr>
<tr>
<td>B. Law 300, Business Law</td>
<td>3</td>
</tr>
<tr>
<td>B. Ad. 410, Business and Government, or B. Ad. 411, Business and Society</td>
<td>3</td>
</tr>
<tr>
<td>B. Ad. 460, Cases and Concepts in Business Policy, or B. Ad. 461, Management Game and Cases in Business Policy, or B. Ad. 452, Small Business Strategy, Policy, and Entrepreneurship</td>
<td>3</td>
</tr>
</tbody>
</table>

Courses in an area of emphasis in one of the following fields: accounting, computer-based information systems, finance, international business, marketing, office administration, operations management, organizational behavior, or transportation management. All course work in the area of emphasis must be taken at the University of Colorado College of Business Administration. |

The student should note that for some courses, and for some areas of emphasis, there are prerequisite requirements which must be met. Since some of the courses may be taken as engineering electives, it is possible to obtain the two degrees in as few as 166 semester hours; however, most students will require more.

PLANNING THE ENGINEERING PROGRAM

Freshman Year and Curriculum Choices

Fundamentals taught in the freshman year are of prime importance in the more advanced classes, and every effort is made to register beginning freshmen in the proper courses.

All freshmen are urged to consult their instructors whenever they need help in their assignments and should feel free to consult with the deans and/or members of their staffs about their problems. During the freshman year, students not doing satisfactory work are required to consult with the dean or his assigned staff members.

It is strongly recommended that students avoid the likelihood of later scheduling problems by following the prescribed sequence exactly.

Courses Required in the Freshman Year. Course requirements for freshmen are detailed within the curriculum given under each department. They are essentially the same throughout the College of Engineering and Applied Science of the University of Colorado. The freshman is exposed to a broad university background, doing much early course work outside the College of Engineering and Applied Science in science, mathematics, and humanities. There is emphasis upon
the humanities during the full four years. Every student should read and follow the assigned curriculum carefully.

About two-thirds of the sophomore year is the same for all students, and the remainder of the courses begin to point to the various fields of engineering taught; however, real specialization begins in the junior year and carries on through the senior year. A fifth year leading to the master’s degree is strongly urged for students of more than usual ability who feel they can profit from additional study.

Advising and Records

Freshman students are advised by members of the engineering advising staff and by representatives from each academic department. These combined sources of help are readily available to assist students with academic, vocational, or personal concerns. Students are assigned specific departmental advisers for academic planning and should consult with the departmental chairman or designated representative for assignment. Additional advising information is contained in the College of Engineering Student Survival Guide for the current year. It may be obtained in the Dean’s Office.

UNDERGRADUATE DEGREE REQUIREMENTS

1. The B.S. degree requires that not less than 136 semester hours in an acceptable curriculum be completed to the satisfaction of the department concerned. The last 30 hours must be earned after admission and matriculation as an engineering degree student of the University of Colorado. Many students will need to present more than the minimum hours because of certain departmental requirements and because they may have enrolled in courses that do not carry full credit toward a degree. For example, not more than 6 hours in ROTC courses may be counted toward graduation. Physical education and performance courses do not carry engineering credit.

A student is awarded a degree by a vote of the faculty of the College of Engineering and Applied Science after a department of the college determines that all of the requirements for the degree have been met. The diploma specifies whether the student graduated from the University of Colorado at Boulder, at Colorado Springs, or at Denver. The campus named is the one where the department recommending the student for the degree is located. Consideration will generally be given to designating the campus where the last 30 hours of course work were completed. However, the final decision on the campus designation is made by the awarding faculty.

2. Overall grade-point averages of 2.0 are required for all courses counted toward degrees and (separately computed) for all required courses. The grades of P or H in honors courses and of P in pass/fail courses count toward graduation but are excluded from these computations. The F grade is included.

3. A basic computer course is required by each department. (See departmental requirements.)

4. Each B.S. program requires a minimum of 24 hours in social-humanistic subjects. Six hours of literature are required. Six hours of social-humanistic subjects should be taken in the junior year and 6 in the senior year. These subjects should be taken from the following categories, with not fewer than 6 hours from category b below.

   a. Literature (including foreign literature either in the original or in translation).
   b. Economics, sociology, political science, history, and anthropology.
   c. Fine arts and music (critical or historical).
   d. Up to a maximum of 6 hours of communications skills (e.g., English composition, technical writing, public speaking, elementary foreign language) may be substituted for 6 hours of the social-humanistic requirement. Alternatively, these courses may be counted as technical electives.

Qualified students will be permitted to take appropriate honors courses as substitutes for social-humanistic courses.

Such courses as accounting, contracts, and management should be considered as technical and may be substituted for technical electives where applicable. Students should consult their faculty advisers.

5. For Engr. 301 (Thermodynamics), see Engineering.

6. Students should see also Requirements for Graduation and the general rules and policies of the University listed in this catalog.

7. Genuinely equivalent courses usually may be substituted for required courses. However, students must verify with advisers that courses actually are equivalent. Careful checking is required. A course given at another institution may have the same name and same textbook as a required engineering course and still be taught with a non-mathematical emphasis or other variation that gives it little value for engineering. (See Transfer Credit.)

8. All courses are not necessarily offered each semester. According to University rules, undergraduate courses having an enrollment of fewer than ten students will be cancelled. Students can minimize scheduling problems by following closely the sequences given in the curricula of their departments. If a course is unavailable, a junior or senior showing definite need of it may be allowed to enroll for equivalent studies under the course number 400, Independent Study.

9. Students in applied mathematics and engineering physics should choose courses in the College of Engineering rather than the same courses cross-listed elsewhere, in order to be able to demonstrate a maximum depth in engineering to prospective employers.

10. There are no language requirements for the B.S. degree in engineering, but it is strongly recommended that students include language courses in their programs. Elementary language courses may be acceptable as technical electives, and advanced courses as literature.

11. See also the College of Engineering Student Survival Guide for the current year. It may be obtained in the Dean’s Office.
English

Communications skills are essential for every professional person and are particularly so for the engineer. Most engineering departments require one of the following series of courses. It is not mandatory but is preferable that the courses be taken sequentially as shown. These courses are intended to develop the student’s writing ability and to allow a close analysis of significant works of world literature in translation and in English originals.

Engineering students may choose certain combinations of courses: Engl. 253, 260, 261, preferably in sequence; or Engl. 260, 261, and two of the following introductory literature courses—Engl. 120 (Introduction to Fiction), Engl. 130 (Introduction to Drama), or Engl. 140 (Introduction to Poetry).

Students who achieve a B average in two of the following English courses—120, 130, 140, 260, and 261—may take immediately thereafter any literature courses listed by the Department of English.

Also, engineering students have the option of taking humanities courses in the Integrated Studies Program of the College of Arts and Sciences as a substitute for introductory literature courses.

No social-humanistic credit will be given for courses dealing with English as a foreign language.

Electives
Engl. 120-3. Introduction to Fiction
Engl. 130-3. Introduction to Drama
Engl. 140-3. Introduction to Poetry
Engl. 220-3. Modern Short Story
Engl. 221-3. Science Fiction
Engl. 222-3. Introduction to Folklore
Engl. 260-3, 261-3. Great Books (not open to students who have credit in Humanities 101, 102)
Engl. 222-3. Masterworks of British Literature
Engl. 233-3. Modern and Contemporary Literature
Engl. 266-3. Masterworks of American Literature
Engl. 267-3. Modern and Contemporary Literature
Engl. 290-3. Major Works of Shakespeare
Engl. 291-3. Literature and Visual Arts
Engl. 315-3. Report Writing (for engineering students, the course may be considered a technical elective)
Engl. 322-3. Folklore
Engl. 368-3. Twentieth-Century American Literature

ENGLISH AS A FOREIGN LANGUAGE

A committee of engineering faculty members is responsible for helping students whose native language is not English acquire fully adequate communication capabilities in oral and written English. Students who may have problems with the English language should be sure to complete appropriate course work.

Credit for ROTC

Students who complete Army, Navy, or Air Force Reserve Officers Training Corps (ROTC) programs and receive their commissions may be allowed credit toward their degrees for up to 6 semester hours of ROTC course work, provided their major departments consider the ROTC courses to be of suitable educational value. The actual number of degree credits to be allowed is determined by the department.

Any student, including those not working toward ROTC commissions, may, with department 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 Dean’s Office. The list is subject to change, and the actual number of credit hours awarded for any of the courses appearing on the list must be approved by the department. For an ROTC student these credits may not be in addition to the 6 semester hours mentioned above.

The faculty of the College of Engineering and Applied Science will not recommend an ROTC student for a bachelor’s degree until the student has completed all ROTC requirements and is eligible for commissioning. Thus, ROTC students must attend their required summer camps and cruises and receive their commissions at or before the commencements exercises at which their degrees are conferred.

ROTC students who are working for degrees in both engineering and another area will be required to attend at least one summer session.

Requirements for Graduation

It is the student’s responsibility to be certain that all the requirements are fulfilled, to file the intended date of graduation in the departmental office upon the completion of 100 semester hours applicable to the B.S. degree sought, to fill out a diploma card at fall schedule pick-up the beginning of the last year, and to keep the departmental adviser and the dean’s office informed of any change in plans.

In order to become eligible for one of the bachelor’s degrees in the College of Engineering and Applied Science, a student, in addition to being in good standing in the University, must meet the following minimum requirements.

Courses. The satisfactory completion of the prescribed and elective work in any curriculum as determined by the appropriate department is required. A department may require a minimum grade of C in all major courses.

Students planning to graduate in December or May should complete an application form prior to the third week of the fall semester. Forms are available at schedule pick-up or in the Dean’s Office BC AD 1-1.

Incomplete and Correspondence Courses. All incompletes must be completed and all correspondence course grades must be officially received no later than three weeks prior to graduation. It is the student’s responsibility to contact the instructor concerning the removal of incomplete grades. Forms are available in the Dean’s Office.

Confering of Combined Degrees and Degrees and Commissions. Confering of such degrees is to be simultaneous. (See ROTC and Joint Degrees.)

Faculty Recommendation. The recommendation of the faculty of the department offering the degree and the recommendation of the faculty of the College of Engineering and Applied Science are required.

Commencement Exercises. Commencement exercises are held in December, May and August.

Campus Designation on Diploma. See Undergraduate Degree Requirements, paragraph 1.
ACADEMIC RULES AND POLICIES

Credits

Students may receive credit for only those courses for which they officially registered, passed special examinations or correspondence courses, or transferred credits from other institutions. (See Advanced Placement, CLEP Credit). Students who have had extensive experience equivalent to required courses should consult with the appropriate department regarding possible credit or waiver.

Normal Course Schedule

Students should register for regular work as outlined in the departmental curricula. Variations from the normal loads specified should be carefully planned with and approved by the appropriate faculty adviser. Students who are employed should consult with their advisers before each registration regarding course loads to be attempted and should inform the dean’s office of the nature and hours of their employment. Guidelines for course load are available in the Dean’s Office.

Sequence of Courses

Students should complete the courses in the department in which they are registered according to the order shown in this catalog. Any course in which there is a failure or an unremoved incomplete should take precedence over other courses; however, each student must register so that departmental requirements will be completed with the least possible delay.

A student who does not earn a grade of C or better in a course that is prerequisite to another may not register for the succeeding course without the permission of both the department and the instructor of the succeeding course.

Students may enroll for as much as 50 percent of their courses in work that is not a part of the prescribed curricula. To exceed this limit, the approval of the major department and the dean of engineering must be obtained by petition.

Grading System, Pass/Fail and Drop/Add Procedures

See the General Information section of this catalog for the University of Colorado uniform grading system and for additional pass/fail information and drop/add procedures. Also see the current Schedule of Courses.

GRADING SYSTEM

It is particularly important to note that in the College of Engineering and Applied Science courses to be counted toward fulfilling the 136-hour graduation requirement cannot be taken no credit (NC). Once a course has been taken for no credit, the course cannot be repeated for credit.

PASS/FAIL

The primary purpose for offering courses on a pass/fail grade basis is to encourage students, especially juniors and seniors, to broaden their educational experience by electing challenging courses without serious risk to their academic records. In general, pass/fail should be limited to 300- or 400-level courses. Below are specific pass/fail regulations for the College of Engineering and Applied Science:

1. A maximum of 16 pass/fail hours may be included in a student’s total program. A maximum of 6 hours may be taken in one semester, but it is recommended that not more than one course at a time be taken pass/fail.

2. Courses that a student may elect to take pass/fail shall be designated and approved in advance by the student’s major department and the Dean’s Office. If courses not so designated are taken, the earned grade will be recorded in place of the P or F grade. An engineering student who has not designated a major field will not be allowed the pass/fail option without approval through the Dean’s Office.

3. A transfer student may count toward graduation 1 credit hour of pass/fail for each 9 credit hours completed in the college; however, the maximum number of pass/fail hours counting toward graduation shall not exceed 16, including courses taken in the Honors Program under that program’s pass/fail grading system.

4. Students on academic probation should not enroll for pass/fail courses.

DROP/ADD

Only under very extenuating circumstances will petitions for dropping courses be considered after the tenth week of the semester.

INCOMPLETES

The grade of I/W (incomplete, withdrawn) is not given in the college. The grade of I/F (incomplete, failing) may be given by an engineering faculty member for circumstances beyond the student’s control, such as a documented medical or personal emergency. When it is given, the student, the Dean’s Office, and the departmental office are informed, in writing, by the instructor of what the student is to do in order to remove the incomplete and when the tasks are to be completed. The instructor may assign only the I/F grade. The student is expected to complete the course requirements, e.g., the final examination or term paper, within the established deadline and not to retake the entire course. The grade will be converted automatically to a grade of F after one year unless the specified work is completed. If, because of exceptional circumstances, the course must be repeated, the student is required to notify the Office of Admissions upon its completion. Under no circumstances will a student be permitted to repeat a course at a campus of the University other than the one on which an I/F was received.

Withdrawal

A student may withdraw from the University without academic penalty before the end of the second week of the semester. After the 10th week of the semester, a student will not be allowed to withdraw officially from the University except for circumstances clearly beyond
the student's control. If a student suspends work by officially withdrawing from the University, permission must be secured from the dean to reenroll in the College of Engineering and Applied Science. Students who interrupt their course of study may be required to take any preparatory courses that have been changed during their absence or to repeat any courses showing weak preparation. Students who withdraw may find it difficult to reenroll because of legislative ceilings on enrollments. They must reapply for admission. Their applications will be reviewed by the Committee on Admissions.

Class Standing

To be classified as a sophomore in the College of Engineering and Applied Science, a student must have passed 30 semester hours; to be classified as a junior, 60 hours; and to be classified as a senior, 90 hours of credit. All transfer students will be classified on the same basis according to their hours of credit accepted at the University of Colorado.

Attendance

Successful work in the College of Engineering and Applied Science is dependent upon regular attendance in all classes. Students who are unavoidably absent should make arrangements with instructors to make up the work missed. Students who, for illness or other good reason, miss a final examination must notify the instructor or the Office of the Dean no later than the end of the day on which the examination is given. Failure to do so will result in an F in the course.

Policy on Academic Progress

The following is a statement of the Policy on Academic Progress in the College of Engineering and Applied Science.

An overall average of 2.0 or better, in hours taken at the University of Colorado toward graduation requirements, is necessary to remain in good standing in the College of Engineering and Applied Science. Grades earned at another institution are not used in calculating the grade-point average at the University of Colorado. However, grades earned in another school or college within the University of Colorado will be used in determining the student’s scholastic standing and progress toward the bachelor of science degree in the College of Engineering and Applied Science.

Students whose overall averages fall below 2.0 will be placed on probation for the next semester in which they are enrolled in the College of Engineering and Applied Science, and will be so notified. If, after that semester the student's average is still below 2.0, the student will be suspended from the college.

The following is additional information and interpretation of the policy:

1. Students who have been suspended are suspended indefinitely and may not enroll at any University of Colorado campus during any regular academic year, September through May, but may enroll in summer sessions or Vacation College and/or may take correspondence courses for credit through the Division of Continuing Education. Suspended students are not permitted to enroll for Boulder evening or mini-college courses through the Division of Continuing Education.

2. Students who have been suspended may apply for readmission if they bring their overall average up to a 2.0 through summer session, Vacation College, and/or correspondence work applying to engineering degree requirements as approved by a member of the Academic Progress Committee.

3. A student, upon satisfactorily completing at another college or university a minimum of 12 semester hours of work appropriate to an engineering curriculum subsequent to suspension, may apply for readmission as a transfer student.

4. Applicants for readmission to the University of Colorado cannot be assured readmission.

5. During a probation semester, the student must complete a normal load, i.e., 12 hours or more (for a full-time student) of courses counting toward graduation requirements. Physical education courses do not count; if the student has previously completed 6 hours of ROTC courses, ROTC courses do not count; if 24 hours of social-humanistic subjects have been completed, social-humanistic subjects do not count.

6. Students who have been on probation or suspension at any time in the past will automatically be suspended if their overall average again falls below a 2.0.

Details of the probationary and suspension status and of the conditions for return to good academic standing will be stipulated in the letters of probation and suspension. Information regarding these matters may be obtained in the Office of the Dean, Engineering Center AD 1-1.

Repetition of Courses

Students may not register for credit in courses in which they already have received grades of C or better. When a student takes a course for credit more than once, all grades are used in determining the grade-point average. An F grade in the repetition of a required course necessitates a subsequent satisfactory completion of the course. Students may not register for credit in any course which they have previously enrolled in and completed for NC (no credit).

Changing Departments

The forms necessary for transferring from one engineering department to another are available in the Dean's Office.

Other University Campuses

A student who needs to work at a part-time or full-time job while obtaining a college education, or who lives in the metropolitan areas of Denver or Colorado Springs, may prefer to attend the University of Colorado at Colorado Springs or the University of Colorado at Denver. The campus designation on the student's diploma and transcript correspond to the campus designation of the faculty recommending the student for a degree.
UNIVERSITY OF COLORADO AT DENVER

Two departments of the College of Engineering and Applied Science are located on the campus of the University of Colorado at Denver. Complete B.S. and M.S. degree programs are offered by the Department of Civil and Urban Engineering and the Department of Electrical and Computer Engineering. The B.S. degree is also offered in mechanical engineering and applied mathematics. Complete M.S. degree programs are offered in applied mathematics, as are many of the courses leading to the B.S. degree in engineering physics and other engineering fields. Many graduate courses in other fields are offered. The offices of the University of Colorado at Denver are located at 1100 14th Street in downtown Denver.

UNIVERSITY OF COLORADO AT COLORADO SPRINGS

Two departments of the College of Engineering are located on the campus of the University of Colorado at Colorado Springs (UCCS). Complete B.S. degree programs are offered by the Department of Electrical Engineering and Computer Science in electrical engineering, computer science, and resource systems engineering, and the M.S. degree is awarded in electrical engineering. Students may complete work for the Ph.D. and Master of Engineering degrees through the University-wide Graduate School. The UCCS Department of Mathematics is also a department of the College of Engineering and offers the B.S. and M.S. degrees in applied mathematics. Freshman-year work is offered for all engineering degrees and the majority of the sophomore-year courses are available for many areas.

Summer Courses

Summer session courses are planned for regular students and for those who must clear deficiencies. Courses are offered also for high school graduates who wish to enter as freshmen and for those who need to remove subject deficiencies. For information about courses, students should write to the chairman of the department in which the courses are taught and for the Schedule of Summer Courses for the campus on which they plan to enroll.

Division of Continuing Education and Correspondence

Some courses are also available through the Division of Continuing Education, either through correspondence instruction or special courses.

Television Courses

The Audiovisual College Education (ACE) Program televises courses at the Boulder, Colorado Springs, and Denver campuses and at the Health Sciences Center, for use by business, industry, and government at remote locations off the campuses. The Intercampus Instruction Program televises courses on all four campuses for mutual exchange to avoid duplication and to supplement the ACE courses. In-state and out-of-state tuition charges for televised courses are comparable to charges for regular instruction.

For information about live or videotaped televised courses, contact the Office of University-Industry Relations, Campus Box 433, Boulder, Colorado 80309, or call 303/492-8211. For a special catalog of ACE courses and for information on the scheduling of courses, write or call the chairman of the department concerned or the Office of University-Industry Relations.

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
- Civil, environmental, and architectural engineering
- Electrical engineering sciences
- Chemical engineering
- Mechanical engineering
- Computer science
- Economic evaluation
- Engineering design
- Mechanics

The Master of Science in applied mathematics is presented by the College of Engineering with the cooperation of the Department of Mathematics and the Master of Science in industrial engineering by the Department of Mechanical Engineering.

The Master of Science in telecommunications is presented jointly by the Department of Electrical Engineering, the Department of Communication, the Department of Political Science, and the Graduate School of Business Administration.

Graduate programs within each engineering department offer a variety of options, providing numerous alternative careers.

Programs with emphasis on special fields include civil engineering degrees focused on construction, illumination, energy conservation, structures, water resources, water quality, and geotechnical engineering. Electrical engineering areas in which there are strong subject concentrations include communications, computer science, microwaves, solid state devices, integrated circuits, electric power, and others. In mechanical engineering a strong option is offered in mechanics and a program in design and economic evaluation. The M.S. degree in engineering design and economic evaluation will be available for a limited time only.

In most departments there is a choice among bioengineering, environmental engineering, energy and energy resources, or computer applications. Systems, process control, and dynamic flow are other strong areas.

Education for Practicing Engineers

The Master of Engineering degree permits graduate students flexibility in defining specialized interdisciplinary fields that meet their professional needs. This degree has standards fully equivalent to those of the Master of Science degree (see Master of Engineering). Each of the engineering departments participates with students in setting up acceptable programs for the degree.

The college puts great emphasis upon making graduate courses readily available through offerings at
other campuses of the University. Televised courses through the Audiovisual Continuing Education (ACE) program make available credit or noncredit courses televised on the three campuses for residents and for off-campus students in the region. For information, the prospective student should contact the Dean's Office.

Graduate Work in Business

Undergraduates in engineering who intend to pursue graduate study in business may complete some of the business background requirements as electives in their undergraduate programs. Seniors in engineering who have such intentions and appear likely to qualify for admission to graduate study in business may be permitted to register for graduate fundamentals courses designed to provide qualified students with needed background preparation in business. (See concurrent B.S. and M.S. degree programs.)

Concurrent B.S. and M.S. Degree Program in Engineering

Students who plan to continue in the Graduate School after completion of the requirements for the B.S. degree will usually find it advantageous to apply for admission to the concurrent degree program.

This program allows the student who qualifies for graduate study and expects to continue for an advanced degree to plan a graduate program from the beginning of the senior year rather than from the first year of graduate study. The student can then reach sooner the degree of proficiency required to begin research and can make better and fuller use of courses offered in alternate years.

Application is made to the Graduate School through the department early in the second semester of the junior year (after completion of at least 84 semester hours). Admission to the Graduate School may be granted on completion of 118 semester hours. (See Seniors at the University of Colorado in the Graduate School section of this catalog.) Requirements are the same as for two degrees taken separately: 136 credit hours for the B.S. degree and 24 hours plus thesis (Plan I) or 30 credit hours (Plan II) for the M.S. or for the Master of Engineering degree. Social-humanistic requirements must be completed within the first 136 credit hours. A 3.0 grade-point average for all work attempted through the first six semesters (at least 96 credit hours) and written recommendations from at least two departmental faculty members are required.

All students will choose or be assigned faculty advisers to help them develop the program best suited to their present interests. Those in each program will be encouraged to pursue independent study on research problems or in areas of specialization where no formal courses are offered. A liberal substitution policy will be followed for courses normally required in the last year of the undergraduate curriculum. The program selected must be planned so that the student may qualify for the B.S. degree after completing the credit-hour requirements for the degree if the student so elects, or if the student's grade-point average falls below the 3.0 required to remain in the program. In this case, all hours completed with a passing grade while in the program will count toward fulfilling the normal requirements for the B.S. degree. There will be no credit given toward a graduate degree for courses applied to the B.S. degree requirements; however, students are still eligible to apply for admission to the Graduate School under the rules set forth in the Graduate School section of this catalog. Normally, however, the student will apply for admission to the Graduate School when at least 130 of the 136 credit hours required for the B.S. degree have been completed, and will be awarded the B.S. and M.S. degrees simultaneously upon meeting the requirements set forth for the concurrent degree program.

Graduate Degree for Science Majors

Science graduates who have good academic records and strong backgrounds in mathematics and physical science may be eligible for admission as graduate students in engineering or may be able to qualify with little extra course work. Preliminary information may be had from the Office of the Dean of engineering. In many cases, some financial support may be available for such students.

Master of Engineering, Master of Science, and Doctor of Philosophy Degrees

Students wishing to pursue graduate work in engineering leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees in the Graduate School section of this catalog. Some departments also have available explanatory material on their advanced degree programs.

Prerequisites. To enroll for an advanced degree in any department of the College of Engineering and Applied Science, candidates either must have previously earned a bachelor's degree in a curriculum that includes the necessary prerequisites for the branch of engineering in which they wish to specialize or qualify for the concurrent B.S. and M.S. program open to juniors. If the candidate's preliminary education was taken at some other institution, the degree of qualification for advanced work shall be determined by the department concerned and by the dean of the Graduate School.

Graduates of engineering technology programs should note that the equivalent of a B.S. degree in an appropriate engineering field is required for entry into the Graduate School. Because the goals and orientation of engineering programs differ from those of technology programs, technology graduates should expect to make up deficiencies before being admitted to graduate study in engineering. Students may not be admitted to the Graduate School while making up deficiencies, but can enroll as special students.

For admission as a regular degree student, an undergraduate grade-point average of at least 3.0 is normally required.

Language Requirement. No engineering department except Mechanical Engineering has a foreign language requirement, but Ph.D. candidates should note the communication requirement of the Graduate School, under which a foreign language is required.
Graduate work in each department of the College of Engineering and Applied Science falls into two classes:

1. Courses that are offered for candidates who have chosen to major in the particular department or as a base for the Master of Engineering combined degree.

2. Courses that are offered as minors for candidates who have chosen their major in some other department.

Graduate students who plan to become candidates for the M.E., M.S., or Ph.D. degree are required to take a qualifying examination in the appropriate field of specialization during the first semester in which they are registered as candidates for a graduate degree. Individual departments should consult the timetable of this examination. The purpose of this examination is to enable the adviser and student to plan a suitable program of study.

Course Requirements. Graduate students majoring in any department receive no credit in the Graduate School for courses listed as required undergraduate work in the same department. They may, however, receive graduate credit for advanced undergraduate courses in an engineering department other than that in which they receive the bachelor's degree, with the approval of the department granting the degree.

Availability of Courses. All courses are not necessarily offered every year. They are available only if there is sufficient demand. According to University rules, a graduate course, even though offered, will be canceled if the enrollment is less than five students. Some courses are offered in alternate years on the Boulder Campus and the Denver Campus; others usually at Boulder only, and some only at Denver. If a course is not available at either Boulder or Denver, a student seeking urgent need for the material may apply for equivalent studies under the course titles of Independent Study or Selected Topics (see course description numbers 400, 500, and 600).

AEROSPACE ENGINEERING SCIENCES

Office in Engineering Center OT 5-16
Professor George R. Inger, Chairman

BACHELOR'S DEGREE REQUIREMENTS

The primary objective of the aerospace engineering sciences curriculum is to provide sound general education in subjects fundamental to the practice of and research in this branch of engineering sciences. The major part of the first three years is devoted to the study of mathematics, physics, mechanics, chemistry, and the humanities. The fourth year is devoted to the professional courses in the fields of physics of fluids (fluid dynamics); propulsion and energy conversion; flight dynamics, control, and guidance; space systems analysis; materials and structural mechanics; space environment; and bioengineering.

Students in the Department of Aerospace Engineering Sciences are encouraged to pursue special research topics of their own choosing during the junior and senior years. Course credit will be allowed for suitable studies under the courses designated as Aero. 461 or 462. This research is under the direction of a member of the departmental faculty. Students should contact the faculty member of their choice at the beginning of the semester.

Planning of graduate study for students having sufficient ability and interest 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 included in technical electives consisting of M.E. 402, Math. 431/432, Math. 481, or Math. 443 (see Graduate Programs). ROTC courses may be substituted for not more than 3 hours of technical electives, subject to the approval of the student's adviser. Certain specified ROTC courses are accepted for social-humanistic credit. The total credit for ROTC courses may not exceed 6 hours. Students who wish to combine the business and aerospace engineering sciences curricula are advised to consider obtaining the B.S. degree in aerospace and the M.S. degree in business rather than a combined B.S. degree. Business courses may not be substituted for technical electives in the aerospace curriculum.

Bioengineering/Premedical Option in Aerospace Engineering Sciences

The Department of Aerospace Engineering Sciences offers a premedical option which has been specifically designed for students who wish either to attend medical school or to enter graduate work in bioengineering after receiving the B.S. degree. This option has been so arranged that no choice need be made by students until the first semester of their junior year. Students wishing to enter the bioengineering/premedical option program will be allowed to substitute the following for some of their normal course work during the senior year:

<table>
<thead>
<tr>
<th>Fall</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioengineering elective (Aero. 461 recommended)</td>
<td>3</td>
</tr>
<tr>
<td>MCDB 384, Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>or EP/EB 353, Genetics</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 331, Organic Chemistry</td>
<td>4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Spring</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 332, Organic Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>Aero. 360, Bioengineering I</td>
<td>3</td>
</tr>
</tbody>
</table>

Students electing this option should consult their adviser regularly to assure the adequacy of their curriculum.

Computer Option in Aerospace Engineering Sciences

The Department of Aerospace Engineering Sciences offers a computer option designed for students who are particularly interested in the computational aspects of engineering and scientific problems. The student who elects this option should have an interest in and an aptitude for mathematics.

The first three years are the same in this option as in the standard program except for the requirement of C.S. 210/310 instead of C.S. 110. In the senior year fall semester, a course in numerical analysis, assembly language, or analog computer should be taken in place of electronics theory and laboratory. The following program is recommended for the senior year spring semester:

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Senior Year

Spring Semester
Aero 417. Aerospace Laboratory ........................................... 2
Computation electives .................................................. 6
Social-humanistic elective ............................................... 3
Technical electives ..................................................... 7

Minimum hours for degree .................................................. 18

Curriculum for B.S. in Aerospace Engineering Sciences

Freshman Year

Fall Semester
Aero 120. Introduction to Science of Flight ........................................... 2
A.Math 135. Calculus for Engineers I ........................................... 4
Chem. 201. General Chemistry (Note 1) ........................................... 4
Engr. 101. Engineering Drawing ........................................... 2
Engr. 261. Great Books or another course in literature (Note 2 and 3) ........................................... 3
A.S. 103. Expository Writing—Natural Sciences (Note 3 and 4) ........................................... 3

Spring Semester
A.Math 136. Calculus for Engineers II ........................................... 4
E.Phys. 111. General Physics ........................................... 4
Engr. 104. Experimental Physics ........................................... 1
Aero 203. Mechanics I (same as M.E. 261) ........................................... 3
C.S. 110. Elementary Programming for Scientists and Engineers (Note 5) ........................................... 3
Social-humanistic elective (Note 3) ........................................... 3

Sophomore Year

Fall Semester
A.Math 236. Calculus for Engineers III ........................................... 4
Phys. 112. General Physics ........................................... 4
Phys. 114. Experimental Physics ........................................... 1
Aero 204. Mechanics II (same as M.E. 262) ........................................... 3
Engr. 301. Thermodynamics ........................................... 3
Social-humanistic elective (Note 3) ........................................... 3

Spring Semester
A.Math 236. Introduction to Linear Algebra and Differential Equations ........................................... 3
Phys. 213. General Physics ........................................... 3
Phys. 215. Experimental Physics ........................................... 1
Aero 304. Analytical Dynamics ........................................... 3
Aero 321. Fluid Dynamics II ........................................... 3
Aero 326. Foundations of Propulsion ........................................... 3

Junior Year

Fall Semester
Aero 311. Fluid Dynamics I ........................................... 3
Aero 322. Structures I ........................................... 3
Aero 328. Materials Science (same as M.E. 301) ........................................... 3
Aero 341. Systems Analysis I (same as M.E. 371) ........................................... 3
E.E. 303. Electrical Circuits I ........................................... 3
Social-humanistic elective (Note 3) ........................................... 3

Spring Semester
Aero 304. Analytical Dynamics ........................................... 3
Aero 312. Fluid Dynamics II ........................................... 3
Aero 326. Foundations of Propulsion ........................................... 3

Senior Year

Fall Semester
Aero 413. Gasdynamics and Propulsion ........................................... 3
Aero 447. Computational Fluid Propulsion ........................................... 3
E.E. 403. Elements of Electronics ........................................... 2
E.E. 440. Elements of Electronic Laboratory ........................................... 1
Aero 403. Flight Mechanics ........................................... 3
Technical electives (Notes 3, 7, 8) ........................................... 7

Spring Semester
Aero 417. Aerospace Laboratory ........................................... 2
Technical electives (Notes 3, 7, 8) ........................................... 12
Social-humanistic elective (Note 3) ........................................... 3

Minimum hours for degree .................................................. 18

Curriculum Notes
1. Chem. 103-5. General Chemistry, may be substituted.
2. For other options in English, see the English language listings under engineering undergraduate degree requirements.
3. Except by petition, not more than 9 hours total of technical electives, social-humanistic electives, and English at the level of 300 or higher may be taken pass/fail. Aerospace engineering sciences courses cannot be taken pass/fail.
4. A.S. 103 must be taken in the freshman or sophomore year as a social-humanistic elective. One of the following expository writing courses may be substituted for it: A.S. 100 (General), A.S. 101 (Humanities), or A.S. 102 (Social Sciences); Engl. 316, Report Writing, may also be substituted.
5. For the student seriously interested in computer science, the sequence C.S. 210/210, Fundamentals of Computing I, is recommended, with C.S. 210 being counted as a technical elective.
6. E.E. 413, Control Systems Analysis, may be substituted.
7. A technical elective is subject to the approval of the department's undergraduate advisor, and is a course in a field of engineering or other science, such as mathematics, physics, computer science, or at a level of 300 or higher, with the exception of the course M.E. 203, Computer-Aided Design.
8. Of the 18 hours of technical electives in the standard aerospace engineering sciences curriculum, a minimum of 9 hours should be aerospace electives, including those that are cross-listed with other departments. Up to 3 credit hours of independent study may be counted as a technical elective in the entire program. ROTC courses may be substituted for not more than 3 hours of non-aerospace technical electives.

Graduate Degree Programs

Professional courses in the graduate area cover the fields of physics of fluids (fluid dynamics); propulsion and energy conversion; flight dynamics, control, and guidance, space systems analysis; materials and structural mechanics; space environment; and bioengineering. In addition, the department has cooperative research programs with institutes in Boulder and the surrounding area.

Presently active areas of research include acoustics, aerospace vehicle design, bioengineering, computational fluid dynamics and data processing, control theory, cryogenics, environmental fluid dynamics, flight mechanics and astrodynamics, kinetic theory, magnetohydrodynamics, material sciences and solid state physics, physics of fluids, space sciences and astrophysics, turbulence and stochastic processes, and unsteady aerodynamics.

College of Engineering and Applied Science / 123
Requirements for Advanced Degrees

All graduate students applying for admission to Aerospace Engineering Sciences are required to present the results of the analytical, quantitative, and verbal sections of the Graduate Record Examination. Each student is encouraged to present also 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 included to assure the student's engineering and professional development.

A core of courses is required of all M.S. students as follows: Aero. 517/M.E. 532, Macroscopic Physics of Fluids; Aero. 547, Computational Fluid Mechanics; and M.E. 521 and 522, Methods of Engineering Analysis I and II (or their equivalents). Students may satisfy these requirements by transfer credit. Both the M.S. candidacy examination and the Ph.D. preliminary examination contain a written part based on the content of this core curriculum of four courses. This test is given once a semester or once a year, depending on the demand. The form of the remainder of the examinations, covering specific areas, is decided by the student's committee and can be written, oral, or both.

Further information on specific requirements can be obtained by writing to the Graduate Committee, Department of Aerospace Engineering Sciences, University of Colorado, Campus Box 429, Boulder, Colorado 80309.

APPLIED MATHEMATICS

Office in Engineering Center OT 2-38
Professor John H. Hughes, Chairman

The Department of Mathematics offers all courses in mathematics for the College of Engineering and Applied Science. The department also offers four options leading to the degree B.S. (A. Math.) in the College of Engineering and Applied Science. In Option I, the student takes a specified amount of course work in a specific engineering department. In Option II, the student takes course work in distributed engineering departments including a solid grounding in mechanics, electronics, and materials. Option III is a joint mathematics-computer science program. Option IV is a program designed for the mathematics major who is interested in statistics, operations research, and applied probability.

Preparatory Courses. Students considering doing graduate work in mathematics are strongly urged to take Math. 314 and Math. 431-432. Without these courses students may have difficulty gaining admission to some graduate schools and, if admitted to graduate school, may expect a delay of an additional year in earning an advanced degree.

The undergraduate curriculum is designed to give training in mathematics and in engineering and science. The use of numerical methods and electronic computers is included. It is anticipated that technical electives indicated in the curriculum will be selected from courses offered by the five departments of the College of Engineering and Applied Science (aerospace engineering, chemical engineering, civil and environmental engineering, electrical engineering, and mechanical engineering). In general, non-technical electives should be broadening and have cultural value. Students interested in research are encouraged to take a foreign language as early as possible. German, French, and Russian are strongly recommended. (Only 6 hours of language courses below the 300 level or 6 hours of English composition may be counted toward the social-humanistic requirement.)

BACHELOR’S DEGREE REQUIREMENTS

The B.S. degree in applied mathematics requires the completion of a minimum of 136 credit hours of course work with an average grade of C (2.0) or better. Students majoring in applied mathematics must complete the following minimum requirements:

1. At least 36 hours of mathematics, all with a grade of C or better.
2. At least 18 hours of mathematics courses numbered above 300, of which at least 6 hours must be numbered above 400.
3. Three semesters of calculus. (Math. 130, 250, 240 are recommended but A. Math. 135, 136, and 225 may be taken.)
5. A minimum of 18 hours in addition to required engineering courses E.E./C.S. 210, Engr. 101, and Engr. 301 must be in courses taught in the departments of the College of Engineering and Applied Science.
6. One of the four options below.

Of the 15 hours required in the social-humanistic area in addition to the literature courses, at least 6 hours must be course at the 300 level or higher.

OTHER PROGRAMS

Other degree programs are offered by the Department of Mathematics in the College of Arts and Sciences and in the Graduate School, including the M.S. and Ph.D. degrees in applied mathematics. For graduate course listings, see Mathematics.

Curriculum for B.S. (Applied Mathematics)

FIRST YEAR

<table>
<thead>
<tr>
<th>Semester</th>
<th>Tag</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Fall Semester</td>
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<tr>
<td>Math. 130</td>
<td>Analytic Geometry and Calculus I</td>
<td>5</td>
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<tr>
<td>Math. 111</td>
<td>General Physics</td>
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<tr>
<td>Eng. 101</td>
<td>Engineering Drawing I</td>
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<tr>
<td>Eng. 261</td>
<td>Great Books (Note 1)</td>
<td>3</td>
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<tr>
<td>E.E. 210</td>
<td>Fundamentals of Computing I</td>
<td>3</td>
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<tr>
<td></td>
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<td>15</td>
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<tr>
<td>Spring Semester</td>
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<tr>
<td>Math. 230</td>
<td>Analytic Geometry and Calculus II</td>
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<td>Eng. 101</td>
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<td>Great Books (Note 1)</td>
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<tr>
<td>E.E. 112</td>
<td>General Physics</td>
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<tr>
<td>E.Phys. 114</td>
<td>Experimental Physics</td>
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SOPHOMORE YEAR

Fall Semester
Math. 240, Analytical Geometry and Calculus III 4
Engl. 253, Modern and Contemporary Literature (Note 1) 3
E. Phys. 213, General Physics 3
E. Phys. 215, Experimental Physics 1
Electives (Note 2) 6
17

Spring Semester
Chem. 103, General Chemistry 5
Electives (Note 2) 12
17

JUNIOR YEAR

Fall Semester
Math. 313, Introduction to Linear Algebra 3
Electives (Note 2) 15
18

Spring Semester
Engr. 301, Thermodynamics 3
Electives (Note 2) 15
18

SENIOR YEAR

Fall Semester
Electives (Note 2) 18

Spring Semester
Electives (Note 2) 18
Minimum total hours for degree 136

Requirements under each option are as follows:

OPTION I—ENGINEERING MINOR  
Semester Hours
Specialty in a specific engineering department 18
Technical electives 15
Required social-humanistic electives 15

OPTION II—DISTRIBUTED ENGINEERING MINOR
Distributed engineering subjects in the College of Engineering 18
(A minimal program would consist of the following courses: Aero. 304, Aero. 311, C. E. 212, C. E. 213, E. E. 303, M. E. 301, or their equivalents.)
Technical electives 15
Required social-humanistic electives 15

OPTION III—COMPUTER SCIENCE
Specific courses required, all with grades of C or better.
C. S. 310 4
E. E. 251 3
E. E. 453 3
E. E. 459 3
E. E. 401 3
Additional hours of upper division C. S. courses or upper division E. E. courses which are cross-listed with C. S. 6
Noncomputer-oriented engineering courses 9
Required social-humanistic electives 15
Note: It is strongly recommended that students on Option III take the following mathematics courses: Math. 413, 443, 465, 466, and 481.

OPTION IV—STATISTICS AND OPERATIONS RESEARCH
Approved courses in statistics, operations research, and applied probability taught by departments in the College of Engineering 21

These hours must include I. E. 441, I. E. 442, I. E. 351 (Chem. E. 351).
Technical electives 12
Required social-humanistic electives 15
Additional required courses offered by the Department of Mathematics are Math. 281, Math. 481, Math. 482.
Students electing this option should consult with an adviser no later than their fourth semester.

A. Math. Curriculum Notes
1. See the general engineering section for a list of alternate English courses.
2. Electives include technical, social-humanistic, and electives in chosen option.

ARCHITECTURAL ENGINEERING
Office in Engineering Center OT 4-34
Associate Professor L. Duane Ball, Associate Chairman

BACHELOR’S DEGREE REQUIREMENTS

The architectural engineering curriculum is supervised and administered by the Department of Civil, Environmental, and Architectural Engineering of the College of Engineering and Applied Science. Students in this program are required to take four courses in the College of Environmental Design.

Options in Architectural Engineering. Architectural engineering prepares students to specialize within the building industry in engineering design, construction and contracting, or sales engineering. Accordingly, the architectural engineering student may select any one of three options offered: construction engineering, environmental engineering, or structural engineering. The first two years of all options are alike with one exception; the following curricula show the options in detail.

Construction Engineering. Specialization in construction leads to contracting and building construction. This program involves courses in construction management, planning and scheduling techniques, cost accounting, estimating and pricing, and in building materials and construction methods.

Environmental Engineering. Those students interested in environmental engineering may concentrate their efforts in the fields of illumination and electrical systems design; mechanical systems for buildings, which includes heating-ventilating-air conditioning systems design; sanitation and water supply; or acoustics. A range of courses is available covering these subjects. A new option being planned is building energy engineering with a strong emphasis on solar energy and energy conservation. The courses should be available by fall 1982.

Structural Engineering. The third area of specialization is for those who are interested in the design of structural systems for buildings. Courses available include structural analysis, indeterminate structures, and steel, concrete and timber design.

COMBINED DEGREE

The five-year combined degree supplements architectural engineering with study in one of the major areas of business administration, such as personnel and business management, marketing, or finance. Course work begins in the sophomore year. In that year, the
student is introduced to the functions of the specialty divisions within the building industry. A basis for understanding architecture and the relationship and contribution of architectural engineering to it is provided. In addition, there is more advanced work in mathematics and physics. The junior year is devoted largely to the engineering sciences and a continuation of those courses fundamental to understanding architecture and building. The last year is devoted to engineering analysis, design, or construction of buildings, the field of specialization being determined by the student’s choice of his technical electives.

The junior, senior, and fifth years of the combined curriculum in architectural engineering and business are devoted to pursuit of the full requirements for the architectural engineering degree, as well as the course work necessary to a specific major study area within the College of Business and Administration. Students should consult an advisor before electing this program.

**CURRICULUM FOR B.S. (ARCH.E.)**

**FRESHMAN YEAR**

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tr>
<td>Fall</td>
<td>Arch. E. 130</td>
<td>Introduction to Architectural Engineering</td>
<td>3</td>
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<tr>
<td></td>
<td>A.Math. 135</td>
<td>Calculus for Engineers I</td>
<td>4</td>
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<tr>
<td></td>
<td>Engr. 101</td>
<td>Engineering Drawing I</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>E.Phys. 111</td>
<td>General Physics</td>
<td>4</td>
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<tr>
<td></td>
<td>Social-humanistic elective</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>15</td>
</tr>
<tr>
<td>Spring</td>
<td>A.Math. 136</td>
<td>Calculus for Engineers II</td>
<td>4</td>
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<tr>
<td></td>
<td>Arch. E. 102</td>
<td>Descriptive Geometry</td>
<td>2</td>
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<td>E.Phys. 112</td>
<td>General Physics</td>
<td>4</td>
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<td>E.Phys. 114</td>
<td>Experimental Physics</td>
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<tr>
<td></td>
<td>C.S. 116</td>
<td>Elementary Programming for Scientists and Engineers</td>
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<td>Social-humanistic elective</td>
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**SOPHOMORE YEAR**

<table>
<thead>
<tr>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>Fall</td>
<td>C.E. 212</td>
<td>Analytical Mechanics I</td>
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<td>A.Math. 235</td>
<td>Calculus for Engineers III</td>
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<td></td>
<td>Basic science elective</td>
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<td>Social-humanistic elective</td>
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<td></td>
<td>Specialty requirement (structures and construction majors take C.E. 221; environmental majors take Arch. E. 382)</td>
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<td>3</td>
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<tr>
<td>Spring</td>
<td>Arch. E. 240</td>
<td>Building Materials and Construction</td>
<td>3</td>
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<tr>
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<td>C.E. 311</td>
<td>Analytical Mechanics II</td>
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<td></td>
<td>C.E. 312</td>
<td>Mechanics of Materials</td>
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<tr>
<td></td>
<td>A.Math. 236</td>
<td>Introduction to Linear Algebra and Differential Equations</td>
<td>3</td>
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<td></td>
<td>Ch.E. 210</td>
<td>Chemical and Physical Properties of Materials (Note 1)</td>
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**Construction Option**

**JUNIOR YEAR**

<table>
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<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Fall</td>
<td>Arch. E. 339</td>
<td>Basic Structural Analysis and Design</td>
<td>4</td>
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<tr>
<td></td>
<td>C.E. 314</td>
<td>Engineering Materials Laboratory</td>
<td>2</td>
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<tr>
<td></td>
<td>Arch. E. 354</td>
<td>Illumination I</td>
<td>3</td>
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<tr>
<td></td>
<td>Acct. 200</td>
<td>Introduction to Financial Accounting</td>
<td>3</td>
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<tr>
<td>Spring</td>
<td>Arch. E. 320</td>
<td>Architectural Appreciation and Design</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Social-humanistic elective</td>
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<td>3</td>
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**Spring Semester**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Arch. E. 322</td>
<td>Introduction to Managerial Accounting</td>
<td>3</td>
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<tr>
<td>C.E. 392</td>
<td>Analytical Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 301</td>
<td>thermodynamics</td>
<td>3</td>
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<tr>
<td>Arch. E. 422</td>
<td>Architectural Appreciation and Design</td>
<td>3</td>
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<tr>
<td>C.E. 495</td>
<td>Engineering Contracts</td>
<td>3</td>
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<tr>
<td>Technical elective</td>
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<td></td>
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**SENIOR YEAR**

**Fall Semester**

<table>
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<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Arch. E. 362</td>
<td>Mechanical Systems for Buildings</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 392</td>
<td>Analytical Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 441</td>
<td>Construction Costs, Estimating, and Pricing</td>
<td>3</td>
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<tr>
<td>Arch. E. 470</td>
<td>History/Philosophy I</td>
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<tr>
<td>Engineering science elective</td>
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<tr>
<td>Econ. 201</td>
<td>Principles of Microeconomics</td>
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**Spring Semester**

<table>
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<tbody>
<tr>
<td>C.E. 497</td>
<td>Engineering Economy</td>
<td>3</td>
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<tr>
<td>Arch. E. 446</td>
<td>Construction Planning and Scheduling</td>
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<tr>
<td>Arch. E. 471</td>
<td>History/Philosophy II</td>
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<tr>
<td>Econ. 202</td>
<td>Principles of Macroeconomics</td>
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<tr>
<td>Engineering science elective</td>
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<td>Minimum hours for degree</td>
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**Environmental (Illumination) Option**

**JUNIOR YEAR**

<table>
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<tr>
<th>Semester</th>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Fall</td>
<td>Arch. E. 339</td>
<td>Basic Structural Analysis and Design</td>
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<tr>
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<td>Arch. E. 354</td>
<td>Illumination I</td>
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<tr>
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<td>E.E. 302</td>
<td>Electric Circuits</td>
<td>3</td>
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<td>E.E. 343</td>
<td>Electrical Laboratory</td>
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<td>Arch. E. 470</td>
<td>History/Philosophy I</td>
<td>3</td>
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<td>C.E. 312</td>
<td>Mechanics of Materials</td>
<td>3</td>
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<tr>
<td>Spring</td>
<td>Arch. E. 456</td>
<td>Illumination II</td>
<td>3</td>
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<tr>
<td></td>
<td>Arch. E. 363</td>
<td>Introduction to Acoustics and Noise</td>
<td>3</td>
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<td>E.E. 403</td>
<td>Elements of Electronics</td>
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<td>E.E. 443</td>
<td>Elements of Electronics Lab</td>
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<td>Engr. 301</td>
<td>Thermodynamics</td>
<td>3</td>
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<td>Arch. E. 470</td>
<td>History/Philosophy II</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Arch. E. 467</td>
<td>Building Electrical Systems Design I</td>
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**SENIOR YEAR**

**Fall Semester**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Arch. E. 456</td>
<td>Luminous Radiative Transfer</td>
<td>3</td>
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<tr>
<td>Arch. E. 441</td>
<td>Construction Costs, Estimating, and Pricing</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 576</td>
<td>Power Distribution Systems</td>
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<tr>
<td>Arch. E. 320</td>
<td>Architectural Appreciation and Design</td>
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<tr>
<td>Social-humanistic elective</td>
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**Spring Semester**

<table>
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<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Arch. E. 459</td>
<td>Computer Applications in Lighting</td>
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</tr>
<tr>
<td>E.E. 435</td>
<td>Energy Utilization</td>
<td>3</td>
</tr>
<tr>
<td>M.E. 392</td>
<td>Heat Transfer</td>
<td>3</td>
</tr>
<tr>
<td>Arch. E. 331</td>
<td>Architectural Appreciation and Design</td>
<td>3</td>
</tr>
</tbody>
</table>

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Environmental (Mechanical) Option

JUNIOR YEAR

Fall Semester
Arch.E. 330. Basic Structural Analysis and Design 4
Arch.E. 334. Illumination I 3
E.E. 303. Electric Circuits I 3
E.E. 343. Electrical Laboratory I 1
Arch.E. 362. Mechanical Systems for Buildings 3
Arch. 476. History/Philosophy I 3

Spring Semester
Arch.E. 369. Introduction to Acoustics and Noise 3
C.E. 331. Theoretical Fluid Mechanics I 3
M.E. 312. Engineering Thermodynamics I 3
M.E. 362. Heat Transfer 3
Arch. 471. History/Philosophy II 3
Social-humanistic elective 3

Minimum hours for degree 18

SENIOR YEAR

Fall Semester
C.E. 332. Applied Fluid Mechanics 3
M.E. 313. Engineering Thermodynamics II 3
Arch.E. 320. Architectural Appreciation and Design 3
Technical elective 3
Social-humanistic elective 3

Spring Semester
Arch.E. 467. Building Electrical Systems Design I 3
Arch. 321. Architectural Appreciation and Design 3
Engineering science elective 3
Technical elective 6
Social-humanistic elective 3

Minimum hours for degree 18

Minimum hours for degree 136

Structures Option

JUNIOR YEAR

Fall Semester
C.E. 314. Engineering Materials Lab. 2
C.E. 360. Structural Analysis 3
Arch.E. 354. Illumination I 3
E.E. 303. Electric Circuits I 3
E.E. 343. Electrical Lab I 1
Arch. 320. Architectural Appreciation and Design 3
Social-humanistic elective 3

Spring Semester
C.E. 331. Theoretical Fluid Mechanics 3
C.E. 311. Analytical Mechanics II 3
Engr. 301. Thermoelasticity 3
Arch. 321. Architectural Appreciation and Design 3
Technical elective 3
M.E. 362. Heat Transfer or engineering science elective 3

Minimum hours for degree 18

SENIOR YEAR

Fall Semester
Arch.E. 362. Mechanical Systems for Buildings 3
C.E. 457. Design of Steel Structures 3
C.E. 456. Design of Timber Structures 2

Arch. 470. History/Philosophy I 3
Social-humanistic elective 3

Minimum hours for degree 136

Spring Semester
Arch.E. 470. Applied Structural Design 3
C.E. 458. Reinforced Concrete Design 3
Arch. 471. History/Philosophy II 3
Engineering science elective 3
Technical elective 3
Social-humanistic elective 3

Minimum hours for degree 136

Courses Available for Specialization

Upon consultation with their advisers, students must select courses applicable to their areas of interest and specialization. The areas of specialization are construction engineering and management, environmental engineering, 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.

Arch.E. 446-3. Construction Planning and Scheduling
Arch.E. 455-3. Illumination II
Arch.E. 456-3. Building Electrical Systems Design II
Arch.E. 470-3. Applied Structural Design
Acct. 203-3. Introduction to Managerial Accounting
Bus Ad. 410-3. Business and Government
H.E. 300-5. Business Law
C.E. 221-3. Plane Surveying
C.E. 332-3. Applied Fluid Mechanics
C.E. 360-3. Structural Analysis
C.E. 360-3. Introduction to Geotechnical Engineering
C.E. 456-3. Design of Timber Structures
C.E. 457-3. Design of Steel Structures
C.E. 458-3. Reinforced Concrete Design
C.E. 459-3. Applied Structural Design
C.E. 481-2. Intermediate Soils Engineering
C.E. 487-3. Engineering Economy
Econ. 201-3. Principles of Economics I
Econ. 202-3. Principles of Economics II
E.E. 408-2. Elements of Electronics
E.E. 443-1. Elements of Electronics Laboratory
E.E. 458-3. Energy
Fin. 401-3. Business Finance
M.E. 314-2. Measurements I
M.E. 316-2. Measurements II
M.E. 362-3. Heat Transfer
M.E. 371-2. Systems Analysis I
M.E. 372-3. Systems Analysis II
M.E. 421-3. Air Conditioning
M.E. 424-3. Refrigeration
M.E. 422-3. Mechanical Engineering Laboratory
Mk. 300-3. Principles of Marketing
R.Rs. 300-3. Principles of Real Estate Practice

Arch.E. Curriculum Note

1. Chem. 105-5 may be substituted for Ch.E. 210-4, in which case the technical level requirement is reduced by 1 credit hour.

GRADUATE STUDY

Graduate credit in architectural engineering is offered in the following courses:

C.E. 523-3. Construction Planning and Scheduling
C.E. 524-3. Engineering Contracts
C.E. 525-3. Construction Management
C.E. 529-3. Industrialized Building Techniques and Systems
Chemical Engineering

Office in Engineering Center OT 2-6
Professor Max S. Peters, Acting Chairman

Bachelor's Degree Requirements

The chemical engineering student must master the broad fields of organic and inorganic chemistry and be able to apply them on a large scale for a widely varied assortment of products. Among these are the whole range of petroleum products, plastics, detergents, synthetic and natural fibers, and many others. Production of these must be nonpolluting; the cleanup of pollution also requires the application of fundamental chemical engineering principles. Chemical engineers are actively engaged in meeting today's crises in oil and energy. Chemical engineers are currently redesigning chemical processes to conserve energy and are working on alternative sources of energy such as coal gasification, solar energy, and geothermal energy.

There is a natural affinity between chemical engineering and medicine, and the department emphasizes its special premedical and bioengineering program. Paralleling the technical courses are studies in literature, social sciences, and humanities.

Each student is requested to obtain close and careful counseling from the faculty. Students each year plan programs that will qualify them not only as chemical engineers but also for professional training in medical, law, or business schools or for graduate work in systems engineering or computing science. The department has several real-time process computers and an analog computer. Process control is stressed. The department believes that since no two students are alike, no two programs should be alike either. Students may carry out a portion of their studies in another country (see International Education). In particular, there is a junior year program of study in Monterrey, Mexico.

Options in the Chemical Engineering Curriculum

Curricular options have been established in fields of major importance and of particular interest. To follow one of these requires careful planning and course selection by student and adviser.

Bioengineering—Premedical Option. Since all biological systems are essentially intricate chemical machines, chemical engineering is a natural professional basis for either medical school or bioengineering research. The department has a strong undergraduate premedical program and graduate bioengineering research programs at both the M.S. and Ph.D. levels. The following courses comprise the central core of the bioengineering program: Ch. E. 370, Animal Engineering; Ch. E. 571, Molecular Bases of Behavior; Ch. E. 572, Neural Modeling; and Ch. E. 573/Psych 607, Brain/Mind Modeling. In addition, bioengineering premedical students are required to complete two semesters of general biology.

The graduate research program in bioengineering is strongly oriented to specialization in the neurosciences.

Environmental Engineering Option. Chemical engineers can make major contributions in the fields of pollution control, resource utilization, and environmental control. The environmental option is designed to emphasize biological and environmental sciences, the sociopolitical effects of engineering on the environment, and chemical engineering applications in environmental problems. The department has a strong interest in this field, including an active graduate program.

Computer Option. Modern machine computation continues to have a great impact on the practice of chemical engineering. The computer option allows the student to emphasize computer work, including the theory of computer operation, programming, and mathematical techniques for computer utilization. The department, the college, and the University have extensive, modern computing facilities.

Curriculum for B.S. (Ch.E.)

Freshman Year

Fall Semester

A. Math. 135, Calculus for Engineers I
Chem. 103, General Chemistry (Note 1)
C. S. 210, Fundamentals of Computing I
Eng. 390, Great Books (Note 2)
Ch. E. 130, Introduction to Chemical Engineering

Spring Semester

A. Math. 136, Calculus for Engineers II
Engr. 101, Engineering Drawing I
Chem. 106, General Chemistry (Note 1)
Ch. E. 201, Introduction to Chemical Engineering
Calculations
Eng. 281, Great Books (Note 2)

Sophomore Year

Fall Semester

A. Math. 235, Calculus for Engineers III
Chem. 331, Organic Chemistry
Ch. E. 241, Chemical Engineering Materials and Industrial Chemicals
E. Phys. 111, General Physics
Social-humanaistic elective (Note 3)

Spring Semester

A. Math. 236, Introduction to Linear Algebra and Differential Equations
Chem. 332, Organic Chemistry
Ch. E. 212, Chemical Engineering Material and Energy Balances
E. Phys. 112, General Physics
E. Phys. 114, Experimental Physics
Social-humanaistic elective (Note 3)

Junior Year

Fall Semester

Chem. 451, Physical Chemistry
or
Engr. 301, Thermodynamics
Ch. E. 321, Chemical Engineering Principles I
E. E. 333, Electric Circuits I
E. E. 443, Electrical Laboratory I
Social-humanistic elective (Note 3) .............................................. 3
Technical elective .................................................................. 3

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Spring Semester
Chem. 453. or
Chem. 452. Physical Chemistry ............................................ 3
Chem. 454. Physical Chemistry Laboratory ......................... 2
Ch.E. 322. Chemical Engineering Principles II ............... 4
Ch.E. 351. Engineering Statistics (or engineering science elective) 3
Ch.E. 432. Chemical Engineering Thermodynamics .......... 3
Social-humanistic elective (Note 3) .............................................. 3

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Junior Year

Fall Semester
Ch.E. 463. Chemical Engineering Laboratory (Note 4) .......... 4
Technical elective .................................................................. 4
Ch.E. 433. Chemical Engineering Reaction Kinetics ........ 3
Ch.E. 442. Organic and Polymeric Technology (Note 5) .... 3
Ch.E. 468. Chemical Engineering Process Dynamics ......... 3
Social-humanistic elective (Note 3) .............................................. 3

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Spring Semester
Technical elective

Ch.E. 463. Chemical Engineering Laboratory (Note 4) .......... 4
Ch.E. 462. Chemical Process Synthesis ......................... 4
Ch.E. 467. Instrumentation and Process Control (Note 5) ... 3
Social-humanistic elective (Note 3) .............................................. 3
Technical elective (Note 4) .................................................. 2

Minimum total hours for degree ........................................... 136

Ch.E. Curriculum Notes
1. See advisor concerning the requirement of Chem. 103.
2. Alternate literature courses in English and foreign languages are acceptable. Students should consult advisors.
3. Up to 6 hours of social-humanistic electives may be specified by the advisor during the four years.
4. Ch. E. 468 is required for graduation.
5. Technical elective may be substituted but must meet engineering science and design requirement.

GRADUATE DEGREE PROGRAMS

Major areas of current research interests in the department are catalysis and kinetics, energy, cryogenics, fluid dynamics, mass transfer, polymer processing, process control and optimization, surface phenomena, systems modeling, transport in porous media and thermodynamics. There is a strong emphasis on the application of chemical engineering to environmental, energy and industrial problems.

Master of Science Degree

A candidate for the Master of Science degree in chemical engineering must fulfill the following departmental requirements:
1. Twenty-seven semester hours of graduate work including a satisfactory thesis. Maximum credit of 6 semester hours will be allowed for the completion of the master's thesis. Twelve hours at the 500 level or above (excluding 6 hours of thesis) must be completed. Six to 9 semester hours are to be taken in a minor field approved by the Department of Chemical Engineering.
2. A final examination as required by the Graduate School on the thesis and/or course work must be passed.

It is expected that a qualified student can complete the master's degree in one and one-half 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. Programs will be arranged on an individual basis.

Three of the following core courses for the M.S. and Ph.D. degrees must be taken, including Ch.E. 575,
Ch.E. 507. Intermediate Chemical Engineering Thermodynamics
Ch.E. 539. Reaction Kinetics
Ch.E. 574. Advanced Chemical Engineering Calculations
Ch.E. 575. Transport Phenomena (Required)

A degree plan must be prepared at the beginning of the academic program in consultation with an advisory committee. The student is urged to maintain close contact with this advisory committee during the entire course of study.

The M.S. thesis committee must consist of three members, including two faculty members from the Department of Chemical Engineering.

Master of Engineering (M.E.) Degree Requirements

Admission. (The standards of admission to the M.S. program also apply to M.E. degree applicants.) A 3.0 overall undergraduate grade-point average is required for regular admission; a 2.75 overall undergraduate grade-point average is usually required for provisional acceptance.

M.E. Degree Adviser. All M.E. candidates should see the chemical engineering Master of Science degree adviser for counseling.

Requirements for Graduation. Nine hours of chemical engineering at the 500 level or above are required for those M.E. degree students enrolled in the Department of Chemical Engineering. The student will orally defend his written report as specified in the M.E. degree description. A comprehensive examination will be administered by the student's advisory committee on his report and course work. Television course credit will be given as approved by the committee.

Doctor of Philosophy Degree

Admission requirements for the Ph.D. include:

1. The applicant must have achieved an academic performance equivalent to a Master of Science degree from an accredited college or university, with a grade-point average substantially above the minimum normally required for the degree.
2. The applicant must show the ability to perform independent research.
3. The applicant must indicate a field of specialization and be acceptable as a thesis adviser to a member of 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 will be based on consideration of the above four criteria and decided by majority vote of the chemical engineering faculty.

College of Engineering and Applied Science / 129
A candidate for the Doctor of Philosophy degree must meet the requirements as described under Requirements for Advanced Degrees in the Graduate School section. A minimum of 30 semester hours of courses numbered 500 or above is required for the degree. Twelve hours should be taken outside the Department of Chemical Engineering.

The Ph.D. dissertation committee must consist of five members, including at least three from the Department of Chemical Engineering and at least one from outside the department. A regular faculty member of the department must be chosen to act as chairman of the committee.

CIVIL, ENVIRONMENTAL, AND ARCHITECTURAL ENGINEERING

Office in Engineering Center OT 4-34
Professor George G. Goble, Chairman

BACHELOR'S DEGREE REQUIREMENTS

This curriculum requires the student to obtain a good 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 literature, the social sciences, or to selected courses in engineering which emphasize the impact of engineering on people and their problems.

Advanced technical courses are elected in the senior year. Random selection is not allowed, the objective being to permit a graduate to enter the engineering profession with a firm groundwork in fundamental engineering science and adequate knowledge in specialized fields. Students should consult their advisers.

A five-year program has been arranged for those students who wish to pursue the combined curriculum for the civil engineering and business degrees. ROTC students taking the combined curriculum will require at least one summer of course work in addition to the five years.

A student interested in a premedical option should consult with an adviser and the department chairman at the earliest possible time in order to make proper plans for an acceptable program (see Premedical Option).

Curriculum for B.S. (C.E.)

FRESHMAN YEAR

Fall Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>C.E. 130</td>
<td>Intro. to Civil Engineering</td>
<td>2</td>
</tr>
<tr>
<td>A.Math. 135</td>
<td>Calculus for Engineers I</td>
<td>4</td>
</tr>
<tr>
<td>E.Phys. 111</td>
<td>General Physics</td>
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<tr>
<td>C.S. 110</td>
<td>Elementary Programming for Scientists and Engineers</td>
<td>3</td>
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<td>Social-humanistic elective (Note 1)</td>
<td>3</td>
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Spring Semester

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<tr>
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<th>Course Title</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>C.E. 221</td>
<td>Plane Surveying</td>
<td>3</td>
</tr>
<tr>
<td>A.Math. 136</td>
<td>Calculus for Engineers II</td>
<td>4</td>
</tr>
<tr>
<td>Engr. 101</td>
<td>Engineering Drawing I</td>
<td>2</td>
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Sophomore Year

Fall Semester

<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>C.E. 212</td>
<td>Analytical Mechanics I</td>
<td>3</td>
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<tr>
<td>C.E. 241</td>
<td>Introduction to Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>A.Math. 235</td>
<td>Calculus for Engineers III</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 100/200</td>
<td>General Chemistry (or Ch.E. 210)</td>
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<td>Social-humanistic elective (Note 2)</td>
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Spring Semester

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<tbody>
<tr>
<td>C.E. 312</td>
<td>Mechanics of Materials</td>
<td>3</td>
</tr>
<tr>
<td>Geol. 337</td>
<td>Geology for Engineers</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 330</td>
<td>Transportation Engineering</td>
<td>3</td>
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<tr>
<td>A.Math. 239</td>
<td>Introduction to Linear Algebra and Differential Equations</td>
<td>3</td>
</tr>
<tr>
<td>Social-humanistic elective (Note 3)</td>
<td>3</td>
<td></td>
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Junior Year

Fall Semester

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<th>Course Code</th>
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<tbody>
<tr>
<td>C.E. 311</td>
<td>Analytical Mechanics II</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 331</td>
<td>Theoretical Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 380</td>
<td>Soils and Foundation Engineering</td>
<td>3</td>
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<tr>
<td>C.E. 314, C.E. 315, or C.E. 318, Engineering Materials Laboratory</td>
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<td>Engineering science elective (Note 4)</td>
<td>3</td>
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<tr>
<td>Social-humanistic elective (Note 5)</td>
<td>3</td>
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Spring Semester

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>C.E. 332</td>
<td>Applied Fluid Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 350</td>
<td>Structural Analysis</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 303</td>
<td>Electric Circuits I</td>
<td>3</td>
</tr>
<tr>
<td>Engr. 301</td>
<td>Thermodynamics</td>
<td>3</td>
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<tr>
<td>Social-humanistic elective (Note 7)</td>
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Senior Year

Fall Semester

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<tr>
<th>Course Code</th>
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<th>Semester Hours</th>
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<tbody>
<tr>
<td>C.E. 457</td>
<td>Design of Steel Structures</td>
<td>3</td>
</tr>
<tr>
<td>Technical electives (Note 8)</td>
<td>7</td>
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<tr>
<td>Engineering science elective</td>
<td>3</td>
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<tr>
<td>Social-humanistic elective (Note 9)</td>
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Spring Semester

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<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>C.E. 436</td>
<td>Reinforced Concrete Design</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 439</td>
<td>Senior Seminar</td>
<td>1</td>
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<tr>
<td>Technical electives</td>
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<tr>
<td>Engineering science elective (Note 10)</td>
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<td>Social-humanistic elective (Note 11)</td>
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</tbody>
</table>

Minimum hours for degree 185

C.E. Curriculum Note

1. Each student must take not less than 6 hours of literature.

GRADUATE DEGREE PROGRAMS

A pamphlet on the requirements for graduate study in civil, environmental, and architectural engineering is available from the departmental office.
No qualifying examination is required by the department for the Master of Science degree; however, in competition for University and other fellowships, the Graduate Record Examination, consisting of the aptitude tests and the advanced test in engineering, is used in the evaluation of candidates. Therefore, students are advised to take this examination prior to their arrival on campus.

**COMPUTER SCIENCE**

*Office in Engineering Center, ECOT 7-7*  
*H. Paul Zeiger, Chairman*

The Department of Computer Science offers a number of undergraduate service courses as well as M.S. and Ph.D. graduate programs. Although the department does not offer an undergraduate major in computer science, students may create various undergraduate programs in which computer science plays a strong role. Options are available in electrical engineering, business, mathematics, and distributed studies. Information on these programs may be obtained from the Computer Science Department and from the offices of the departments mentioned. It is suggested that students interested in computer science take the following course sequence: C.S. 210-310, 401, 413, 445, 453, 459, and 465, along with other computer courses which match the student's area of interest. Mathematics, electrical engineering, and business majors may select an option in computer science. Computer science courses which are application oriented will be taught as service courses to students of computer science and other fields.

Other courses and programs offered by or jointly with the Department of Computer Science are described in the Graduate School section.

**GRADUATE DEGREE PROGRAMS**

*General Admission Requirements*

The Computer Science Department offers the following areas of study: automata theory, programming languages, operating systems, information systems, and numerical analysis. A graduate student should consider a major in computer science if he is primarily interested in the general aspects of computational processes, both theoretical and practical, e.g., theory of algorithms, methods by which algorithms are implemented on a computer, and information structures. A student who is primarily interested in the results of a computer process and its relation to a particular area of application should major in another field and consider a minor in computer science.

Applicants will be favorably considered for graduate study in computer science if they hold at least a bachelor's degree or its equivalent from an institution comparable to the University of Colorado. They should have considerable programming experience and sufficient mathematical maturity to understand pure mathematics courses.

The applicant should satisfy the following requirements for mathematics courses: at least three semesters of university-level calculus and at least two one-semester courses of a mathematical nature beyond calculus, for example, advanced calculus, differential equations, linear algebra, probability, statistics, combinatorial analysis, etc. These courses need not be in a mathematics department; however, they should require mathematical maturity expected of an upper level mathematics undergraduate.

In computer science, the applicant should offer the equivalent of the following University of Colorado courses (the contents of which are outlined later in the catalog): C.S. 210-310, 401, 445, 453, and 456.

Applicants should have a grade-point average of at least 3.0 (on a scale of 4.0). Applicants having the listed qualifications will, if accepted, be classified as regular degree students. Applicants with an average below 3.0 and above 2.75 and/or lacking certain of the prerequisites, as indicated, will be considered on an individual basis. Students accepted in this category will be classified as provisional degree students.

All applicants who wish to be considered for financial aid should have their applications in by February 15 preceding the academic year in which they plan to enroll. Financial aid opportunities exist through research assistant and teaching assistant positions and through work at selected area industries in a one-year internship program.

All Ph.D. applicants and any applicants who wish to apply for financial aid must submit scores from the Verbal, Quantitative, and Advanced sections of the Graduate Record Examination. Applicants with a grade-point average near or below 3.0 should also submit G.R.E. scores, as they weigh heavily in deciding borderline cases.

The Ph.D. applicant must satisfy the same entrance requirements as those noted above for the M.S. degree. In addition, strong academic and problem-solving abilities should have been demonstrated.

Ph.D. applications should be submitted by January 15 preceding the academic year in which the applicant wishes to enroll. M.S. applications should be submitted by April 1 preceding the fall semester and by October 1 preceding the spring semester in which the applicant wishes to enroll.

**Master's Degree**

Admission requirements for this program are given above under general admission requirements. Plan I or Plan II may be followed. The requirements for Plan I (thesis) are as stated under the general requirements of the Graduate School in the Graduate School section. Students in Plan I and Plan II must pass a written comprehensive examination. Students in Plan I are examined orally on their theses. Under Plan II (no thesis) a student must take C.S. 701 (3 hours), do independent reading from a list supplied by the department, and be examined orally on this material. Under Plan I or Plan II a student may take 6 hours in a minor field. Students are expected to work out an acceptable program of course work with their adviser. Specific courses depend on the student's background and field of specialization.

**Doctor's Degree**

Admission requirements for this program are given above under general admission requirements. Students
in this program must pass a preliminary examination to be eligible for admission to Ph.D. candidacy. This examination consists of participation in a special seminar involving the solution of a variety of problems in computer science and a written examination covering elementary topics in computer science. The language requirement is as stated under the general requirements of the Graduate School. A minimum of 30 semester hours in courses numbered 500 or above is required for the degree, but the number of hours in formal courses will ordinarily be greater than this. 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, the student is 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.

**ELECTRICAL ENGINEERING**

*Office in Engineering Center OT 2-32
Professor Frank S. Barnes, Chairman*

**BACHELOR'S DEGREE REQUIREMENTS**

The electrical engineering department offers two options. One focuses primarily upon either electronics or energy and power. The other offers specialization in electrical engineering and computer science. Within these standard options seniors may elect several courses from various areas of concentration. These include:

- Circuit logic, computer software and computer design and application
- Electromagnetic field propagation associated with radio and related areas
- Signal processing, communications, and communications systems
- Electrical devices, from rotating machines and vehicles to lasers
- Power equipment and systems, solid-state devices, solid-state materials, integrated circuit fabrication techniques
- Modeling of systems related to electrical engineering
- Selected undergraduate students may participate in bioelectronics research

Within these areas of specialization the fields are so numerous it is impossible for the four years of training to cover them in detail. Students may acquire specialization in a research field through graduate work beyond the bachelor's degree either at the University or through courses available through special continuing education programs. The curriculum in electrical engineering is designed to make it possible for the graduating senior with high scholarship to finish a master's degree in electrical engineering in about one additional full year of work at any of the nation's major universities.

Study of the principles of computing, physics, chemistry, mathematics, and electric circuits form the common core of the first two years. Early, intensive training in the theory and laboratory application of electrical circuits is necessary. In the third year students learn more fundamentals in electronic circuits, electromagnetic and transmission theory, electrical machines and transformers, heat, and mechanics. Starting in their third year, those in the computer science option will learn more fundamentals of programming and computer hardware. In the summer between the junior and senior years, many students find an opportunity to put their knowledge to work with jobs in industry or research projects being conducted at the University. In the senior year students elect courses from a wide variety of subject matter to fit their particular interests. Throughout the entire four years, students reinforce their understanding of theory in well-equipped laboratories.

Students are also encouraged to develop interests outside of their electrical engineering specialty. Each student enters in at least one nontechnical subject each semester usually in the College of Arts and Sciences, thus obtaining a well-rounded background and a sense of awareness and responsibility for a professional role in society. Students are urged to attend meetings of their student professional society, where practicing engineers from many engineering specialties speak.

The curriculum is arranged so that qualified transfer students may join the program without appreciable loss of time or credit. For example a transfer student who has completed the mathematics and physics of the freshman and sophomore years and who has a total of about 68 credit hours acceptable to the department could obtain the degree in four semesters.

**Standard Curriculum for B.S. (E.E.)**

In the standard curriculum the student has considerable freedom in electives during the senior year. These electives can provide a good foundation in several of the seven electrical engineering areas. Some of these electives may be used for courses approved by their adviser in other branches of engineering or in other colleges. Students primarily interested in taking courses in the digital or computer area may do so in this curriculum or in the Computer Option Curriculum discussed below. If they do not care to take all the courses required in the latter curriculum they may prefer to use the standard curriculum to strengthen their knowledge in computers.

Students interested in premedical programs should inquire at the departmental office as early as possible.

**Computer Option Curriculum for B.S. (E.E. and C.S.)**

This option is selected by the student at the beginning of the junior year and covers both hardware and software aspects of computer system design. This program is administered in cooperation with the Department of Computer Science. It is directed toward students whose major interests are in the computer itself and in a broad range of applications. The program leads to a B.S. (E.E. and C.S.) and can be extended for one year to obtain either an M.S. in computer science or an M.S. in electrical engineering.
The details of the program are listed in the E.E. and C.S. curriculum. This curriculum includes mathematics courses that provide a basis for graduate work in computer-related fields and permits inclusion of courses in logic circuits, scientific application of computers, logic structure of computers, and assembly language programming. The student obtains operating experience with the departmental computers. For other computer-related programs, see the Computer Science listings.

**Combined Business Option**

Students who take the combined engineering-business program should not start this program until their fourth year, with the exception of electing Econ. 201 and 202 for two of their social-humanistic electives. They should check with the electrical engineering department office during the latter part of the junior year.

**Curriculum for B.S. (E.E.) and B.S. (E.E. and C.S.)**

### Freshman Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Hours</th>
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<tbody>
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<tr>
<td>A.Math. 135, Calculus for Engineers I</td>
<td>4</td>
</tr>
<tr>
<td>E.Phys. 111, General Physics</td>
<td>4</td>
</tr>
<tr>
<td>Egr. 101, Engineering Drawing I (Note 9)</td>
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<tr>
<td>E.E. 130, Problems and Methods of Modern Electrical Engineering</td>
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<td><strong>Total</strong></td>
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<tr>
<td>A.Math. 135, Calculus for Engineers II</td>
<td>4</td>
</tr>
<tr>
<td>E.Phys. 112, General Physics</td>
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<tr>
<td>E.Phys. 114, Experimental Physics</td>
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<td>E.E./C.S. 210, Introduction to Computing (Note 3)</td>
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<tr>
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<td><strong>Total</strong></td>
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### Sophomore Year

<table>
<thead>
<tr>
<th>Semester</th>
<th>Hours</th>
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<tbody>
<tr>
<td>Fall Semester</td>
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<tr>
<td>A.Math. 235, Calculus for Engineers III</td>
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<tr>
<td>E.Phys. 213, General Physics</td>
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<td>E.E. 213, Experimental Physics</td>
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<td>E.E. 213, Circuit Analysis I</td>
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<tr>
<td>E.E. 255, Circuits Laboratory I (Note 5)</td>
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<td>Social-humanistic elective (Note 2)</td>
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<td>E.E. 257, Logic Circuits (Note 1)</td>
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<tr>
<td>Spring Semester</td>
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<tr>
<td>Math. 313 or A. Math. 235, Introduction to Linear Algebra or Introduction to Linear Algebra and Differential Equations (Notes 4 and 5)</td>
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<tr>
<td>Chem. 202 or Ch.E. 210, General Chemistry or Chemical and Physical Properties of Matter</td>
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<tr>
<td>E.E. 214, Circuit Analysis II</td>
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<tr>
<td>E.E. 254, Circuits Laboratory II</td>
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<td>E.E. 351, Introduction to Computer Engineering</td>
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### Junior Year

**Curriculum for B.S. (E.E.) Option (Commencing the Junior Year)**

<table>
<thead>
<tr>
<th>Semester</th>
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<tbody>
<tr>
<td>Fall Semester</td>
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<tr>
<td>E.E. 313, Electromagnetic Fields I</td>
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<tr>
<td>E.E. 321, Electromagnetics I</td>
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</tr>
<tr>
<td>South-eastern Laboratory I</td>
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<tr>
<td>Social-humanistic elective (Note 2)</td>
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</tr>
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</table>

**Spring Semester**

| E.E. 314, Electromagnetic Fields II | 2 |
| E.E. 322, Electromagnetics II | 3 |
| E.E. 316, Energy Conversion I | 3 |
| E.E. 354, Power Laboratory I | 2 |
| E.E. 362, Electronics Laboratory II | 2 |
| Social-humanistic elective (Note 2) | 3 |
| Technical elective | 2 |
| **Total** | **18** |

### Senior Year

**Fall Semester**

| E.E. 313, Electromagnetic Fields I | 3 |
| E.E. 321, Electromagnetics I | 3 |
| E.E. 361, Electronics Laboratory I | 2 |
| E.E. 351, Introduction to Probability Theory | 3 |
| E.E. 401, Introduction to Programming Language and Processors | 3 |
| E.E. 458, Logic Laboratory | 1 |
| Math 465, Numerical Analysis | 3 |
| **Total** | **18** |

**Spring Semester**

| E.E. 314, Electromagnetic Fields II | 3 |
| E.E. 322, Electromagnetics II | 3 |
| E.E. 331, Linear Systems Theory | 3 |
| E.E. 459, Computer Organization | 3 |
| Social-humanistic elective (Note 2) | 3 |
| **Total** | **18** |

### Junior Year

**Fall Semester**

| Math 413, Advanced Finite Mathematics I | 3 |
| E.E. 453, Assembly Language Programming | 3 |
| Social-humanistic elective (Note 2) | 3 |
| Technical elective (Note 7) | 8 |
| **Total** | **17** |

**Spring Semester**

| E.E. 456, Computer Laboratory | 2 |
| Social-humanistic elective (Note 2) | 3 |
| Technical elective | 9 |
| Advanced hardware course (Note 8) | 3 |
| **Total** | **17** |

**E.E. and E.E./C.S. Curricula Notes**

1. E.E. 257 will be waived for students who have taken E.E. 124.
2. Social-humanistic electives (3 hours required) must be chosen to include not less than 6 hours of literature plus at least 6 hours in

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*College of Engineering and Applied Science / 133*
The electrical engineering department does not require a sequence of two courses in one area. Upper division students are expected to take upper division social-humanelectives.

3. ECE 230 and ECE 233 (Introduction to Computing and Circuits Laboratory I) may be a repetition of material covered in high school or through practical experience by some students. If this seems to be the case, the student should request a waiver of the course in question from his advisor prior to or during the first week of the semester in which the student is registered for the course.

4. The mathematics requirement in the spring semester of the sophomore year of the standard B.S. (E.E.) option may be satisfied either by A. Math. 236 or any mathematics course with a number higher than 240 except Math. 481.

5. For those considering the ECE/C.S. option, Math. 313 should be taken at this time.

6. The mechanics requirement of the B.S. (E.E.) sequence may be satisfied by the 3-hour course C.E. 313 or the 6-hour sequences of either C.E. 212 and 213, or EPhys. 321 and 322.

7. The elective hours prescribed for the senior year are designed to allow students to develop some breadth in electrical engineering as well as to develop some depth in areas in which they are most likely to concentrate after graduation. Usually these courses will be taken in electrical engineering, mathematics, and physics at the 300, 400, or 500 levels. In all cases the approval of the student's undergraduate adviser is required.

8. In selecting these electives, students should note that electrical engineering courses at the 400 and 500 levels are separated into the following seven areas: Communications (C), Digital (D), Electronics (E), Fields (F), Materials (M), Power (P), and Systems (S). Seniors may elect courses from any of these areas but, in order to insure a minimum breadth of studies, every student's program must include at least 9 semester hours of electrical engineering theory courses distributed in three different areas. Also, every student must elect a minimum of three electrical engineering laboratory courses from three different areas. Independent study (ECE 340 and ECE 350) may be used only once to satisfy part of the distribution requirements. Courses at the 400 and 500 level without a letter designation may not be used to satisfy the distribution requirement. Of the senior technical electives, a minimum of 5 hours must be in engineering design.

9. Advanced hardware courses are ECE 551, 559, or another 400- or 500-level course approved by a C.E. adviser.

10. This requirement may be waived upon completion of one year of mechanical drawing in high school.

11. Election of the ECE/C.S. option will be made during the first semester of the junior year.

The student who has good grades and is interested in graduate work should certainly take additional mathematics. Some preliminary counseling with a department graduate adviser is desirable.

Some students, after satisfying their minimum electrical engineering requirements, may wish to use part of their remaining elective hours in areas other than electrical engineering, mathematics, or physics. With written approval of their adviser, they can take additional courses in other departments of the University. One restriction on these electives is that there may be no performance courses such as those in music or physical education.

GRADUATE DEGREE PROGRAMS

The electrical engineering graduate programs leading to the M.S. and Ph.D. degrees cover the areas of biomedical engineering, materials and quantum electronics, information systems, energy conversion and systems, control theory, circuits and electronics, fields and propagation, and computers. The department works in close cooperation with the National Bureau of Standards and other organizations in the Boulder area, and its research capability is strengthened by the addition of additional faculty members from these institutions.

Requirements for Advanced Degrees

The student should obtain a copy of the specific electrical engineering requirements by writing to the Director of Graduate Admissions, Electrical Engineering Department, Campus Box 425, Boulder, Colorado 80309. A student formally accepted into the graduate program will be assigned a program advisor.

Master's students are expected to include two semesters of graduate seminar (without credit) in their programs and to present a thesis under Plan I unless specifically exempted by the department.

The Ph.D. preliminary examination will include the following areas:

- Circuits (active, passive, models)
- Energy conversion
- Communication theory
- Physical and electronic computers
- Control theory
- Electrical and magnetic fields
- Mathematics
- Physical electronics
- Semiconductor electronics
- Networks

Each student must complete two sections of the examination, mathematics and the area in which he plans to specialize, and must present an acceptable master's thesis or the equivalent as an indication of ability to perform independent research.

Each semester several courses are taught under the special topics classification. Typical courses taught during the last several years include:

- Signal Processing for Remote Probing
- Computer Memory and Storage
- Nonlinear Optics
- Crystal Physics
- Foundations of Plasma Physics
- Interaction of Light and Sound
- Lightning Transients
- Conduction in Metals at Low Temperatures
- Pulse Response of Transmission Lines
- Error Correcting Codes
- Problems in Pattern Recognition
- Decision Theory
- Semiconductor Diode Lasers
- Computerized Design of Networks

The department is involved in an interdisciplinary study leading to an M.S. degree in telecommunications, details of which are shown under Telecommunications in this bulletin.

ENGINEERING PHYSICS

Office in Duane Building E-032
Professor Chris Zafiratos, Chairman

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 which may be incorporated in the curriculum make it possible for the student to prepare himself 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 fields will require careful selection of their engineering electives. Students are urged to prepare, in consultation with a
departmental adviser, a coherent plan of courses to meet their professional objectives.

During the freshman and sophomore years, the student must attain a thorough training in mathematics and a grounding in fundamental methods and principles of the physical sciences.

During the junior and senior years the work in physics is extended to provide a comprehensive knowledge of the various branches of physics such as nuclear physics, atomic physics, electronics, thermodynamics, mechanics, electricity and magnetism. Individual initiative and resourcefulness are stressed.

For purposes of Federal Civil Service requirements this degree is an engineering degree from an accredited College of Engineering. Students who plan to become registered professional engineers should check the requirements for registration in their state before choosing their engineering electives.

It is recommended that students preparing for graduate school also prepare for its foreign language requirement as part of their undergraduate curriculum.

In order to earn a bachelor's degree in engineering physics from the Department of Physics, a student must, in addition to any other requirements, successfully complete 30 semester hours of courses on the Boulder Campus, including 12 semester hours in upper division physics courses.

Applied Physics Option

It is also possible to earn the degree Bachelor of Science (Engineering Physics) with an applied physics option. This option differs from the regular engineering physics degree primarily in that fewer advanced theoretical physics courses are required and in their place a selection of applied science courses is required. This option should not be selected by students intending to pursue graduate study in physics, but it is appropriate for students intending to pursue graduate work or employment in related fields such as geophysics, environmental science, oceanography, nuclear engineering, medicine, and law. Students intending to pursue this option should consult an adviser by the beginning of their junior year regarding the electives which they wish to propose. The 24 hours of electives in pure or applied natural science must be approved by the engineering physics advising committee. The committee will consider the proposed courses relative to the student's stated educational and/or professional objectives. At least 30 semester hours of credit must be earned after the student's proposed program is approved.

Curriculum for B.S. (E.Phys.) (Note 1)

**FRESHMAN YEAR**

*Semester Hours*  
**Fall Semester**  
A.Math. 135. Calculus for Engineers I 4  
Engr. 101. Engineering Drawing I 2  
Social-humanistic electives (Note 2) 6  
E.Phys. 111. General Physics 4  
18

**Spring Semester**  
A.Math. 136. Calculus for Engineers II 4  
Social-humanistic electives (Note 2) 6  
10

** Sophomore Year**

*Semester Hours*  
**Fall Semester**  
A.Math. 236. Calculus for Engineers III 4  
Social-humanistic elective (Note 2) 3  
E.Phys. 213. General Physics 3  
E.Phys. 215. Experimental Physics 1  
Electives (Note 2) 6  
17

**Spring Semester**  
A.Math 236. Introduction to Linear Algebra and Differential Equations 3  
Chem. 202. General Chemistry (Note 4) 4  
Social-humanistic elective (Note 2) 3  
E.Phys. 214. Introductory Modern Physics 3  
Electives (Note 2) 5  
18

**Junior Year**

*Semester Hours*  
**Fall Semester**  
Upper division mathematics elective 3  
E.Phys. 317. Junior Laboratory 2  
E.Phys. 321. Classical Mechanics 3  
E.Phys. 331. Principles of Electricity and Magnetism 3  
Social-humanistic elective (Note 2) 8  
Elective (Note 3) 3  
17

**Spring Semester**  
E.Phys. 318. Junior Laboratory 2  
E.Phys. 322. Classical Mechanics and Quantum Mechanics 3  
E.Phys. 332. Principles of Electricity and Magnetism 3  
E.Phys. 341. Thermodynamics and Statistical Mechanics 3  
Chem. 453. Physical Chemistry (Note 5) 3  
Chem. 454. Physical Chemistry Laboratory (Note 5) 2  
16

**Senior Year**

*Semester Hours*  
**Fall Semester**  
E.E. 403. Elements of Electronics 2  
E.E. 443. Elements of Electronics Laboratory 1  
E.Phys. 491. Atomic and Nuclear Physics 3  
E.Phys. 496. Senior Laboratory 2  
Electives (Note 3) 6  
Social-humanistic elective (Note 2) 3  
17

**Spring Semester**  
E.Phys. 492. Atomic and Nuclear Physics 3  
E.Phys. 496. Senior Laboratory (Note 5) 2  
Electives (Note 3) 12  
17

Curriculum for B.S. (E.Phys.)—Applied Physics Option

The first five semesters are identical to those of the regular engineering physics curriculum.

**Junior Year**

**Spring Semester**  
E.Phys. 323. Classical Mechanics and Quantum Mechanics 3  
E.Phys. 333. Principles of Electricity and Magnetism 3  

College of Engineering and Applied Science / 135
Earlier industrial engineers were frequently called efficiency experts. More recent identification has included the terms systems engineers and operations researchers. The current need is for what might be called a productivity engineer. Productivity may be defined as the process of providing in the most efficient manner any end result that the public demands. All industrial nations compete for increasingly scarce resources for manufacturing as well as for markets for their products. High rates of productivity are necessary to minimize manufacturing costs and maximize a country’s competitive position. Significantly, the rates of productivity growth in the United States since World War II have been the lowest of those among the eleven major industrial nations.

In a very real sense, the industrial engineer has the basic responsibilities of providing leadership in generating alternative courses of action to reduce costs and increase productivity through both technological changes and improvement in human performance and of providing leadership in evaluating technically and economically such alternatives and in the implementation of the desired alternatives.

Such responsibilities have technical, social, economic, and political components, and there is an increasing need to assess the impacts of various courses of action upon the individual and society.

Industrial engineering is the only major branch of engineering concerned with people as well as things, which makes industrial engineers a prime source of management talent. Thus, industrial engineering represents a considerable departure from the purely technological point of view, which holds that there are no longer any insurmountable barriers to the solution of the physical aspects of historical human problems.

In the improvement of productivity, today’s engineer must accept that he or she is also responsible for making technology compatible with the environment and with human needs. Engineering problems increasingly refuse to remain within the ordered confines of established engineering disciplines.

INDUSTRIAL ENGINEERING

Office in Engineering Center OT 47
Mechanical Engineering Department
Professor Robert A. Christopher, Chairman

BACHELOR’S DEGREE REQUIREMENTS

Industrial Engineering concerns itself primarily with problems which involve effectiveness and efficiency in the use of money, materials, time, energy, and human effort. The ever-increasing demands on each of these resources, coupled with diminishing supplies (particularly of energy and materials), means that more must be done with fewer resources. A substantial increase in industrial productivity has become one of the top priorities in the U.S. economy.

Industrial engineering employs the principles and methods of engineering analysis and design together with the knowledge and skills of the physical and social sciences. Complex problems in manufacturing, health systems, transportation, and similar operational areas require an integrated systems approach, utilizing mathematics, statistics, simulation, computer science, and operations research techniques to maximize the productive utilization of all resources.
Phys. 112. General Physics ........................................ 4
Phys. 114. Experimental Physics .................................. 1
A.Math. 235. Calculus for Engineers III ...................... 4
Social-humanistic elective ........................................ 3

Spring Semester
M.E. 212. Engineering thermodynamics I ....................... 3
M.E. 282. Mechanics II .......................................... 3
Phys. 213. General Physics ....................................... 3
Phys. 215. Experimental Physics ................................ 1
A.Math. 236. Introduction to Linear Algebra and
Differential Equations ............................................ 3
Social-humanistic elective ........................................ 3

Junior Year

Fall Semester
I.E. 303. Computers in Industrial Engineering ................ 3
I.E. 351. Engineering Statistics .................................. 3
M.E. 301. Introduction to Materials Science I .............. 3
M.E. 314. Measurements I ....................................... 3
M.E. 352. Heat Transfer .......................................... 2
C.E. 312. Strength of Materials ................................ 3

Spring Semester
I.E. 331. Industrial Cost Analysis ................................ 3
I.E. 397. Engineering Economics ................................ 3
M.E. 316. Measurements II ...................................... 2
C.E. 331. Fluid Mechanics ....................................... 3
E.E. 303. Circuits I ............................................... 3
Social-humanistic elective ......................................

Senior Year

Fall Semester
I.E. 441. Introduction to Operations Research ............... 3
I.E. 465. Human Factors ......................................... 3
M.E. 414. Mechanical Engineering Design I ................. 3
E.E. 403. Elements of Electronics ....................... 2
E.E. 443. Elements of Electronics Laboratory ............. 1
Technical Elective ............................................... 3

Spring Semester
I.E. 431. Production Automation Systems ..................... 3
I.E. 460. Senior Project ......................................... 3
Social-humanistic electives ..................................... 6
Technical elective .................................................

Minimum total hours for degree ............................... 136

I.E. Curriculum Notes
1. In fulfilling the social-humanistic requirement of 24 semester
   hours, students must complete a minimum of two literature courses.
2. I.E. business students should include Econ. 201 and 202 among
   their social-humanistic courses.
3. Up to 6 hours of ROTC credit may be acceptable, consistent
   with College of Engineering recommendations.

MECHANICAL ENGINEERING
Office in Engineering Center OT 4-7
Professor Robert A. Christopher, Chairman

BACHELOR'S DEGREE REQUIREMENTS
The mechanical engineering curriculum begins with
a strong emphasis on mathematics, physics, and
chemistry. It continues with a concentration in engi-
neering sciences such as solid and fluid mechanics;
thermodynamics, heat and mass transport; materials;
and systems analysis and control. It concludes with
laboratory and design courses which demonstrate the
ways in which scientific knowledge is applied in the
design and development of useful devices and
processes.

The mechanical engineering program may be roughly
subdivided into two-year groupings. In the first two
years, the program emphasizes the fundamentals of
those engineering sciences that are essential for an
understanding of most branches of professional engineer-
ing. Because broad and varied demands are imposed on
the mechanical engineer, the department provides two
plans—A and B—for the curriculum leading to the
degree Bachelor of Science in mechanical engineering.
The plans are designed to accommodate the profes-
essional objectives of the individual student.

Plan A specifies a typical mechanical engineering
curriculum and is intended for students who wish to
obtain a broad, general education in mechanical engineering
without an emphasis on any of the specific
professional aspects.

Plan B is designed for students who know what they
intend to do upon graduation. It allows the student to
pursue any course plan that meets a valid professional
objective and has been approved by the undergraduate
adviser. Under Plan B, the specific requirements of
the program are determined after a detailed conference
with the adviser. In the course of this conference, the
professional objectives of the individual student are
studied in detail, and a specific plan (with a minimum
of 136 credit hours) is designed to meet these objec-
tives. With liberal use of courses throughout the
University, the following may be considered typical
among the professional concentrations which can be
achieved:

<table>
<thead>
<tr>
<th>Thermodynamics</th>
<th>Design</th>
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<tbody>
<tr>
<td>Heat transfer</td>
<td>Power</td>
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<tr>
<td>Fluid mechanics</td>
<td>Dynamics and controls</td>
</tr>
<tr>
<td>Solid mechanics</td>
<td>Materials science</td>
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<td>Electromechanical systems</td>
<td>Premedicine</td>
</tr>
<tr>
<td>Industrial engineering</td>
<td></td>
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Curriculum for B.S.(M.E.)

FRESHMAN YEAR

Fall Semester
Engl. 269. Great Books (Note 1) ............................. 3
A.Math. 135. Calculus for Engineers I ..................... 4
M.E. 130. Introduction to Mechanical Engineering ........ 2
Chem. 103. General Chemistry ................................ 5

Spring Semester
Engl. 261. Great Books (Note 1) ............................. 3
EPhys. 111. General Physics ................................ 4
A.Math. 136. Calculus for Engineers II ................... 4
Engr. 101. Engineering Drawing I ............................ 2
M.E. 131. Manufacturing Processes
(or other approved elective) ................................. 2
Social-humanistic elective ..................................... 3

College of Engineering and Applied Science / 137
**Sophomore Year**

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<th>Fall Semester</th>
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<tbody>
<tr>
<td>M.E. 281. Mechanics I</td>
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<td>M.E. 205. Introduction to Computer-Aided Design</td>
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<tr>
<td>E.Phys. 112. General Physics</td>
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<tr>
<td>E.Phys. 114. Experimental Physics</td>
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</tr>
<tr>
<td>A.Math. 235. Calculus for Engineers III</td>
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<tr>
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<table>
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<tbody>
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<td>E.Phys. 213. General Physics</td>
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</tr>
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<td>E.Phys. 215. Experimental Physics</td>
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</tr>
<tr>
<td>A.Math. 236. Introduction to Linear Algebra and Differential Equations</td>
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</tr>
<tr>
<td>M.E. 212. Engineering Thermodynamics I</td>
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</tr>
<tr>
<td>Social-humanistic elective</td>
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**Junior Year**

<table>
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<tr>
<td>M.E. 313. Engineering Thermodynamics II</td>
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</tr>
<tr>
<td>M.E. 314. Measurements I</td>
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</tr>
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<td>M.E. 362. Heat Transfer</td>
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<td>M.E. 371. Systems Analysis I</td>
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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>M.E. 301. Introduction to Materials Science I</td>
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<td>M.E. 372. Systems Analysis II</td>
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<td>M.E. 394. Mechanics IV</td>
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<td>Social-humanistic elective</td>
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**Senior Year**

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<tr>
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<tbody>
<tr>
<td>Technical electives (Note 2)</td>
<td>6</td>
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<tr>
<td>M.E. 442. Mechanical Engineering Laboratory</td>
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<tr>
<td>M.E. 431. Mechanical Behavior of Materials</td>
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<td>M.E. 414. Mechanical Engineering Design I</td>
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<td>I.E. 297. Engineering Economics</td>
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<tbody>
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<tr>
<td>Free elective</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
</tbody>
</table>

**Minimum total hours for degree**                                           136

**M.E. Curriculum Note**

1. For other English options, see the English department listings for engineering students.
2. The student's adviser has a list of approved technical electives.

**Graduate Degree Programs**

The department offers graduate programs leading to the M.S. and Ph.D. degrees in mechanical engineering to students whose goal is teaching, research, or advanced development in the broad disciplines of solid mechanics, fluid mechanics, heat transfer, thermodynamics, mechanical and thermal design, and engineering economy and management. These areas of study provide the technical background necessary to deal with a wide variety of contemporary mechanical engineering problems. Typical examples include combustion-generated pollution; fire safety; effective use of alternative energy sources such as solar and geothermal heat; efficient energy management of thermal systems; dynamic behavior of high-strength composites; earthquake engineering; brittle fracture of coal and oil shale; and bioengineering topics such as heart valve research, design of prosthetic devices, and modeling of the human spine.

At the M.S. degree level students following Plan I (with thesis) are required to take 9 hours of core courses which include engineering analysis and a selection from thermodynamics, mechanics, design, and mechanisms. Students following Plan II (all formal course work) are required to take 15 hours of core courses in thermodynamics, continuum mechanics, dynamics, and engineering mathematics. The remainder of the program is developed by the student in consultation with the adviser.

For admission to Ph.D. candidacy the student must pass a comprehensive examination to demonstrate a general competence in mechanical engineering at an advanced level. In addition, second-year college-level reading proficiency must be demonstrated in scientific French, German, Russian, or other foreign language approved by the department upon petition by the student.

Graduate Study in Mechanics

Graduate programs leading to the M.S. and Ph.D. degrees in mechanics that emphasize the mechanical sciences of solids and fluids and thermal science are available through the Department of Mechanical Engineering. For students working in mechanics, a strong cognate program in mathematics is imperative. Specific degree plans emphasize courses of both a fundamental character and a research level treatment.

Requirements for the M.S. and Ph.D. degrees in mechanics are similar to those in mechanical engineering, with the additional requirement that students following Plan II (all formal course work) at the M.S. level must take 6 hours in advanced calculus, ordinary and differential equations, complex variables, boundary value problems, or their equivalent.
College of Environmental Design

Division of Environmental Design

W. Mike Martin, Resident Dean
Spenser W. Havlick, Assistant Dean

INFORMATION ABOUT THE COLLEGE

Scope and Purpose

The environmental design professions have long been recognized as major contributors to the improvement of the built environment. The College of Environmental Design at the University of Colorado exists to serve society through these professions and to provide education for professional responsibility.

To fulfill this obligation, the college provides the student with an educational experience that is founded in the humanities and sciences and that evolves through this background to creative work in technical and aesthetic disciplines. It brings to the practicing professional an opportunity for continuing education and a means of keeping abreast of cultural and technological change. It encourages a better informed public through provision of academic experience for students other than those majoring in the environmental design professions and through presentations to the general public outside the academic environment. In these various efforts the College of Environmental Design seeks to fulfill its responsibility for continuing improvement of the physical, ecological, and psychological environment.

Designers and planners of the physical environment have in recent years moved into expanded roles and responsibilities; changes in breadth of concern and scope of service have brought closer together the architect, the landscape architect, the urban and regional planner, the technologist in environmental systems, and often the interior designer. All are being asked to make larger decisions from wider alternatives with deeper effects. Lines of demarcation among these professions are being minimized and interdependence among them increased.

These requirements necessitate a broader base of educational experience including not only a background for design technique but also an increased association with and understanding of the physical and social sciences. The social and economic determinants to contemporary life, the complexities of urban and regional interdependence and the allied problems of transportation and population, the effect of business and governmental activity, changing resource availability and human values, rapid technological change—all require of the environmental designer a broad educational base to meet present needs and anticipate and guide the future.

Preparation for professional service through careers in these fields is partially fulfilled through the academic process. Accordingly, the University of Colorado has expanded its offerings to provide an undergraduate degree in environmental design and a series of professional graduate degrees allowing specialization in particular areas of concern within environmental design.

Full professional status in most environmental design fields requires a minimum of five to six years of academic experience and three years of practical experience followed by state registration or licensing through a professional examination. Completion of the four-year curriculum allows those who do not wish to pursue further academic work to follow careers in social, technical, or product research; marketing; government and corporate service; and other contributing activities which do not require professional registration.

Combined Programs and Double Majors

Official combined programs are available only in conjunction with the College of Business. Combined and double degree programs require approval of the deans of both colleges. Before a combined degree student will be admitted to courses in the College of Business, the student must obtain permission and complete an Application for Admission form from the College of Business.

Organization

The College of Environmental Design is presently organized into six programs. At the undergraduate level there is a four-year environmental design program leading to a Bachelor of Environmental Design degree. At the graduate level there are programs in architecture, urban design, landscape architecture, urban and
Facilities

Facilities for academic programs at Boulder are provided in the College of Environmental Design Building. On its lower floors are administrative and faculty offices, lecture rooms, and exhibit halls. A media center, workshop, darkroom, and drawing studios supplement design studios, which are available throughout the building. An attempt is made to provide space within the design studios for each upper division student for academic use during the entire semester. These facilities are available to the student throughout the day and evening.

The Center for Environmental Design Education and Research, a branch of the Center for Community Design and Development, provides technical assistance in architectural and graphic design, planning and community development to other community groups, individuals, and organizations. In addition, it offers special education programs for professionals and others. The center is a nonprofit organization.

In response to a growing number of community needs, design services for a variety of projects including child and health care facilities, community centers, housing, and parks have been generated through the Center for Environmental Design Education and Research.

Students, clients, and professional volunteers are offered a creative learning experience through active group and citizen participation. All learn to identify and assess their particular needs throughout the design process, and through this approach, neighborhood and individual goals are translated into effective design programs.

The Center for Environmental Design Education and Research stimulates broad involvement within the community, and interested members are offered an opportunity to volunteer. While professionals gain a better understanding of community problems, design students receive training and practical experience in defining, managing, and resolving community problems.

Equipment such as special drawing instruments, the heliodon for use in studying the continuing effect of sun rays on a building, a computer terminal with added computer graphic capabilities and photocopier equipment are available to the student.

House of Essentials (the HOE project) is an urban laboratory and applications studio. Students apply skills to create appropriate technology for existing and experimental dwellings in Boulder. Special applications include passive solar energy and other forms of appropriate technology.

Recognition of Scholarship

As a professional school, the College of Environmental Design provides an atmosphere for study and creative investigation in which the attainment of quality is held in the highest esteem. In recognition of high scholarship and professional attainment, the college grants honors at graduation in two categories: honors and special honors. At an annual awards program, scholarships, prizes, and awards are given to outstanding students and faculty.

Scholarships, Loans, Awards, and Prizes

Scholarships

Several scholarships are available to students in the College of Environmental Design and are awarded upon recommendation of the faculty of the school. In 1961 the Educational Fund of the Colorado Chapter, American Institute of Architects, was incorporated by appropriate action of its executive committee. The purpose of this fund is to advance education in architecture by the granting of scholarships, prizes, and financial aid to deserving students in architecture and to architects interested in research programs directly related and of value to the architectural profession.

The original Educational Fund was founded in January 1934 by William E. Fisher, F.A.I.A.; George H. Williamson, F.A.I.A.; Fred E. Mountjoy, A.I.A.; William H. Bowman, A.I.A.; and Robert K. Fuller, F.A.I.A. Kenneth R. Fuller, son of the founder, now serves as secretary of the fund and, acting with the president and vice president of the Colorado Society, American Institute of Architects, forms the board of directors of the fund. This board has granted scholarships annually to students and alumni of the College of Environmental Design.

Scholarships and prizes have been awarded also by other organizations in the building industry. Such awards have been made by Blumcraft of Pittsburgh, the Monarch Tile Company, the Portland Cement Association, the American Concrete Institute, the Producers' Council, and Dow Chemical Company.

The Dana Soper Memorial Scholarship. This $2,000 grant, started in 1973, is awarded to a second-year student in environmental design based upon the following criteria: proven academic performance, personality and character, contribution to the college, and professional potential.

Special Loan Funds

In addition to those funds available through the Office of Financial Aid, students majoring in the College of Environmental Design also have available two special loan funds: the Carolyn Miller Scott Memorial Loan Fund, established in 1962, and the J. Roger Craig Memorial Loan Fund, established in 1971.

Exhibits, Lectures, and Trips

The regular academic program of the College of Environmental Design is supplemented by visiting lecturers who make particular contributions to the education of the student. Exhibits, both local and traveling, are displayed within the teaching facility of the college and are available to its students, the general student body, and the public.

Field trips are organized as a part of regular class activity or as an extracurricular program.
The College of Environmental Design cooperates with other divisions of the University in the presentation of the annual Creative Arts Program held each summer on the Boulder Campus.

UNDERGRADUATE DEGREE PROGRAM

The baccalaureate program in environmental design is intended to help the student in the attainment of the following goals:

1. Effective understanding of forces that shape the environment and the expression of human thought, feeling, and emotion through alteration of the natural and built environment.
2. Logical and analytical thought processes in problem evaluation, concept development, and solution.
3. Concern for creativity and aesthetics in this process.
4. Ability to communicate ideas by oral, written, and visual means and to work collaboratively with others of similar purpose.
5. Awareness of professional and social responsibility, personal organization, and self-discipline.
6. Incentive and ability to continue the educational process after attainment of the baccalaureate degree.

Requirements for Admission

Candidates for regular admission to the College of Environmental Design are expected to meet the general requirements for admission to the University. All credentials presented for admission to the University of Colorado become the property of the University of Colorado and must remain on file permanently.

FRESHMAN STUDENTS

Freshman applicants are required to present 16 units of acceptable high school work including the following:

- English (literature, composition, grammar) .................................. 3
- Mathematics (college preparatory) ........................................... 2
- Physics ........................................... 1
- Biological science ........................................... 1
- Foreign language, social science, and history ............................. 5
- Additional English .................................................................. 4

A unit of work in high school is a course covering a school year of not less than 36 weeks, with five periods of at least 40 minutes each per week. (Two periods of manual training, domestic science, drawing, or laboratory work are equivalent to one period of classroom work.) The 16 required units are equivalent to 30 points. High school is interpreted as the 9th, 10th, 11th, and 12th grades. Fractional units of value less than one-half unit will not be accepted. Not less than one unit of work will be accepted in a foreign language, elementary algebra, plane geometry, physics, chemistry, or biological science.

Acceptable English units are courses in literature, composition (including all composition given as part of a basic English course), grammar, speech, and journalism. All modern and classical languages are acceptable as foreign language units.

Applications should be submitted early since the College of Environmental Design has a quota.

TRANSFER STUDENTS

Qualified students transferring from other institutions as well as those seeking admission from another division of the University of Colorado will be accepted into the College of Environmental Design. Former students who have attended another college or university for one semester (12 hours or more) will be considered transfer students. Since the College of Environmental Design has a transfer quota, all qualified students are not guaranteed admission. Transfer students must have attained a 2.75 cumulative grade-point average in all previous college work. All course work except the last term, if in progress, must be completed and on the official transcript sent for admissions consideration. Transfer students are not required to meet the general requirements for admission to the University of Colorado. Students who possess a bachelor's degree in another discipline are encouraged to apply for one of the graduate programs in the college instead of pursuing an additional bachelor's degree.

Prerequisite courses for application include mathematics through analytical geometry or algebra and trigonometry, a general college physics course with laboratory (units), and graphics or freehand drawing. Students who select architecture must complete college calculus, and for students whose emphasis is planning or other design-related areas statistics is required prior to graduation.

Normally students should effect the transfer prior to the third year of college-level work; all transfer students will be required to take the six semesters of required environmental design studio and the three semesters of required social and natural science and media courses offered in the college.

Although preference will be given to Colorado residents, all applicants will be considered on an individual basis in relation to the requirements they have completed and the overall quality of their work. Letters of intent and recommendation must accompany the application. It is the responsibility of the student to be sure transcripts and other application materials are complete at the Admissions Office located in Regent Administrative Center. Only complete application files will be considered for admission.

A maximum of 60 semester hours taken at a junior college may be applied toward the baccalaureate degree.

NONDEGREE STUDENTS

A student may, under exceptional circumstances, be admitted to the College of Environmental Design as a nondegree student. This admission is on the basis that the student is not a degree candidate and that a more limited program of study appears to be indicated. Admission is only with the permission of the dean and is for one semester only. It may, under appropriate circumstances, be renewable.
Course Requirements

The course requirements for the Bachelor of Environmental Design are as follows:

<table>
<thead>
<tr>
<th>Required Professional Courses</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Environmental Design Studio (6 semesters in sequence)</td>
<td>36</td>
</tr>
<tr>
<td>First year — Env.D. 100-6 (fall); Env.D. 101-6; Env.D. 100-6; Env.D. 101-6; Env.D. 200-6; Env.D. 300-6 and two 400-level Env.D. Studio Courses.</td>
<td></td>
</tr>
<tr>
<td>b. Environmental Design content courses:</td>
<td></td>
</tr>
<tr>
<td>Three semesters each</td>
<td>27</td>
</tr>
<tr>
<td>Env.D. Language/Media, 120/121/220-3</td>
<td></td>
</tr>
<tr>
<td>Env.D. Natural Science/Technology, 130/131/230-3</td>
<td></td>
</tr>
<tr>
<td>Env.D. Societal Science, 110/111/210-3</td>
<td></td>
</tr>
<tr>
<td>Elective or General Study Courses</td>
<td>65</td>
</tr>
<tr>
<td>The following courses are necessary for graduation (and for admission for transfer students) even though they are not totally representative of the environmental design professions: either statistics or college calculus, college physics, and expository writing.</td>
<td></td>
</tr>
<tr>
<td>Students may select the elective courses from any department on campus. These courses include a broad spectrum of offerings from other colleges as well as the College of Environmental Design but should support the declared minor or double major. A minor is usually selected during the second year with faculty consultation.</td>
<td></td>
</tr>
<tr>
<td>Total hours required for graduation</td>
<td>128</td>
</tr>
</tbody>
</table>

Students should note that during the first semester they have four required courses. Before graduation, either statistics or calculus must be completed in addition to expository writing and college physics. Since the required courses total 15 credit hours, it may be desirable to delay taking the mathematics and elective courses for two or three semesters. A maximum of 18 credit hours is recommended for the first semester.

Permission to take more than 19 hours or fewer than 12 hours may be granted only by written petition to the dean, showing approval of the student's adviser.

The electives are provided in the curriculum to allow the student to pursue personal interest areas but also to provide support for the environmental design program.

Students intending to pursue graduate studies in architecture should plan to take the following courses:

| Env.D. 420/421-3, Architectural Graphics I and II | |
| Env.D. 450/451-3, Environmental Systems I and II | |
| Env.D. 452/453-2, Architectural Structures I and II | |
| Env.D. 401/402-6, Architecture Studio I and II | |
| Arch. 470/471-3, History of Architecture | |

The course requirements for the combined environmental design and business degree are as follows. The nine-semester plan leads to completion of all degree requirements. While the exact sequence of courses may vary, students are urged to follow the general plan.

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Env.D. 100 and 101</td>
<td>12</td>
</tr>
<tr>
<td>Math. 107 and 108*</td>
<td>6</td>
</tr>
<tr>
<td>Env.D. 110 and 111</td>
<td>6</td>
</tr>
<tr>
<td>A.S. 100*</td>
<td>3</td>
</tr>
<tr>
<td>Env.D. 120 and 121</td>
<td>6</td>
</tr>
<tr>
<td>Sophomore Year</td>
<td></td>
</tr>
<tr>
<td>Env.D. 200</td>
<td>6</td>
</tr>
<tr>
<td>Econ. 201 and 202</td>
<td>6</td>
</tr>
<tr>
<td>Env.D. 130 and 131</td>
<td>6</td>
</tr>
<tr>
<td>Env.D. 210 and 220</td>
<td>6</td>
</tr>
<tr>
<td>Electives</td>
<td>9</td>
</tr>
<tr>
<td>Total</td>
<td>33</td>
</tr>
</tbody>
</table>

| Junior Year | |
| Env.D. 230 | 3 |
| B.Ad. 200 | 3 |
| P.Sc. 100 | 3 |
| Q.M. 201 | 3 |
| Acct. 200 | 3 |
| Env.D. 300 | 6 |
| Psy. 110 | 3 |
| Behavioral psychology§ | 3 |

| Senior Year | |
| Mk. 300 | 3 |
| P.Sc. 110 | 3 |
| Fin. 305 | 3 |
| Env.D. 400 Level 2 courses | 12 |
| B.Law 300 | 3 |
| Fr.Mg. 300 | 3 |
| B.Ad. 410 | 3 |
| Or.Mg. 330 | 3 |
| Total | 33 |

| Ninth Semester | |
| Area of Emphasis (Business) | 12 |
| B.Ad. 450 | 3 |
| Total semester credits for the combined degree | 141 |

In addition to the above courses, all course prerequisites must be met.

Physics 301 is required prior to graduation but could be counted as part of the 21 hours of electives.

A minimum of 80 hours of business course work must be taken at this institution.

The combined program is also open to those who wish to emphasize architecture; however, it must be noted that to complete the 18 hours of required architecture courses (i.e., Env.D. 402, 403, 420, 421, 450, 451, 470, and 471), an additional 6 hours will be added to the 141 hours, making a total of 147 hours.

Degrees must be awarded concurrently.

Grade-Point Average

Students must have a cumulative grade-point average of 2.0 for all courses attempted at the University of Colorado after admission to the College of Environmental Design.

Residence Requirement

In all instances, a student must be in residence for at least one full academic year's work (normally 32 semester hours, and usually in the fourth year) in the College of Environmental Design to be eligible for the degree Bachelor of Environmental Design.

Academic Policies — Undergraduate Course of Study

The undergraduate course of study in the College of Environmental Design is four academic years in length.

*Math. 107 and 3 hours of college calculus required of all students.
* A.S. 100, 101, 102, 103, 126 or Engl. 315 is acceptable.
§Not human sexuality or computer/research techniques.
and leads to the degree Bachelor of Environmental Design. Some students devote more than this specified time to completion of the program.

Students may enroll for as much as 50 percent of their current course schedule in work not a part of the prescribed curriculum of the College of Environmental Design provided they have at least a 2.0 grade-point average in all undergraduate work attempted. Exceptions to this policy may be made with the consent of the dean’s office.

SPECIAL EDUCATIONAL OPPORTUNITIES

Advanced placement and college credit may be granted on the basis of the College Entrance Examination Board’s Advanced Placement Tests. For students who have taken an advanced placement course in high school and who make scores of 4 or 5 in the CEEB’s Advanced Placement Examination, advanced placement as well as college credit will be granted. College credit granted will be treated as transfer credit without a grade, but will count toward graduation and the meeting of other specific requirements for which it may be appropriate.

GRADE-POINT AVERAGE REQUIREMENTS
AND SCHOLASTIC SUSPENSION

As a general rule, students who fail to meet the minimum grade-point requirements (2.0) in the fall semester of any year will be permitted to continue their studies during the spring semester. Scholastic records of students will be reviewed as soon as possible after the close of the spring semester, and students will be informed in writing if they are to be suspended.

The normal period of suspension is two regular semesters (one academic year, excluding the summer term). However, students suspended a second time will be reinstated only under unusual circumstances. Students who believe that their situations warrant a departure from these normal stipulations may petition the Committee on Academic Progress for reinstatement. The committee will look with favor on such petitions only if the student’s total grade-point average exceeds the required 2.0, if marked improvement in academic work is indicated by the student’s record, or if there are unusual circumstances that have contributed to the student’s academic difficulties. Deadlines for petitions will be specified in the letter of suspension.

Academic work undertaken at another institution while the student is under suspension from the University of Colorado will not be credited toward a degree in the College of Environmental Design without special permission by the dean. Students should also be aware of the fact that if they enroll for as many as 12 semester hours at another institution, regardless of their status in the University of Colorado, they must apply as transfer students if and when they wish to return to the University. The College of Environmental Design does not give incomplete grades (IW or IF) for incomplete work. Only extreme emergency situations warrant an extension of time for the appropriate letter grade to be awarded for a course.

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 the instructor shall inform the students of policies governing attendance in his or her classes.

Students who miss a final examination for illness or other good reasons must notify the instructor or the director of environmental design no later than the end of the day on which the examination is given.

TRANSFER CREDITS

Credits in subjects transferred from other institutions to the University of Colorado will be limited to the number of credit hours given for similar work in the regular offerings at the University of Colorado. Exceptions to this regulation may be made by the dean upon written petition.

A grade of C or better is required in any course for which credit is granted in transfer from another institution to the University.

UNIVERSITY CAMPUSES

Certain professional and nonprofessional courses are available on the university’s Denver Campus. These credits are applicable toward residence requirements only when earned after admission to the college.

Students in residence on the Boulder Campus in the College of Environmental Design may take work on the Denver Campus with the approval of the dean of the college.

ENVIRONMENTAL DESIGN AND THE ROTC PROGRAM

Students matriculating in the College of Environmental Design are eligible to participate in the ROTC programs on the Boulder Campus.

Students interested in such programs should contact the professor in charge of the ROTC program of their choice (army, navy, air force), and also the dean of the College of Environmental Design for information on residence and curriculum requirements for graduation. Credit for ROTC courses may be given upon faculty recommendation to a maximum of 8 hours. Such credit is given only if the student completes all requirements of the four-year ROTC program.

CONVOCATIONS

All students registered in the College of Environmental Design may be required to attend convocations and special lectures scheduled throughout the year.

RETENTION OF STUDENT WORK

The College of Environmental Design reserves the right to retain any student project submitted in fulfillment of class requirements for whatever period of time it deems necessary. This retained work is used to provide accrediting agencies with tangible evidence of performance, to serve as additional visual aid material in presentation to other students, and to make possible meaningful exhibits for study by design students, non-design students, staff within the University, and the general public.

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STUDIO COURSE QUALITY REQUIREMENT

In studio courses, a grade of C or better is prerequisite before the next course in the sequence is taken.

GRADUATE PROGRAMS

The College of Environmental Design at the Denver Campus (UCD) offers five graduate programs: the Master of Architecture, Master of Architecture in Urban Design, Master of Interior Design-Interior Architecture and Space Planning, Master of Landscape Architecture, and Master of Urban and Regional Planning-Community Development. The graduate programs allow for advanced experience.

Graduate students in all of the graduate programs are accepted at the Denver Campus of the University of Colorado. Facilities are in the Bromley Building and include classrooms, a library, administrative offices, faculty offices, a darkroom, model shop, and drawing and design spaces for students.

Students seeking information regarding the graduate programs of the College of Environmental Design should refer to the University of Colorado at Denver Bulletin. Contact the College of Environmental Design, University of Colorado, Denver, Colorado 80202.
Graduate School
Bruce R. Ekstrand, Acting Dean

INFORMATION ABOUT THE SCHOOL
Melvyn C. Branch, Acting Associate Dean
M. Laurance Morse, Associate Dean (Health Sciences Center)
Bruce W. Bergland, Acting Associate Dean (Denver)
Thomas J. Napierkowski, Associate Dean (Colorado Springs)

History
Graduate work at the University of Colorado began on a small scale in 1892. Following some years of development, the present Graduate School was organized in 1909 with a separate faculty. The Graduate School is administered by a dean in conjunction with the Executive Committee appointed by the president of the University and governed by the rules of the Graduate School.

Degrees Offered
The Graduate School of the University of Colorado offers instruction leading to the following advanced degrees:

- Doctor of Philosophy (Ph.D.)
- Doctor of Business Administration (D.B.A.)
- Doctor of Education (Ed.D.)
- Doctor of Musical Arts (D.Mus.A.)
- Specialist in Education (Ed.S.)
- Master of Arts (M.A.)
- Master of Science (M.S.)
- Master of Basic Science (M.B.S.)
- Master of Business Education (M.Bus.Ed.)
- Master of Education (M.Ed.)
- Master of Engineering (M.E.)
- Master of Fine Arts (M.F.A.)
- Master of Humanities (Denver)
- Master of Music (M.Mus.)
- Master of Music Education (M.Mus.Ed.)
- Master of Social Science (Denver)

The Ph.D. can be earned in the following fields:

- Aerospace engineering
- Anthropology
- Applied mathematics
- Applied physics
- Astro-Geophysics
- Biochemistry
- Biometrics
- Biophysics and genetics

The M.A. can be earned in the following fields:

- Anthropology
- Art education
- Art history
- Biology
- Classics
- Communication
- Communication disorders and speech science
- Comparative literature
- Dance
- Economics
- Education
- English language
- English literature
- French
- General psychology
- Geography
- German
- History
- Italian
- Journalism
- Linguistics
- Mathematics
- Philosophy
- Political science
- Psychology
- Russian
- Sociology
- Spanish
- Theatre

The M.S. can be earned in the following fields:

- Aerospace engineering sciences
- Anatomy
- Anthropology
- Applied mathematics
- Applied physics
- Astro-Geophysics
- Biochemistry
- Biometrics
- Biophysics and genetics
- Business: accounting
- Business: finance
- Business: management and organization
- Business: management science
- Business: marketing
- Chemical engineering
- Chemistry
- Child health associate
- Civil engineering
- Computer science
- Electrical engineering
- Mathematical physics
- Mathematics
- Mechanical engineering
- Mechanics
- Microbiology and immunology
- Music education
- Musicology
- Nursing
- Pathology
- Pharmacology
- Pharmacy
- Philosophy
- Physics
- Physiology
- Political science
- Psychology
- Slavic languages and literatures
- Sociology
- Spanish
- Theatre

Departments offering degrees in these fields are located on the campus of the Health Sciences Center in Denver. Offered only in the Denver Campus.

Offered only at Colorado Springs Campus.
Engineering design and economic evaluation
Environmental sciences
Geology
Health administration
Mechanical engineering
Medicine
Microbiology and immunology
Nursing
Pathology
Pediatrics
Pharmacology
Physical education
Physical therapy
Physics
Physiology
Preventive medicine
Psychiatry
Radiology
Social Science
Telecommunications

Research Support at the University of Colorado

The University of Colorado takes an active part in research in a wide variety of fields.

Combined research and related instructional programs sponsored within the University represent annual expenditures amounting to over $80 million. Of this total, the expenditures on the Boulder, Denver, and Colorado Springs campuses are now approximately $40 million per year. The sponsored research, clinical and instructional program of the Health Sciences Center in Denver totals more than $40 million annually. The principal sources of these funds for research and training contracts and grants are various agencies of the federal government. There is also assistance in the support of research activity from appropriations of the State of Colorado, research foundations, and private donors.

Special Facilities for Graduate Study and Research on the Boulder Campus

The Institute of Arctic and Alpine Research (INSTAAR) is an interdisciplinary research institute of the Graduate School of the University of Colorado which emphasizes the environmental sciences (biology, geography, and geology), especially as they pertain to high latitudes and high altitudes and to cold environments in the past. INSTAAR faculty are appointed jointly in the institute and in the relevant academic department, usually in the College of Arts and Sciences. Courses taught include Arctic and Alpine Environments, Physical Geography of Arctic Regions, Data Processing in the Earth Sciences, Advanced Geomorphology, History of Biological Communities, Advanced Palynology, Mountain Geomorphology, Techniques in Geocology, Mountain Climatology, Physical Climatology, Synoptic and Dynamic Climatology, Seminar in Climatic Change, and Independent Study. Not all courses are offered every year.

INSTAAR'S main headquarters are on the East Campus of the University. The facility includes a lecture room; a reading room; well-equipped geomorphology, sedimentology, palynology, plant and animal ecology, and amino-acid dating laboratories; staff, faculty, and graduate student offices; and the editorial office of Arctic and Alpine Research, a quarterly journal published by the Institute.

The Mountain Research Station operated by INSTAAR is located at 2,925 m (9,600 ft) in the Front Range of the Colorado Rocky Mountains, 40 km (25 miles) west of Boulder. The Mountain Research Station is a complex of buildings including summer and winter living quarters, washhouse, dining room, meeting room, Alpine Laboratory with offices, laboratories and library, and a warehouse. Weather observing stations have been operated since 1952 at four elevations between 2,200 m and 2,750 m. Solar radiation and near-surface ground-temperature measurements, together with the standard climatic parameters, form a data bank vital to many branches of field research. During the summer, based at the Mountain Research Station, INSTAAR operates research participation projects supported by various agencies. Under this scheme high school students may spend ten weeks working in association with faculty and graduate students on various phases of the research program in the Colorado Rocky Mountains.

The Institute for Behavioral Genetics is an interdisciplinary research organization concerned with the inheritance of behavioral characteristics. Facilities are available for research on a variety of organisms, including humans and laboratory mice. Research perspectives of the present staff include quantitative genetics and behavioral pharmacogenetics. Specific behavioral traits under study include learning, memory, motivation, social behavior, mental abilities, reading disability, and addiction to commonly used drugs.

A graduate training program offers specialized interdisciplinary training to students who are degree candidates in various departments.

The Institute of Behavioral Science is an interdisciplinary research organization serving faculty and graduate students in the behavioral sciences. Its principal functions are to conduct and sponsor research programs involving two or more of the behavioral sciences and related fields; to provide research facilities, equipment, and administrative services for participating faculty; to facilitate graduate research training; and to disseminate information about its activities and findings to scientific groups and institutions.

The institute conducts four research programs which constitute its principal administrative units: Center for Research on Judgment and Policy; Program of Research on Problem Behavior; Research Program on Technology, Environment and Man; and Program of Research on Population Processes.

The University Computing Center provides computing services in support of the instructional and research activities of the University. The center is located on the Boulder East Campus, but serves faculty and students on all four University campuses through a network of batch and time sharing terminals and minicomputers. The University's academic computing system is built around two main computers at the center: a Control Data Corporation Cyber 172 and a Digital Equipment Corporation VAX 11/780. Specialized research computers are located in several academic departments. The software available includes programming languages such as FORTRAN, PASCAL, COBOL, and BASIC, as well as a library of mathematical and statistical packages and other applications programs. The center offers short, noncredit courses and seminars in the use of center facilities each semester. Computing assistants employed by the
center are available at several sites to answer user questions.

The Cooperative Institute for Research in Environmental Sciences (CIRES) is jointly sponsored by the University of Colorado and the National Oceanic and Atmospheric Administration with support from other public and private sources. CIRES consists of more than 100 faculty, students, and staff from several scientific disciplines. Graduate students in CIRES conduct multidisciplinary studies of atmospheric chemistry and physics, climate dynamics, environmental chemistry and geochemistry, solid earth geophysics, and other subjects. Current research programs in which graduate students are involved include measurement of constituents and reactions in the atmosphere, kinetics of reactions in the stratosphere and troposphere, gas and liquid chromatography, mass spectrometry, metal complex chemistry, nucleation phenomena, aerosol and surface chemistry, molecular properties and laser photochemistry of small clusters, leaching of toxic wastes from mining, climate dynamics, earthquake prediction and earthquake physics, plate tectonics, seismic wave propagation, nuclear test discrimination, rock deformation and fracture, gravity-wave propagation in the lower troposphere, numerical hydrodynamics, dynamics of the atmospheric boundary layer, strains and tilts associated with earthtides and secular deformation, geophysical inverse studies, and normal modes of vibrations of the earth. Research performed includes theoretical studies, laboratory experimentation, and field investigations. Field studies are conducted along the Front Range and in the mountains of Colorado, in the Aleutian Islands, Hawaii, and elsewhere. Results of this fundamental research bear on such practical societal problems as the destruction of the earth’s ozone shield by pollutants, acid rain, the degradation of air and water quality, energy developments such as synfuels from oil shale, weather and climate modification, earthquake prediction, and enhancement of fossil fuel and geothermal energy production. The work of the approximately 60 graduate students presently conducting studies in CIRES is supported by grants, contracts, and gifts from NOAA, NSF, USGS, DOE, AFOSR, CMA, ARO, NASA, EPA, and private companies. The departments presently represented in CIRES are chemistry, chemical engineering, geography, geological sciences, and physics. The institute serves as a center for multidisciplinary collaboration of research workers from Boulder and institutions throughout the world. A visiting fellowship program enables scientists working in these fields to spend time at CIRES.

The Engineering Research Center coordinates the research activities of the College of Engineering and Applied Science and ensures that these achieve educational as well as scientific value. Currently there are more than 100 research projects in progress, most of them under funding from governmental agencies or industry. Many other projects replace conventional demonstration laboratory work for graduate students. Typical projects which have been ongoing for some time include studies of lightning, carried out with the aid of a million-volt high impulse generator; extensive work with semiconductors and the fabrication of large-scale integrated circuits; laser research; bioengineering studies in various areas including white blood cell communications systems and sensory devices; and areas of energy-related research including coal gasification, power transmission, conservation, and both radiant and photovoltaic solar power. There is an elaborate new integrated circuits laboratory. Faculty and graduate students of the college have made important contributions to the fields of computer technology and programming, smog control, bioengineering, cryogenics, high speed rotating electrical machinery, solid state devices, electromagnetic propagation, analog and digital signal processing, microprocessors, tertiary oil recovery, water resources, materials science, fluid dynamics, and various aspects of the aerospace engineering sciences.

The High Altitude Observatory is an internationally recognized center for the study of solar, interplanetary, and magnetospheric physics with emphasis on the interrelationships between these areas. Established in 1940, HAO now has its central laboratory and administrative offices in the National Center for Atmospheric Research (NCAR) building in south Boulder.

HAO is a part of NCAR, which is sponsored by the National Science Foundation. HAO’s extensive research facilities are available to and are used by graduate students pursuing advanced studies in the Departments of Astro-Geophysics and Physics.

The Sommers-Bauch Observatory on the Boulder Campus is equipped with a 24-inch Cassegrain-Coude telescope with ancillary equipment for photographic, spectrographic, and photometric stellar observations. The facilities at Sommers-Bauch are used by the Department of Astro-Geophysics for undergraduate and graduate teaching and research. Open houses, for both students and the public, are generally held on Friday nights by reservation.

The Fiske Planetarium on the Boulder Campus is one of the finest planetarium facilities in the world. Equipped with a Zeiss VI star projector, a 65-foot diameter dome and 213 seats, the planetarium regularly presents astronomically oriented shows designed to entertain as well as inform. In addition, multimedia laser shows, dance, and musical concerts are presented in the planetarium. It is also used as a teaching tool in astronomy classes and by many other departments of the University. Students are employed on a part-time basis to help in the running of the planetarium.

The Institute of Cognitive Science (ICS) was established to promote interdisciplinary instruction and research activities in the fields of psychology, education, linguistics, computing science, and other cognitive sciences. Its major current research programs are concerned with cognitive factors in comprehension, induction, problem solving, perception and motor processes. Research programs of ICS focus on individual differences, development processes, and educational applications.

The Laboratory for Atmospheric and Space Physics (LASP) is an established center for research in terrestrial and planetary atmospheres, solar physics, and
space astronomy. A forerunner in ultraviolet spectroscopy, LASP is located on the Boulder campus and involves students and faculty from the Departments of Astro-Geophysics and Physics in many experimental and theoretical research programs. LASP has experiments on two current NASA spacecraft: on the Voyager mission a photospectrometer is studying the atmospheres of Jupiter, Saturn, and Uranus; and the Pioneer Venus mission carries a programmable ultraviolet spectrometer which is examining the Venusian atmosphere and the planet's cloud tops. In addition, LASP is developing the complete instrument package for the Solar Erosion Explorer satellite, scheduled for launch in September 1981, to study the effects of active minor species on the Earth's ozone layer. LASP personnel will conduct all mission operations for the SME as well as interpret the scientific data. An ultraviolet spectrometer experiment is currently being developed at LASP for the Galileo mission to Jupiter in 1985. LASP has developed a unique data handling system for use with these space experiments as well as with earlier experiments such as the Mariner 9 Mars orbiter and the Orbiting Solar Observatory. Laboratory experiments, such as a major program to develop sensitive new photoelectric array detectors for ground-based and space astronomical observations, are also pursued on a continuing basis. LASP astrophysicists are involved in analyzing and interpreting data from other scientific satellites such as the High Energy Astrophysical Observatory, the International Ultraviolet Explorer, and Copernicus. They are also involved in developing state-of-the-art ultraviolet and X-ray instruments. Active sounding rocket programs complement the research in planetary atmospheres, solar astrophysics, and astronomy.

The Joint Institute for Laboratory Astrophysics (JILA) was established in 1962 by an agreement between the University and the National Bureau of Standards. Located on the Boulder Campus, the institute provides facilities for advanced research and graduate training in a number of areas of atomic physics and astrophysics. These areas include both theoretical and experimental studies of atomic interactions, spectroscopy and line broadening, chemical physics, lasers and other optical resonance phenomena, precision measurements, new geophysical measurement techniques, stellar atmospheres and radiative transfer, stellar interiors, solar physics, binary X-ray sources, and the interstellar medium and galactic astronomy. A brochure giving more detailed information is available on request from the institute.

The Nuclear Physics Laboratory, operating under the direction of the Department of Physics, conducts experimental and theoretical research in nuclear physics with a staff of faculty members and research associates. The investigations center on problems of nuclear structure and nuclear reaction mechanisms, as well as applications of nuclear science to a number of other fields. In particular, problems from the area of environmental and medical science are investigated. The laboratory is equipped with a modern cyclotron capable of accelerating hydrogen ions to 30 MeV and helium ions to 44 MeV. Several computers and instrumentation for precision spectroscopy of charged particles, neutrons, and gamma rays are available. A magnetic spectrometer system, which permits very high resolution analysis of charged particle reaction products, and a time-of-flight system for precision neutron studies are two unique features of the laboratory equipment. Staff members and faculty of the laboratory participate also in experiments carried out at the Los Alamos Meson Physics Facility and at the Indiana University Cyclotron Facility. Research assistantships are available to support graduate students for research in nuclear physics and in the field of modern accelerator design.

The Business Research Division, the research arm of the College of Business and Administration, was originally chartered as the Bureau of Business Research in 1915.

The research effort of the division falls into three general categories: state service, contract research, and faculty research. State service, the principal activity, focuses on assisting the Colorado business community by providing information and special studies on the state's economy and special business problems. Contract research is conducted for federal, state, and local agencies, as well as for private business firms and associations. Research includes regional and local economic base studies and studies on manufacturing, tourism, and other state industries.

The Business Research Division serves as a Census Summary Tape Processing Center in cooperation with the Colorado Division of Planning. The Business Research Division also maintains the Colorado Business/Economic Data Bank which contains state information on Colorado economic activities.

Publications of the division include the Colorado Business Review, the Directory of Colorado Manufacturers, the Journal of Travel Research, Colorado County and City Retail Sales, Colorado Ski and Winter Recreation Statistics, and numerous special interest publications.

The Center for 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 avail themselves of conferences with staff members and use of available library facilities. CLEAR staff members also teach credit courses in other schools and colleges as related to those fields.

The Bureau of Governmental Research and Service prepares studies and publishes reports and monographs on governmental, political, and public policy issues. It also occasionally sponsors conferences for public officials and for people concerned with governmental problems. A main focus of interest is Colorado and the Rocky Mountain region, but ongoing research also deals with national and international problems. The research library in Ketchum 125 contains materials available to researchers interested in governmental and public policy questions.

The Bureau of Economic Research formulates and conducts research projects in economics and related
fields in order to further knowledge about the nature and behavior of economic variables, to develop and refine research methodology, and to provide decision makers in both the public and private sectors with data and techniques to improve the quality of their decision making. The bureau 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 Economics Institute offers intensive transitional training and orientation to foreign students prior to entering graduate programs in economics, agricultural economics, business, and related fields at universities throughout the United States. It offers a wide range of intensive course work in economic theory, mathematics, statistics, in several business subjects, in computer science, and in English. Instruction is organized in five- and ten-week terms. Participants may be admitted to up to nine consecutive five-week terms, depending on beginning proficiency in English and in core subject preparation areas. University of Colorado credit is available for several institute course offerings, and its courses are open to local students by special arrangement. Graduates receive an English Proficiency Certificate, a certificate attesting to levels of preparation in the student's major field of study, and a transcript of all course work completed. The institute was established under the sponsorship of the American Economic Association in 1958.

The Center for Educational Leadership Services in the School of Education provides assistance to the schools and educational agencies of Colorado and facilitation of faculty research work. Evaluation services, school surveys, assistance in curriculum revision, in-service education programs, educational planning, and a variety of consultant services are available through the center, which focuses the resources of the University on educational problems in the state.

The Laboratory of Educational Research in the School of Education has two interrelated and complementary functions: service and training. It serves faculty, graduate students, and school districts in matters of research, design, statistics, measurement, and computer utilization; and it provides a training ground and medium for practical experience in a wide variety of research projects for doctoral candidates pursuing a research specialization.

The International Economics Studies Center engages in cooperative instructional and research programs with foreign universities with a view to expanding the opportunities of students and faculty members interested in international developmental problems.

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: three low-turbulence wind tunnels and several hotwire anemometer sets for turbulence and unsteady aerodynamic research; conventional and double-diaphragm shock tubes for combustion and combustion-instability studies; a laboratory for the study of ultrasound in gases; a laboratory for the study of the hydrodynamics of superfluid helium and geophysical fluid dynamical modeling; bioengineering laboratories for studies in cardiac physiology, neurophysiology, and neurochemistry; electromagnetic shock tubes for high Mach numbers and high-temperature studies; stroboscopic laser optical techniques for unsteady aerodynamics and aeroacoustics research; and apparatus for studying plasma turbulence.

The Astro-Geophysics Department conducts advanced studies in astrophysical and geophysical sciences. Special emphases are placed on studies of the sun, atmospheres of the earth and other planets, theoretical and observational astrophysics, astronomy, geophysical and astrophysical fluid dynamics, aeronomy, space physics, hydrodynamics, plasma physics (including controlled thermonuclear fusion), radiative transfer, atmospheric circulations, and the earth's magnetic field.

The department operates the Sommers-Bausch Observatory, laboratories in experimental fluid dynamics and plasma physics, and makes extensive use of the Fiske Planetarium on the campus. Also used are observational facilities of the Sacramento Peak Observatory at Sunspot, New Mexico; the Kitt Peak National Observatory, Tucson, Arizona; and the National Radio Astronomy Observatory, Green Bank, West Virginia. A considerable part of the teaching and research is in collaboration with the National Center for Atmospheric Research (including the High Altitude Observatory), the Laboratory for Atmospheric and Space Physics, National Bureau of Standards, Joint Institute for Laboratory Astrophysics, National Oceanic and Atmospheric Administration (e.g., Space Environment Laboratory, Aeronomy Laboratory), Cooperative Institute for Research in Environmental Sciences, Institute for Telecommunication Sciences, and other Boulder institutions.

Chemical engineering research facilities are varied. For studies in kinetics and catalysis there are two quadrapole mass spectrometers, a magnetic sector mass spectrometer, and a time-of-flight mass spectrometer. Studies to characterize surface properties make use of the Auger electron spectrometer. Laboratories for flow characterization in porous media use two Amino Mercury porosimeters, a Lippens-de Boer gas adsorption apparatus and a Wicke-Kallenbach gaseous counter diffusion apparatus.

There is a complete core flooding laboratory for work in enhanced oil recovery, leaching of oil shales, and modified in-situ oil shale studies. Spinning drop tensiometers, a Langmuir trough, and a Wilhemy plate apparatus are used for surface phenomena studies involving surfactant flooding.

Cryostats and gas chromatographs are used for low temperature thermal conductivity and phase equilibria studies, and there are extrusion and injection molding machines, an intensive mixer, and a rheometer for polymer studies. Process control studies are carried out.
using a variety of experimental units including fluidized bed, distillation column, packed-bed catalytic reactor, and heat exchanger. Oil shale leaching experiments are available for simultaneously measuring dynamic leaching and porous media properties.

Water pollution control equipment includes biological reactors and pressure vessels.

Most of the research laboratories are being interfaced to the departmental minicomputer/microprocessor network. This distributed laboratory computer system consists of a central Eclipse S/130 minicomputer with remote Micro/NOVA laboratory terminals. The system has complete multi-programming, multi-tasking capabilities, and all real-time programming is done in a high level scientific language such as FORTRAN.

Civil, environmental, and architectural engineering laboratories facilitate research in structures, vibrations, materials testing (including metals, timber, concrete, masonry, soils, rock, and highway materials), hydraulics, sanitary engineering and water quality, surveying and photogrammetry, and illumination. There is a polarized light apparatus for study and research in the photoelastic field, and controlled-atmosphere rooms for materials and soils testing are available. The principal feature of the structures laboratory is a massive test bed permitting a wide variety of investigations of structural forms under dynamic as well as static loading. The sanitary engineering laboratories include two laboratories in water quality at the Boulder Campus and an extensive pilot plant for experimentation in wastewater reuse.

Electrical engineering department special equipment and facilities include an anechoic chamber for studying propagation effects at microwave frequencies; a high-voltage laboratory for impulse tests to 1,000,000 volts; a class 10,000 clean room facility for epitaxial growth and fabrication of microwave and optical devices; high-vacuum and vacuum deposition equipment for thin-film 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 laboratory; numerous special purpose computers; mini- and microprocessors and a computer laboratory; a roof-mounted antenna range; a special microscope for laser manipulation of microorganisms in vitro; and a growing array of other bioengineering research apparatus.

Mechanical engineering laboratories provide for experimental studies of thermal and mechanical systems. Typical investigations include convective heat transfer, mechanical behavior of materials, combustion, prosthetic device performance, and fracture mechanics. Specialized equipment needed for these investigations includes Instron testing machines, a diffused light polariscope, a torsion pendulum for internal friction measurements, high-frequency oscillators and high-precision counter-timers for ultrasonic testing, a digital storage/dual beam oscilloscope, a gas chromatograph for combustion product analysis, a Kolsky apparatus for material measurements at high strain rates, metallographs, shaker tables, and a holographic interferometer.

Electrical and mechanical equipment is available for work in servomechanisms; molding presses and fabrication equipment for plastics technology; equipment for experimental stress analysis, modular analog computer units; high-speed photographic equipment; a precision microscope for grain examination and film reading; time-sharing computer terminals; a servo analyzer; an 8-track instrumentation tape recorder; and special equipment for bioengineering studies of skeletal systems, nerves, and prosthetic devices.

The modern language laboratory facility consists of four language laboratories with a total of 114 record-playback positions, a 30-station audiovisual classroom, a recording studio, a tape library with high-speed duplicator, and two equipment repair rooms. The Colorado Springs campus has a 20-position laboratory. The Denver Campus shares facilities at the Auraria complex.

The Speech and Hearing Clinic has a two-fold purpose: it provides facilities for the training of undergraduate and graduate students, and it provides speech and hearing evaluation and remediation services for the Boulder community, preschool to adult population. Any student of the University or any member of the Boulder community is eligible for the services offered. Services include evaluations of speech and language skills, training for the improvement of communication skills, hearing evaluations, lipreading instruction, hearing aid evaluations, and auditory training for the hearing-impaired.

The Computer Laboratory for Instruction in Psychological Research (CLIPR) is a laboratory in the Department of Psychology specializing in research, development, and training in computer use in the social, behavioral, and educational sciences. The laboratory operates a Digital Equipment VAX 11/780 computer. The computer is used to provide automation of research laboratories, to control research instruments, to collect research data, to give training in computer use at both the graduate and undergraduate levels, and to offer a facility for research and development in computer-assisted research and instruction.

Facilities for Graduate Study on the Colorado Springs Campus

The University of Colorado at Colorado Springs is located in northeast Colorado Springs. The campus offers programs in the College of Business and Administration and the Graduate School of Business Administration, the School of Education, the College of Engineering and Applied Science, the College of Letters, Arts and Sciences, and the Graduate School of Public Affairs, as well as the Graduate School.

The library offers seating for over 500 users in a variety of configurations ranging from lounge areas to group study rooms. Also included is an exhibit area and a 24-hour study lounge. The holdings of the library total more than 150,000 volumes with a subscription list of over 1,000 titles. Photocopying and audio-visual services are available. There is direct batch-processing access by remote job entry to twin CDC 6400 digital computers located in Boulder. In addition, an
HP 2100 minicomputer is available for instructional and research purposes.

The following programs at the master's level are available for completion through the Graduate School:

- History (M.A.)
- Basic science (M.B.S.)
- Education (M.A.)
- Political science (M.A.)
- Psychology (M.A.)
- Electrical engineering (M.S.)
- Applied mathematics (M.S.)
- Sociology (M.A.)

A Master of Public Administration (M.P.A.) degree is offered through the Graduate School of Public Affairs, and the Master of Business Administration (M.B.A.) degree is offered through the Graduate School of Business Administration.

Further details may be obtained by contacting the individual department on the Colorado Springs Campus.

Facilities for Graduate Study and Research on the Denver Campus

The University of Colorado at Denver is located at 1100 14th Street (14th and Arapahoe) in downtown Denver. The campus offers programs in the following schools and colleges:

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

UCD is a partner in the Auraria Higher Education Center with the primary role of providing graduate, professional, and upper division education. The combined Auraria libraries have more than 300,000 volumes and a periodical subscription list of more than 2,000. In addition, UCD students can draw on the holdings of the libraries of the other campuses. Good photoreproduction and audiovisual services are also available.

The Denver Campus is making research contributions in many areas with special emphasis upon programs with an urban direction. The Institute for Urban and Public Policy Research, the Center for Urban Transportation Studies, the Center for Public and Urban Affairs, and the Center for New Towns and Community Design are examples of organizations that provide a multidisciplinary approach to the problems of the city.

The following graduate programs are available for completion through the Graduate School on the Denver Campus:

The Master of Arts (M.A.) in:

- Counseling and guidance
- library media
- Counseling and guidance
- in the agency setting
- Early childhood education
- Educational psychology
- Elementary education

Specialist in Education (Ed.S.)

The Master of Science (M.S.) in:

- Accounting
- Finance
- Applied mathematics
- Management and organization
- Chemistry
- Management science
- Civil engineering
- Marketing
- Electrical engineering
- Environmental science
- Mechanical engineering
- Educational administration
- Physical education
- Fine arts
- Spanish
- Geology

Further details may be obtained by contacting the Associate Dean of the Graduate School, University of Colorado at Denver, 1100 14th Street, Denver, Colorado 80202, or by consulting the bulletin for the University of Colorado at Denver.

Students should contact the College of Business, the College of Environmental Design, and the Graduate School of Public Affairs for graduate work within their respective programs.

Facilities for Graduate Study and Research at the Health Sciences Center in Denver

The University's Health Sciences Center is located at 4200 East Ninth Avenue, Denver, on its own 32-acre campus. It includes the School of Medicine, the School of Nursing, the School of Dentistry, the Graduate School Division of the Health Sciences Center, and the clinical teaching facilities of Colorado General Hospital, Colorado Psychiatric Hospital, John F. Kennedy Child Development Center, Children's Psychiatric Day Care Center, Diagnostic Service for Rheumatic and Congenital Heart Diseases, Newborn and Premature Center, and Children's Diagnostic Center for the evaluation of emotionally disturbed children.

Also on the Health Sciences Center Campus are the Florence R. Sabin Building for Research in Cellular Biology, the Denison Memorial Library, the Humphreys Postgraduate Center, and the Bonfils Tumor Clinic. Additional facilities on the Medical Campus include the Webb-Waring Lung Institute, Belle Bonfils Memorial Blood Bank, the Eleanor Roosevelt Institute for Cancer Research, and the Barbara Davis Children's Diabetes Center.

The Denison Memorial Library has a collection of over 161,000 bound volumes and a subscription list of...
2,000 medical and scientific journals, American and foreign. There are photoreproduction facilities and 120 private study carrels.

The Health Sciences Center is making research contributions in such fields as ultrastructure of cells, molecular genetics, mechanisms of enzyme action, protein synthesis, physical chemistry of macromolecules, neurophysiology, viral structure and function, cell growth and differentiation, and immuno-chemical mechanisms, as well as in such areas of clinical investigation as transplantation of vital human organs, mental illness and retardation, allergies, viral and bacterial infections, heart disease, muscular dystrophy, cancer, emphysema, arthritis and rheumatism, and radiation effects.

The following graduate programs are available for completion through the Graduate School on the Health Science Center campus.

The Master of Science (M.S.) in:

- Anesthesiology
- Biometrics
- Biophysics and genetics (genetic counseling)
- Child health associate
- Health administration
- Laboratory medicine
- Nursing
- Physical therapy
- Radiology (medical physics)

The Doctor of Philosophy (Ph.D.) in:

- Anatomy
- Biochemistry
- Biometrics
- Biophysics and genetics
- Microbiology and immunology
- Molecular and cellular biology
- Molecular and human genetics
- Nursing
- Pathology
- Pharmacology
- Physiology

International Education

The Office of International Education expedites student and faculty exchanges. It provides information and guidance to foreign students, schedules and entertains foreign visitors, promotes special relationships with foreign universities, and advises students about international fellowships such as Fulbright, Marshall, and IREX. The University of Colorado also has graduate exchange programs with the Universities of Erlangen, Gottingen, and Regensburg in Germany and the University of Bordeaux in France. A special program in film studies in Paris is also available to graduate students. The University of Colorado operates a summer program in art history in Florence, a Theatre and Music Program in London, and other short-term programs which offer graduate credit to the eligible student. Graduate students may apply for directorships and assistant directorships of some of the University's study abroad programs, which are designed for undergraduates. Information and application forms are available from the Office of International Education, Environmental Design Building.

Division of Continuing Education

For courses offered and other information, write to the University of Colorado, Campus Box 178, Boulder 80309, or call (303) 492-5148 or 492-8756. Opportunities for professional level management and engineering seminars are available year-round. Other Continuing Education offices are located at the Denver and Colorado Springs campuses.

Graduate Student Advisory Council (GSAC)

The Graduate Student Advisory Council (GSAC) represents all graduate students on the Boulder Campus of the University of Colorado. It is composed of one voting representative from every graduate degree granting program. The GSAC works with and makes recommendations to various University administrators, the dean of the Graduate School, the Western Interstate Commission for Higher Education, and the graduate faculty concerning the quality of graduate education, equitable treatment with respect to appointments and support, University services, and other matters which may affect the welfare and education of graduate students.

Graduate Student Committee on Privilege (GSCP)

Grievances which concern graduate students and which cannot be redressed through appropriate administrative channels should be directed to the GSCP, either through the Graduate Student Advisory Council (UMC 183E, ext. 5068) or through the dean of the Graduate School (ext. 7401). The GSCP, a newly established committee composed of graduate students from all University of Colorado campuses, considers grievances involving graduate student rights and privileges and is designed to expedite grievance proceedings and to protect the grievant from any overt or covert discrimination or intimidation which may result from his or her filing a complaint. The committee has been endorsed by the dean of the Graduate School, the Executive Committee of the Graduate School, and the graduate faculty.

TUITION AND FEES

Tuition and fees for the 1982-83 school year have not yet been set. The tuition rates per campus for the 1981-82 school year are given below.

Boulder Campus Tuition

See Tuition and Fees in the General Information section of this catalog.

Colorado Springs Campus Tuition, Per Semester

See the University of Colorado at Colorado Springs Bulletin for schedule of fees and academic calendar.

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1The Board of Regents reserves the right to change tuition and fees at any time.
Denver Campus Tuition, Per Semester

See the University of Colorado at Denver Bulletin for current schedule of fees and academic calendar.

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<tr>
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</table>

Each credit hour over 18 $ 18
Charge for Candidate for Degree $ 19
Charge for students enrolled for doctoral thesis $ 109

Health Sciences Center Campus Tuition

See the University of Colorado Health Sciences Center Course Book for the academic calendar.

Graduate Programs in the School of Nursing, Health Administration and Radiology, Per Semester

<table>
<thead>
<tr>
<th>Credit Hours of Enrollment</th>
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<th>Nonresident</th>
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Graduate Programs in All Other Clinical and Basic Science Areas, Per Quarter

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</table>

FINANCIAL AID FOR GRADUATE STUDY

Financial Aid

Graduate students wishing to apply for long-term loans through the National Direct Student Loan Program and for part-time jobs through the College Work-Study Program should submit an Application for Financial Aid to the Office of Financial Aid by April 1.

Scholarships and Fellowships

The University of Colorado administers various forms of financial assistance for graduate students: fellowships, fellowships for the disadvantaged, traineeships, scholarships, research and teaching assistantships, and a number of awards from outside agencies.

The Graduate School offers two types of assistance: Colorado Doctoral Fellowships and Colorado Graduate Grants.

Colorado Doctoral Fellowships are awarded to entering and continuing regular degree doctoral students and provide an award of $8,500 for the academic year. These are awarded to entering students on the basis of academic promise; to continuing students on criteria of academic success. All awards are determined in a University-wide competition. In order for a fellowship to be renewed, the student holding it must reapply and must again be successful in open competition. Special fellowships, traineeships, and scholarships are also available for study in certain departments.

Applications for fellowships and scholarships are due in the department before the announced departmental deadline. Awards are announced on March 15 in accord with the Council on Graduate Schools.

The Colorado Graduate Grant Program is a new program open to graduate students who are residents of the state of Colorado. The competition for these funds is based on need. Applications are available from the Office of Financial Aid.

For further details consult the University of Colorado brochure, Fellowships, Scholarships, and Assistantships for Graduate Students, 1982-83.

Graduate School Fellowships

A limited number of fellowships is available for Ph.D. students in the basic science departments at the Health Sciences Center.

Part-Time Instructors (F-89) and Teaching Assistants

Many departments employ graduate students as part-time instructors (F-89) or teaching assistants. Part-time instructors (F-89) are enrolled graduate students who have a master's degree or the equivalent. They are compensated on the basis of the number of appointment hours per week. Tuition is paid depending upon the number of appointment hours per week. Nonresident students employed as assistants are eligible for the nonresident tuition differential stipend for

"The Board of Regents reserves the right to change tuition and fees at any time."
their first-year appointments as assistants only. Exceptions extending beyond the first year must be approved in advance by the respective dean.

Research Assistantships

Research activities provide opportunities for graduate students to secure part-time work as research assistants in many departments. General fund research assistantships are subject to the one-year rule on eligibility for waiver of the nonresident tuition differential. Nonresident students who are appointed as research assistants in nongeneral fund accounts are eligible for resident tuition rates. Assistants must be enrolled students.

ADMISSION REQUIREMENTS

General Requirements

A student who is granted admission must reflect in a moral and ethical sense a personal background acceptable to the University. The University reserves the right to deny admission to applicants whose total credentials reflect an inability to assume those obligations of performance and behavior deemed essential by the University and relevant to any of its lawful missions, processes, and functions as an educational institution.

Admission to the Graduate School is not admission to candidacy for an advanced degree. A student who wishes to become a candidate for a degree must make special application at the time and in the manner prescribed by the requirements for the degree sought. Students may be admitted to the Graduate School in either of the two categories described below.

Regular Degree Students

Qualified students are recommended for admission to regular degree status by the appropriate department. In addition to departmental approval, an applicant for admission as a regular degree student must:

1. Hold a baccalaureate degree from a college or university of recognized standing, or have done work equivalent to that required for such a degree and equivalent to the degree given at this University.

2. Show promise of ability to pursue advanced study and research, as judged by the student’s previous scholastic record.

3. Have had adequate preparation to enter graduate study in the field chosen.

4. Have at least a 2.75 (2.0=C) undergraduate grade-point average (for engineering, 3.0).

5. Meet additional requirements for admission as established by major departments.

Pass-Fail Grades. In order to permit a meaningful evaluation of an applicant’s scholastic record, not more than 10 percent of those credit hours that are relevant to the intended field of graduate study shall have been earned with pass-fail grades, nor more than 20 percent overall. Applicants whose academic record contains a larger percentage of pass-fail credits must submit suitable additional evidence that they possess the required scholastic ability. An applicant who does not submit satisfactory additional evidence can be admitted only as a provisional student.

Provisional Degree Students

Students who do not meet the requirements for admission as regular degree students may be recommended for provisional degree status by the major department. With the concurrence of the dean of the Graduate School these students are admitted to a probationary term of either one or two semesters of full-time study or its equivalent for part-time students. At the end of the specified probationary period, provisional degree students must be either admitted to regular degree status or dismissed from the graduate program to which they were provisionally admitted.

Credit earned by persons in provisional degree status may count toward a degree at this University.

Provisional degree students are required to maintain a 3.0 grade-point average or higher, as may be required by the terms of their provisional admission, each semester or summer session on all work taken, whether or not it is to be applied toward the advanced degree sought. Students who fail to maintain such a standard of performance will be subject to suspension from the Graduate School.

Seniors at the University of Colorado

A University of Colorado senior who has satisfied the undergraduate residence requirement and needs not more than 6 semester hours of advanced subjects and 12 credit points to meet the requirements for a bachelor’s degree may be admitted to the Graduate School.

A University of Colorado senior enrolled in the College of Engineering and Applied Science who needs not more than 18 semester hours or 36 credit points to meet the requirements for a bachelor’s degree may be admitted to the Graduate School, but is not eligible for financial aid, scholarships, or fellowships as a graduate student until the equivalent of the minimum requirements for the bachelor’s degree have been satisfied.

Graduate Record Examinations

The Graduate Record examinations are 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 his/her status is determined. For the Health Sciences Center see individual departments. Satisfactory scores on the Graduate Record Examinations are required on the Health Sciences Center Campus for graduate students in the basic sciences.

Students who are applying for the fall of 1982 should take the GRE no later than the December testing date so that their scores will be available to the graduate awards selection committee.

Information regarding these examinations may be obtained from the Testing Office, 130 Willard Administrative Center, Campus Box 103, University of
Readmission of Former and Suspended Students

Students who were previously admitted to a graduate degree program but who did not complete that degree and who have not been continuously registered at the University must:

1. Clarify their status with the department to determine their eligibility to return and pursue the same degree.
2. After receiving departmental approval, as indicated above, submit a Former Student Application to the Office of Admissions before quotas are filled or deadlines passed for the term in which they expect to return to the University. Application deadlines are available from the department.

In some instances, students who have left the degree program to which they were formerly admitted must submit a new Graduate Application form and be reconsidered for admission by the department concerned.

Former students who wish to change from undergraduate to graduate status or from one major to another must complete the appropriate forms at the time they apply for readmission.

Students transferring from one campus to another must apply and be accepted to the new campus.

A student admitted to the Graduate School for the master's program must reapply for admission for the doctoral program.

A suspended student 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. In case of lack of agreement between the department and the dean or in case of appeal by the student, the final decision will be made by the Executive Committee.

Faculty Members

No member of the faculty above the rank of instructor may receive an advanced degree from this University.

Boulder Campus

All requests from U.S. citizens and permanent U.S. residents for admission to the Graduate School should be sent to the chairman of the department in which the applicant wishes to study. Prospective foreign students must contact the Office of Admissions, University of Colorado, Regent Administrative Center, Campus Box B-7, Boulder, Colorado 80309.

Colorado Springs Campus

Graduate students who expect to study on the Colorado Springs Campus should apply for admission by contacting the graduate representative for the particular program. Specific admission requirements for programs on the Colorado Springs Campus may be found by consulting the bulletin of the University of Colorado at Colorado Springs.

Denver Campus

Graduate students who expect to study on the Denver Campus should apply for admission by contacting the graduate representative for the particular program. Specific admission requirements for programs on the Denver Campus may be found by consulting the bulletin of the University of Colorado at Denver. Further information may be obtained from the Office of the Associate Dean, Graduate School; University of Colorado, Denver, 1100 14th Street, Denver, Colorado 80232, (303) 629-2863.

Graduate School at the Health Sciences Center

The Graduate School at the Health Sciences Center campus of the University of Colorado is located in Denver and is under the jurisdiction of the associate dean of the Graduate School.

Requests and inquiries regarding admission to all graduate programs at the Health Sciences Center should be addressed to the graduate program in which the applicant wishes to study, University of Colorado Health Sciences Center, 4200 East 9th Ave., Denver, Colorado 80262.

Aside from the general admission requirements for the Graduate School, the minimal departmental admission requirements for most doctoral degree programs are as follows: One year each of biology, general physics, differential and integral calculus, and one semester of physical chemistry.

In the event that an applicant is deficient in any of these subjects, but is otherwise scholastically acceptable for admission for the Ph.D. degree, it is recommended that he eliminate these deficiencies as early as possible in his residency here by taking the appropriate courses on the Boulder Campus, Denver Campus, or through the University Division of Continuing Education.

APPLICATION PROCEDURES

An applicant for admission from another institution must present complete application materials which include:
1. Part I and Part II of the graduate application.
2. Two official transcripts of all academic work completed to date.
3. A $20 nonrefundable application processing fee (check or money order). No application will be processed unless this fee is paid.
4. Four reports from references (not required from M.B.A. applicants).
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 chairman of each department or a committee named for the purpose shall decide whether an applicant shall be recommended for admission. That recommendation is further reviewed and the student is informed of the decision by the Office of Admissions.
Persons who do not wish to work toward an advanced degree should see the section entitled Special Students.

A completed application must be in the office of the major department at least 120 days prior to the term for which the admission is sought or earlier as may be required by the major department.

Foreign students coming from abroad should have completed applications on file in the Office of Admissions prior to May 1 for the fall semester and October 1 for the spring semester; those foreign students currently studying in the United States should follow deadlines set for United States citizens.

Applicants should be aware of the limitation on total enrollment in effect at the University of Colorado Boulder Campus. Acceptable applicants may find that their application cannot be processed for a specific term if the limitation on enrollment has been reached.

**Graduate Notification and Confirmation**

After the Office of Admissions has received the department recommendation and all required credentials, the applicant will be notified regarding eligibility for admission. If eligible, the applicant will receive a Certificate of Eligibility as well as a confirmation form and must return the confirmation deposit before the enrollment limits are reached or the deadline passed. The 1981 confirmation amounts were $200 for a nonresident student and $100 for a resident of Colorado. If the confirmation is accepted, the student will be sent information regarding registration. Should the enrollment limits be reached, the confirmation deposit will be returned. Applicants not accepted for admission will be notified by the appropriate graduate department.

**REGISTRATION**

Every student entering this Graduate School for the first time must have an Eligibility for Admission Form. Former students must have an Eligibility for Admission Form when changing departments or when working toward another graduate degree. This form is mailed from the Office of Admissions after processing of the approved application has been completed.

**Late Registration**

Late registration will be held only if enrollment limits have not been reached. Therefore, there is no guarantee there will be a late registration. Graduate students who fail to complete registration and pay fees during the regular registration days may be charged a late registration fee if a late registration is held. Students registering as Candidate for Degree or for thesis must register during the regular registration period or be subject to the late registration fee if a late registration is held.

**Limitation of Registration**

**FULL LOAD**

A graduate student will be considered to be carrying a full load during a regular semester for purposes of determining residence credit if the student is registered for no fewer than 5 semester hours in work numbered 500 or above, at least 8 semester hours of other graduate work, or any number of thesis hours.

A full load for purposes of determining residence credit during the summer session is 3 semester hours of work in courses numbered 500 or above, 6 semester hours of other graduate work, or any number of thesis hours.

**MAXIMUM LOAD**

No graduate student may receive graduate credit toward a degree for more than 15 hours in a regular semester.

The maximum number of graduate credits that may be applied toward a degree during a summer session is 6 hours per 5-week term and 10 hours per 10-week summer session.

**UNIVERSITY EMPLOYEES**

Full-time employees of the University may not undertake more than 6 credit hours per semester. Part-time employees, including assistants, may take such work as is approved by the major department.

**Changes in Registration**

A student who wishes to drop a course or take it for no credit should follow the drop/add standard procedure found in the current Schedule of Courses. Note that after the 10th week of classes a graduate student may not drop, add, or change a course to noncredit without presenting a letter to the dean of the Graduate School, 308 Regent Administrative Center, stating the exceptional circumstances which justify the change. This letter, endorsed by the instructor of the course, must accompany the properly signed and completed drop/add card.

**Withdrawal**

A graduate student who desires to withdraw from the University must apply to the dean of the Graduate School for permission to withdraw in good standing. A student who discontinues attendance in a course without official withdrawal will be marked as having failed the course.

**REQUIREMENTS FOR ADVANCED DEGREES**

**Quality of Graduate Work**

Although the work for advanced degrees is specified partly in terms of credit hours, an advanced degree will not be conferred merely for the completion of a specified period of residence and the passing of a given number of courses. A student should not expect to gain from formal courses all the training, knowledge, and grasp of ideas necessary to meet the requirements for an advanced degree.

A student is required to maintain at least a B average in all work attempted in Graduate School.

For the Ph.D., a course work below B is unsatisfactory and will not be counted toward fulfilling the minimum requirements for the degree.
A student who fails to do satisfactory work will be subject to suspension from the Graduate School by the dean with the approval of the major department. Appeal may be made to the Executive Committee of the Graduate School, whose decision shall be final.

**GRADING SYSTEM**

Students should refer to the uniform grading system described in the General Information section of this catalog and note the following:

1. Work receiving the lowest passing grade, D, may not be counted toward a degree, nor may it be accepted for the removal of deficiencies. Marks below B are not accepted for the Ph.D.

2. Should a student enter the armed forces before completing a course and an IW is reported, this grade may be carried on the records for the duration of the student's service provided arrangements have been made in advance with the dean of the Graduate School.

3. An in progress grade given for thesis or M.Ed. report will be valid until the thesis or report has been completed.

**REPEATING A COURSE**

A graduate student who receives a grade of C, D, or F in a course may repeat that course once, upon written recommendation to the dean by the chairman of the student's advisory committee and major department, provided the course has not previously been applied toward a degree. The grade for the repeated course will substitute for the old grade in computation of the grade-point average. All grades received will appear on the student's transcript.

**USE OF ENGLISH**

A student who is noticeably deficient in the use and spelling of the English language may not obtain an advanced degree from the University of Colorado. The satisfaction of this requirement depends not so much upon the ability to pass formal tests, although these may be demanded, as it does upon the habitual use of good English in all oral and written work. Ability to use the language with precision and distinction should be cultivated as an attainment of major importance.

Each department will judge the qualifications of its advanced students in the use of English. Reports, examinations, and speech will be considered in estimating the candidate's proficiency.

**Master of Arts and Master of Science**

A student regularly admitted to the Graduate School and later accepted as a candidate for the degree Master of Arts or Master of Science will be recommended for the degree only after the following requirements have been met.

In general, only graduates of an approved institution who have a thorough preparation for their proposed fields of study and who do graduate work of high quality are able to attain the degree with the minimum amount of work specified below. All studies offered toward the minimum requirement for the degree must be of graduate rank. Courses taken during the fall semester of 1975 and thereafter will have graduate rank only if they are taught by members of the graduate school faculty and are in one of the two following categories: (1) courses within the major department at the 500 level or above; (2) courses outside the major department at any level, provided they are approved for graduate rank for a specific degree plan by the faculty of the degree-granting program and the dean of the Graduate School. Necessary additional work required to make up deficiencies or prerequisites may be partly or entirely undergraduate courses.

The requirements stated below are minimum requirements; additional conditions set by the department will be found in the announcements of separate departments. Any department may make further regulations consistent with the general rules.

**MINIMUM REQUIREMENT**

The minimum requirement of graduate work for the degree Master of Arts or Master of Science may be fulfilled by following either Plan I or Plan II below.

**Plan I:** By presenting 24 semester hours of graduate work, including a thesis. At least 12 semester hours of this work must be at the 500 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 500 level or above. Courses below the 500 level may be used only if they are in departments other than the student's major department.

Plan II does not represent a free option for the student. A candidate for the master's degree may be allowed to select Plan II only on the recommendation of the department concerned.

**MASTER'S THESIS**

A graduate student who writes a thesis under Plan I must register for 4, 5, or 6 semester thesis hours (700). The student may register for 6 hours during one semester or spread the total out over a number of semesters. The student may not register for zero thesis hours. After the student has registered for the total number of thesis hours, he or she should, if registration is required for a final examination, register as Candidate for Degree (999).

The final grade will be withheld until the thesis is completed; if the thesis is not finished at the end of the term in which the student is registered, an in progress (IP) will be reported.

**LANGUAGE REQUIREMENTS**

Candidates must have such knowledge of ancient and modern languages as each department requires. See special departmental requirements.

**CREDIT BY TRANSFER**

Work already applied toward a master's degree received at another institution cannot be accepted for transfer toward the master's degree at the University of Colorado; extension work completed at another institution cannot be transferred; and correspondence work, except to make up deficiencies, is not recognized.

All work accepted by transfer must come within the five-year time limit or be validated by special examination.
Credit will not be transferred until the student has established, in the Graduate School of this University, a satisfactory record of at least one semester in residence; such transfer will not reduce the residence requirement at this University, but it may reduce the amount of work to be done in formal courses.

Excess undergraduate credits from another institution may not be transferred to the Graduate School. Seniors in this University may, however, transfer a limited amount of advanced resident work (up to 8 semester hours) provided such work:

1. Is completed with distinction in the senior year at this University.
2. Comes within the five-year time limit.
3. Has not been applied toward another degree.
4. Is recommended for transfer by the department concerned and is approved by the dean of the Graduate School.

The maximum amount of work that may be transferred to this University, dependent upon the master's degree sought, is noted below:

<table>
<thead>
<tr>
<th>Degree</th>
<th>Semester Hours</th>
</tr>
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<td>M.A. or M.S.</td>
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<tr>
<td>M.Bus.Ed.</td>
<td>8</td>
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<tr>
<td>M.Ed.</td>
<td>8</td>
</tr>
<tr>
<td>M.Mus.</td>
<td>8</td>
</tr>
<tr>
<td>M.Mus.Ed.</td>
<td>8</td>
</tr>
<tr>
<td>M.F.A. (Studio)</td>
<td>10</td>
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Requests for transfer of credit to be applied toward an advanced degree must be made on the form specified for this purpose and submitted to the Graduate School by the beginning of the semester prior to that in which the student will graduate. This form is to be completed by the student, endorsed by his advisor, the departmental chairman or his designated representative, and the dean of his college if applicable, and sent to the Graduate School. An official transcript of credit must accompany the request. (Information required: course title, number, credit hours, when and where taken, grade received, and certification that student was enrolled in graduate school at the time.) To be eligible for courses to be considered for transfer, a student must have an overall B average in all courses taken at the University of Colorado in Graduate School.

TRANSFER OF SPECIAL STUDENT CREDIT HOURS

A department may recommend to the graduate dean the acceptance of as many as 8 hours of credit toward the requirements for a master's degree for courses taken either as a student at another recognized graduate school, as a special student at this University, or both. In addition, the department may recommend to the graduate dean the acceptance of credit for courses taken as a special student at this University during the term for which the student applied for admission to the Graduate School provided such admission date was delayed through no fault of the student's. A grade of B or better must be obtained in any course work transferred in this manner.

CONTINUING EDUCATION COURSE WORK

Students may use the resources of the Division of Continuing Education in the pursuit of graduate study only if they obtain proper academic approval from the major department and the graduate dean in advance. These resources include classes, courses by consultation, and group study.

RESIDENCE

In general the residence requirements can be met only by residence at this University for at least two semesters or at least three summer sessions. For full residence a student must be registered within the time designated at the beginning of a semester and must carry the equivalent of at least 5 semester hours of work in courses numbered 500 or above, or at least 8 semester hours of other graduate work. See Limitation of Registration, Full Load for requirements for full residence credit during the summer. Students who are noticeably deficient in their general training or in the specific preparation required by the department cannot expect to obtain a degree in the minimum time specified.

Assistants and other employees of the University may fulfill the residence requirements of one year in two semesters, provided their duties do not require more than half time. Full-time employees may not satisfy the residence requirement of one year in fewer than four semesters.

CANDIDACY

A student who wishes to become a candidate for a master's degree must file application in the dean's office not later than 10 weeks prior to the completion of the comprehensive-final examination.

This application must be made on forms obtainable at the dean's office and in appropriate departments and must be signed by the major department, certifying that the student's work is satisfactory and that the program outlined in the application meets the requirements set for the student.

THESIS REQUIREMENTS

A thesis, which may be of a research, expository, critical, or creative type, is required of every master's degree candidate under Plan I. Every thesis presented in partial fulfillment of the requirements for an advanced degree must:

1. Deal with a definite topic related to the major field.
2. Be based upon independent study and investigation.
3. Represent the equivalent of from 4 to 6 semester hours of work.
4. Receive the approval of the major department at least 30 days (in some departments, 90 days) before the commencement at which the degree is to be conferred.
5. Be essentially complete at the time the comprehensive-final examination is given.

Two weeks prior to the date on which the degree is to be conferred, two formally approved, typewritten
copies of the thesis, complete with abstracts, must be filed in the Graduate School.

The thesis must be signed by two professors in the student’s major field. All approved theses are kept on file in the library. The thesis binding fee must be paid when the thesis is deposited in the Graduate School.

COMPREHENSIVE-FINAL EXAMINATIONS

Each candidate for a master’s degree is required to take a comprehensive-final examination after the other requirements for the degree have been completed. This examination may be given near the end of the last semester of residence while the candidate is still taking required courses for the degree, provided satisfactory progress is being made in those courses.

The following rules applying to the comprehensive-final examination must be observed:

1. A student must be registered when the examination is taken.
2. Notice of the examination must be filed by the major department in the dean’s office at least one week prior to the examination.
3. The examination is to be given by a committee of three graduate faculty members appointed by the department concerned with approval of the dean of the Graduate School.
4. The examination, which may be oral or written, or both, must cover the thesis, which should be essentially complete at the time, as well as other work done in the University in formal courses and seminars in the major field.
5. The examination must include all work presented for the degree. The examination on transferred work will be given by representatives of the corresponding fields of study in this University.
6. A student who fails the comprehensive-final examination may not attempt the examination again until at least three months have elapsed and until such work as may be prescribed by the examining committee has been completed. The student may reattempt the examination only once.

SUPPLEMENTAL EXAMINATIONS

Supplemental examinations should be simply an extension of the original examination and given immediately. If the student fails the supplemental examination, three months must elapse before he or she may attempt the comprehensive examination again.

TIME LIMIT

All work, including the comprehensive-final examination, should be completed within five years or six successive summers. Work done earlier 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.

Doctor of Philosophy

The Doctor of Philosophy degree is the highest academic degree conferred by the University. To state the requirements for the degree in terms of credit hours would be misleading, since the degree is not conferred merely upon the satisfactory completion of a course of study, however faithfully pursued. Students who receive this degree must demonstrate that they are proficient in some broad subject of learning and that they can critically evaluate work in this field; furthermore, they must have shown the ability to work independently in their chosen field and must have made an original contribution of significance to the advancement of knowledge. The technical requirements stated below are minimal requirements for all candidates for the degree; additional conditions set by the departments will be found in the announcements of separate departments. Any department may make additional regulations consistent with these general rules.

Studies leading to the Doctor of Philosophy degree must be chosen so as to contribute to special competence and a high order of scholarship in a broad field of knowledge. A field of study chosen by the student may be in one department except for essential related subject matter, or the field of study may include two or more closely related departments. The criterion as to what constitutes an acceptable field of study shall be that the student’s work must contribute to an organized program of study and research without regard to the organization of academic departments within the University.

MINIMUM REQUIREMENT

A minimum of 30 semester hours of courses numbered 500 or above is required for the degree, but the number of hours of formal courses will ordinarily exceed this minimum. At least 20 of the required hours must be in graduate courses taken at this University. Unless otherwise specified by departmental requirements, all 500-level or above courses taken for the master’s degree at the University of Colorado may be applied toward the doctor’s degree at the University. Students who have been admitted to the Graduate School with deficiencies may expect to receive little or no residence credit until the deficiencies have been removed.

CHANGE IN REQUIREMENTS FOR DOCTORAL DEGREE

To complete the requirements for the Ph.D. and other doctoral degrees, except the Doctor of Musical Arts degree, a student must register for 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 taken preceding the semester of being admitted to candidacy. In addition, up to 10 hours may be taken in the semester in which admission to candidacy is approved. Dissertation credit does not apply toward the minimum 30 hours of required course work specified above and will not be included in calculation of the student’s grade-point average. Only the grades of A, B, C, and IP shall be used.
Course work and work on dissertation may proceed concurrently throughout the doctoral program. However, at no time shall a doctoral student register for more than 15 hours of 500-level and above courses. Normally a student must have earned at least three and not more than six semesters of residency before admission to candidacy.

Following successful completion of comprehensive examinations and admission to candidacy, students must register continuously. Students admitted to "candidate for degree" will register for and be charged for 10 hours of credit for each full-time term of doctoral work. For each term of part-time enrollment, students will be charged for 7 hours of credit, except that students not making use of campus facilities may petition the Graduate School for 3-credit-hour status. Continuous registration during the academic year will be required until completion of the dissertation defense. It is expected that the student and advisor will consult each semester as to the number of hours for which the student will register, consistent with the classifications identified above.

QUALITY OF WORK

Students are expected to complete with distinction all work in the formal courses in which they enroll. A course mark below B is unsatisfactory and will not be counted toward fulfilling the minimum requirements for the degree. Upon recommendation by the advisory committee and the executive officer of the department and with the approval of the dean, a student may be required to withdraw at any time for failure to maintain satisfactory progress toward the degree.

ADVISORY COMMITTEE

As soon as the field of specialization has been chosen, the candidate will request the faculty member with whom the candidate wishes to work to act as chairman of the advisory committee. The chairman, with the advice and approval of the executive officer of the department, may select two or more others to serve on the committee, so that the several fields related to the student's special interest will be represented. A purpose of the advisory committee (beyond guiding the student throughout his graduate study) is to insure against too narrow specialization. The student shall obtain the signature of the chairman of the committee (thereby signifying his willingness to act) on the Application for Admission to Candidacy Form. Any change in the membership of the Advisory Committee is to be similarly reported.

PRELIMINARY EXAMINATION

Each department will satisfy itself (by examination or other means) that students who signify intent to undertake study for the Ph.D. degree are qualified to do so. The means by which each department makes this evaluation shall be specified in departmental requirements. Students who are thus evaluated will be notified immediately of the results. The results of this preliminary evaluation shall be reported to the Office of the Graduate School on the Application for Candidacy Form filed by the student at least two weeks before the comprehensive examination is attempted.

LANGUAGE REQUIREMENT

Students are required to meet the following language requirements:

Communication Requirement

1. All graduate students for whom English is the native language are required to demonstrate at least second-year college proficiency in a foreign language of their choice. This requirement may be satisfied in the following ways:
   a. The student's undergraduate transcript may be presented, showing completion with a grade of C or better of at least 3 semester hours of a fourth-semester undergraduate college course in a foreign language. The transcript must accompany the student's Application for Admission to Candidacy when it is submitted to the Graduate School.
   b. The student may take the Graduate School Foreign Language Test (GSFLT) at the Testing Office before or after admission to the Graduate School. Students should check with the Graduate School for the passing score required for each language.
   c. If the student wishes to demonstrate competence in a language for which the GSFLT is not available, a test designed and administered by the appropriate language department at the University of Colorado may be taken, with the passing criterion to be set comparable to the above GSFLT criterion.
   d. The student may register at the University for any fourth-semester course in a foreign language and pass it with a grade of C or better. (Registration in such courses is contingent upon the language department's approval.)

A student who elects b, c, or d above must complete the requirements before the Ph.D. comprehensive examination may be scheduled.

2. Students whose native language is not English will, by passing their courses and completing their graduate work at the University, demonstrate sufficient ability in English to meet the communication requirement.

Special Languages

When special languages are needed as tools to read foreign literature in a particular field, the individual academic departments may require further training in foreign languages for all their Ph.D. graduate students. The choice and number of languages as well as the required levels of skill and the methods of testing these skills are determined by the individual departments.

CREDIT BY TRANSFER

 Resident graduate work of high quality earned in another institution of approved standing will not be accepted for transfer to apply toward the doctorate until the student has established in this Graduate School a
satisfactory record in residence, but such credit must be transferred before the student makes application for admission to candidacy for the degree. Such transfer will not reduce the minimum residence requirement at this University, but it may reduce the amount of work to be done in formal courses.

The maximum amount of work which may be transferred to this University, dependent upon the doctoral degree sought, is noted below:

<table>
<thead>
<tr>
<th>Degree</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ed.D.</td>
<td>10</td>
</tr>
<tr>
<td>Ph.D.</td>
<td>10</td>
</tr>
<tr>
<td>D.B.A.</td>
<td>10</td>
</tr>
<tr>
<td>D.M.A.</td>
<td>10</td>
</tr>
</tbody>
</table>

Requests for transfer of credit to be applied toward an advanced degree must be made on the form specified for this purpose and must be submitted to the Graduate School before the student makes application for admission to candidacy for the degree.

This form is to be completed by the student; endorsed by the adviser, the departmental chairman or a designated representative, and the dean of the college if applicable; and sent to the Graduate School. An official transcript of credits must accompany the request. (Information required: course title, number, credit hours, when and where taken, grade received, and certification that the student was enrolled in graduate school at the time.) To be eligible for courses to be considered for transfer, a student must have a B average in all courses taken in Graduate School at the University of Colorado.

THESIS REQUIREMENTS

A thesis based upon original investigation and showing mature scholarship and critical judgment as well as familiarity with tools and methods of research must be written upon some subject approved by the student’s major department. To be acceptable, this dissertation should be a worthwhile contribution to knowledge in the student’s special field. It must be finished and submitted in typewritten form at least 30 days (in some departments, 90 days) before the day of the final examination and must be formally approved and made available for inspection by the examining committee before the final examination may be taken.

In mechanical features all dissertations must comply with the specifications of the Graduate School.

It is the student’s responsibility to notify the Graduate School of the exact title of the dissertation at least six weeks prior to the commencement at which the student will graduate. This title will be printed in the commencement program.

One formally-approved, typewritten copy of the thesis, including abstract, plus one additional copy of the title page and abstract must be filed in the Graduate School office at least two weeks before the date on which the degree is to be conferred.

The abstract, not to exceed 600 words, will be published in Dissertation Abstracts International. The determination of what constitutes an adequate abstract shall rest with the major department.

All theses must be signed by no fewer than two members of the major department staff who are regularly engaged in graduate instruction.

All approved theses are kept on file in the library.

When the thesis is deposited in the Graduate School, the candidate must pay the thesis-binding fee and sign an agreement with University Microfilms International to allow for publication in Dissertation Abstracts International and to grant University Microfilms International the right to reproduce and sell (a) copies of the manuscript in microform and/or (b) enlarged copies of the manuscript made from microform. The author retains all rights to publish and/or sell the dissertation by any means at any time except by reproduction from negative microform.

FINAL EXAMINATION

After the thesis has been accepted, a final examination of the thesis and related topics will be conducted. This examination will be wholly or partly oral, the oral part being open to anyone. The examination will be conducted by a committee appointed by the dean, which will consist of at least five persons, one of whom must be from outside the student’s department. More than one dissenting vote will disqualify the candidate in the final examination.

Arrangements for the final examination must be made in the dean’s office at least two weeks in advance. The examination must be scheduled not later than two weeks before the date on which the degree is to be conferred. A student must be registered at the time of the final examination.

Professional Degrees

The prerequisites and requirements for professional degrees will be found in the appropriate departmental material in this catalog.

MASTER’S AND DOCTORAL DEGREE CANDIDATES

Students planning to graduate should obtain current deadline dates in the office of the Graduate School. It is the graduate student’s and the department’s responsibility to see that all requirements and deadlines are met (i.e., changing of JW grades, notifying the Graduate School of final examinations, etc.).

Departments or program committees may have additional deadlines which must be met by graduate students in that department or program. It is the student’s responsibility to ascertain such requirements and to meet them as designated by the department or program chairman.

RESIDENCE

The student must be properly registered to earn residence credit. The minimal residence requirement shall be six semesters of scholarly work beyond the attainment of an acceptable bachelor’s degree. Mere attendance shall not constitute residence as the word is here used. Residence may be earned for course work completed with distinction, for participation in seminars, or for scholarly research performed here or
elsewhere under the auspices of the University of Colorado.

As a guiding policy in determining residence credit for employed students, those who are employed in three-fourths to full-time work which does not contribute directly to their program toward a degree may not earn more than one-half residence credit in any semester. Students who are employed more than one-fourth time and less than three-fourths time in work that does not contribute directly to the degree may earn no more than three-fourths residence credit. Those who have one-fourth time employment or less may earn full residence credit. (All these provisions are subject to the definition of residence credit given in the preceding paragraph.) In case the interpretation of residence credit for any student needs to be clarified, a decision will be made by the chairman of the student's advisory committee, the executive officer of the student's major department, and the dean of the Graduate School.

Two semesters of residence credit may be allowed for a master's degree from another institution of approved standing, but at least four semesters of residence credit, two of which must be consecutive in one academic year, must be earned for work (course and/or dissertation) taken at this University.

CONTINUOUS REGISTRATION REQUIRED FOR DOCTORAL CANDIDATES

A student who is certified as Candidate for the Ph.D., D.Mus.A., Ed.D., or D.B.A. degree, or who has received permission to take the comprehensive and passes them prior to meeting the language requirement, must enroll and pay tuition for fall and spring semesters of each year until either defending the dissertation or formally resigning as a candidate. This continuing registration is independent of whether the candidate is in residence at the University. (See also section on Residence.)

APPLICATION FOR ADMISSION TO CANDIDACY

A student must make formal application for admission to candidacy for the Ph.D. degree on forms supplied by the Graduate School office at least two weeks before the comprehensive examination is attempted.

A student shall have earned at least three semesters of residence, shall have passed the language requirements, and shall have passed the comprehensive examination before admission to candidacy for the degree.

COMPREHENSIVE EXAMINATION

Before admission to candidacy for the Ph.D. degree, the student must pass a comprehensive examination in the field of concentration and related fields. This examination may be oral, written, or both, and will test the student's mastery of a broad field of knowledge, not merely the formal course work completed. The oral part is open to members of the faculty. The student must be registered at the time the comprehensive examination is attempted.

The examination shall be conducted by an examining board appointed by the chairman of the department concerned and approved by the dean. The board shall consist of the advisory committee and additional members as necessary to a minimum of five. A successful candidate must receive the affirmative votes of a majority of the members of the examination board. In case of failure, the examination may be attempted once more after a period of time determined by the examining board.

TIME LIMIT

If a student fails to complete all requirements for the degree within four years of the date on which the comprehensive examination was passed, a second examination similar in extent to the first will be required before the candidate may take the final examination. If this second comprehensive examination is failed, it may be attempted once more after not fewer than eight months of further work.

Interdepartmental Programs

See departmental listings in the college and school sections of this catalog for descriptions of graduate programs.

The following are descriptions of interdepartmental programs, medical division programs, and the graduate nursing program.

APPLIED PHYSICS

Students who wish to enter the Applied Physics Program must be admitted to either the Department of Electrical Engineering or the Department of Physics. Applied physics should be designated on the part of the physics or electrical engineering application form which asks for the intended specialty.

COURSE REQUIREMENTS

Each student accepted into the program will be assigned a faculty adviser who will aid in developing a personalized curriculum to meet the student's individual goals. The credit-hour requirement for both the M.S. and Ph.D. degrees is consistent with the requirements of the department in which the student is enrolled.

BEHAVIORAL GENETICS

The Institute for Behavioral Genetics offers a training program in behavioral genetics but is not a degree-granting unit of the University.

A student wishing to specialize in behavioral genetics must be regularly enrolled as a graduate student in an academic department of the University and must satisfy all requirements of that department. In addition, courses in behavioral genetics will be required.

In general, each student entering the program must demonstrate competence in the subject matter of general genetics, either by satisfactory performance on a comprehensive examination administered by the institute or by satisfactorily completing an advanced undergraduate course, e.g., EPOB 320 (general genetics) and EPOB 409 (statistics). Unless equivalent subject matter has already been taken, first-year graduate students will be required to enroll in Psych. 410 (Beh.
A research project under the supervision of a faculty member of the institute must also be initiated during the first year.

During the first two years in the program, each trainee shall complete two semesters of Psych. 510 (Concepts in Behavioral Genetics), one course in molecular or biochemical genetics (MCDB 384 or 489, or Chem. 481-482), and one course in population or quantitative genetics (Psych. 412/512, EPOB 422/522, or EPOB 527).

During each semester after the second year, each trainee shall enroll in Psych. 610 (Seminar in Behavioral Genetics). Each trainee shall be actively engaged in research in behavioral genetics during each semester in the program.

Other courses directly relevant to the program (but not required) are Behavioral Genetics Laboratory (Psych. 411 or EPOB 421), and Research in Behavioral Genetics (Psych. 601).

Further information about requirements for this interdisciplinary training program can be obtained from the institute.

**CHEMICAL PHYSICS**

The purpose of the interdepartmental doctoral program in chemical physics is to prepare students for research in such interdisciplinary fields as atomic and molecular radiative processes, nuclear and electron magnetic resonance spectroscopy, laser chemistry and physics, x-ray crystallography, molecular quantum mechanics, statistical mechanics, quantum chemistry, kinetics, and chemistry and physics of the surface and condensed state.

Students wishing to pursue graduate work leading to the Ph.D. degree in chemical physics should apply for admission to, and will be formally associated with, either the Department of Chemistry or the Department of Physics, in accordance with their undergraduate backgrounds.

Entering students will take the qualifying examination in the area of their undergraduate major, but the comprehensive examination will test their knowledge in the relevant aspects of both chemistry and physics. Certain requirements associated with the regular Ph.D. programs in the participating departments will be replaced by some in the complementary field; each student’s program of course work and research will be individually planned according to the student’s special needs.

Some of the courses that will be used in planning most programs in chemical physics are listed below. For descriptions of their contents, refer to the listings of the participating departments.

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chem. 501 and 506, Advanced Inorganic Chemistry</td>
<td>6</td>
</tr>
<tr>
<td>Chem. 531 and 532, Advanced Organic Chemistry</td>
<td>6</td>
</tr>
<tr>
<td>Chem. 550, Chemical Dynamics</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 553, Statistical Mechanics</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 558, Physical Chemistry of Macromolecules</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 568, Quantum Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 559, Advanced Molecular Spectroscopy</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 662, Advanced Topics in Physical Chemistry</td>
<td>3</td>
</tr>
</tbody>
</table>

**GeoPHYSICS**

This is an interdisciplinary and interdepartmental program leading to the Ph.D. degree. It is designed to encourage students with a wide variety of undergraduate backgrounds to pursue graduate studies in solid earth geophysics and is flexible enough to allow a student to specialize in one of the many aspects of geophysics, while providing a general background in geophysics and an in-depth training in the relevant parts of the parent disciplines.

Students wishing to enter the program should apply for admission and will be formally associated with one of the following departments: geological sciences, astrogeophysics, physics, aerospace engineering sciences, civil and environmental engineering, electrical engineering, and mechanical engineering. The choice will depend upon the student’s primary area of interest. A committee on geophysics assists in the choice of department and the planning of individual academic programs. The preliminary examination for the Ph.D. is administered by the student’s department, while the comprehensive examination and thesis are conducted by an interdepartmental committee.

Exceptional research opportunities are available through the Cooperative Institute for Research in Environmental Sciences (CIRES). Financial support is available either through teaching assistantships in the student’s department or as research assistantships on research programs. These are awarded on a competitive basis to students applying to the program. For further information contact Professor J. C. Harrison, CIRES, or the Department of Geological Sciences.

**MASTER OF BASIC SCIENCE PROGRAM**

The program is an interdisciplinary one leading to the Master of Basic Science degree. It provides an opportunity for present and prospective mathematics and science professionals and others to extend and/or broaden their training in computer science, mathematics, museology, and the natural sciences at advanced undergraduate and graduate levels. These professionals would include public school teachers, industrial scientists, engineers, business persons, and others.

The student may elect the mathematics, museology, or science option as described below. Wide latitude is possible in the details of a degree plan so that each student may follow a course of study most pertinent to his or her interest. Each degree plan must be approved by the M.B.S. Executive Committee.
The Master of Basic Science degree is supervised by an administrative committee appointed by the dean of the Graduate School, with representation from the following departments: anthropology, astrophysics, environmental, population, and organismic biology; chemistry; computer science; geological sciences; mathematics; molecular, cellular, and developmental biology; museum; and physics. The Colorado Springs and Denver campuses are also represented. The deans of the College of Arts and Sciences and the Graduate School are ex officio members.

Application should be made to the Master of Basic Science Program, Ketchum 306E, Campus Box 328, University of Colorado, Boulder, Colorado 80309.

REQUIREMENTS FOR ADMISSION

1. General regulations for admission to the Graduate School apply (see Admission Requirements).
2. A student must present at least 40 semester hours in the natural sciences and mathematics, preferably including one year of calculus. Students may be admitted to the program with a deficiency in calculus, but must remedy the deficiency within two years after admission by completing one year of calculus (or other courses in mathematical subjects on approval by the executive committee) with a grade of C or better.

REQUIREMENTS FOR THE MASTER OF BASIC SCIENCE DEGREE

1. General regulations of the Graduate School governing the award of the master's degree apply (see Master of Arts and Master of Science) except as modified below.
2. For the nonthesis option, 30 semester hours of basic science courses numbered 300 and above, taught by members of the graduate faculty, and selected from two or more departments. For the thesis option, 24 hours of basic science courses numbered 300 and above, taught by members of the graduate faculty, and selected from two or more departments. Of the required hours for either option, 12 hours or more must be from courses numbered 500 and above. Thesis credit does not count toward these 12 hours. Courses fulfilling program requirements may be selected only from among the departments listed below. See mathematics, museology, and science options below.

<table>
<thead>
<tr>
<th>Anthropology (museology option only)</th>
<th>Geology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Astro-Geophysics</td>
<td>Mathematics</td>
</tr>
<tr>
<td>Chemistry</td>
<td>Molecular, cellular, and developmental biology</td>
</tr>
<tr>
<td>Computer science</td>
<td>Museum (museology option only)</td>
</tr>
<tr>
<td>Environmental, population, and organismic biology</td>
<td></td>
</tr>
</tbody>
</table>

All courses applied toward the degree must be taken over a period of five years or six successive summers. Courses may be taken at each or at all three University of Colorado campuses. A maximum of 3 hours of graduate-level course credit of B or better grade transferred from other institutions may be applied toward the M.B.S. degree, provided that such credit has been approved by both the M.B.S. Executive Committee and the appropriate University of Colorado department. Students already in the program must obtain approval prior to enrolling in courses they may wish to transfer.

3. For the nonthesis option, completion of a paper describing a research project or other specialized study on a topic approved by the Executive Committee. For the thesis option, completion of a thesis which must meet the general requirements of the Graduate School for M.A. or M.S. theses and must be approved by the Executive Committee. Approval of the topic, for either option, is given on the basis of a written explanation or précis submitted no later than the end of the semester in which the student completes 21 hours of course credit or the completion of the third year after entering the program, whichever is earlier. The final paper must be approved by the student's committee.

4. Minimum grade-point average: courses on the 300 and 400 level will be accepted toward the degree only with grades of A or B; 500- and 600-level courses will be accepted toward the degree with grades of A, B, or C. The student must have a B average in all courses taken subsequent to admission to the program, including courses not actually offered for the degree.

MATHEMATICS OPTION

1. A reasonable degree of competence is required in the fields of analysis, algebra, and geometry. A minimum of 15 semester hours of upper division courses (300-level or above) in mathematics must be offered for the degree, including at least 3 hours of analysis, 6 hours of algebra, and 3 hours of geometry.
2. One upper division sequence of at least 6 semester hours in any of the physical and biological sciences named above. With permission, two independent one-semester courses in the same area may be substituted for the one-year sequence.
3. Upper division electives in science, mathematics, or computer science, to complete an approved 30-hour degree plan. Of these 30, 12 hours or more must be from courses numbered 500 and above. The 30 hours may also include 3 semester hours of courses in secondary school mathematics teaching, history of mathematics or science, or philosophy of mathematics or science.

MUSEOLOGY OPTION

1. At least 8 but not more than 12 semester hours of courses offered by the museum. Alternatives are the sequence Musm. 401-402-403; or Musm. 401 and a selection of additional courses in museum. Students are required to take 3 semester hours in small business management and are permitted to take an additional 3 semester hours in the College of Business and Administration. The total museum-business semester hours may not exceed 15.
2. An upper division sequence (300-level or above) of at least 6 semester hours in one of the departments (other than museum) represented in the program.
3. Upper division electives in science, mathematics, or computer science to complete an approved 30-semester-hour degree plan. Of these 30, 12 hours or more must be from courses numbered 500 and above.
SCIENCE OPTION

Within the science option there are two choices: the nonthesis option or the thesis option.

1. In either option the student must take an upper-division sequence (300-level or above) of at least 6 semester hours in each of two of the physical and biological sciences named above. With permission, two independent one-semester courses in the same area may be substituted for one of the one-year sequences.

2. For the nonthesis option, upper division electives in science, mathematics, or computer science to complete an approved 30-semester-hour degree plan. For the thesis option, upper division electives in science, mathematics, or computer science to complete an approved 24-semester-hour degree plan. Of the required hours for either option, 12 hours or more must be from courses numbered 500 and above, not to include thesis credit. The required hours may also include 3 semester hours of upper division courses or seminars in secondary school teaching, history of science, or philosophy of science.

3. Thesis Option. The student who plans to present a thesis for the M.B.S. degree must report this to the Executive Committee of the M.B.S. program not later than the second semester. The student's choice of a thesis adviser must be approved by Executive Committee at this time.

MASTER OF ENGINEERING PROGRAM

The Master of Engineering degree program is administered by the Graduate School through the departments of engineering. The requirements for admission and for quality and quantity of academic work are essentially the same as for the Master of Science awarded in the College of Engineering and Applied Science.

The principal difference between the Master of Engineering degree and the Master of Science is that the Master of Engineering is intended to meet the needs of those practicing engineers who are working full time outside the University and who wish to carry on an integrated program of studies in an exceptionally broad interdisciplinary field in engineering and allied subjects related to the individual student's professional work. Examples of broad interdisciplinary fields include engineering and the social sciences, engineering and the biological sciences, engineering and law, and engineering and business administration. A successful program to meet these needs requires greater flexibility in operation than is normally possible or intended under the existing Master of Science degree program.

The program makes use of the Audiovisual Continuing Education program, and other continuing televised offerings of the University.

The degree is not intended as a means to permit a random, unguided selection of courses. Each prospective student is required to present a well-defined objective in order to be admitted to the program. An academic program is developed to meet this objective in consultation with faculty advisers.

REQUIREMENTS

The requirements for the degree are 30 credit hours plus a written report on a creative investigation, which may be related to the student's professional work. The report will be of the same general quality as that required for the thesis for the Master of Science degree and must be defended orally, but does not in itself carry credit, nor require registration as specified by the rules under Master's Thesis or Report. It may be based upon work done for credit under independent study. At least 15 credit hours must be in engineering at the 500 level or above. As many as 15 credit hours may be taken outside of engineering. Credit in courses below the 400 level will not apply toward degree requirements.

Requirements relating to the following items are the same as those for the Master of Science degree as awarded in the College of Engineering and Applied Science; admission to Graduate School, application procedures, registration, quality of graduate work, status, credit by transfer, residence, admission to candidacy, and time limit.

The admission of each student to graduate study, approval of the degree program, admission to candidacy for the degree, and approval of the awarding of a degree are to originate through a specific department of the College of Engineering and Applied Science in the same manner as for the established Master of Science program. An advisory committee, consisting of not fewer than three faculty members, will be appointed for each student by the major department promptly upon the student's beginning work toward the degree. At that time a plan of study shall be completed and a copy placed on record with the office of the associate dean of engineering for graduate and research programs. Changes in the plan must have the concurrence of the committee and must be reported to the dean.

The members of each advisory committee shall be chosen from the various interdisciplinary academic areas represented in the student's program and will be from more than one department. The advisory committee guides the student. It is responsible for approving the individual's degree program and admission to candidacy; it approves the student's written report and the awarding of the degree.

The student should see also the requirements of the departments involved.

MATHEMATICAL PHYSICS

In recent years the increasingly mathematical character of many branches of physics has opened up numerous opportunities for fruitful interplay of the ideas of mathematics with those of physics. At the same time increasing specialization in both fields has, if anything, reduced the possibility of communication between the two disciplines, so that students of mathematics have less time to study physics and vice versa. This contrasts strongly with the period up to the first quarter of this century, when there was close contact between the two fields, many great mathematicians were deeply involved in physics problems, and a number of important mathematical ideas had their origin in the study of nature itself.

It is against this background that the Departments of Mathematics and Physics offer an interdisciplinary doctoral program in mathematical physics, with the following general objectives:

Graduate School / 165
1. To attract students to and prepare them for research in modern mathematical physics and the relevant mathematics.

2. To promote collaboration and cooperation between the Departments of Mathematics and of Physics.

3. To institute courses pertinent to mathematical physics not already offered in either department.

4. To develop a strong center of mathematical physics at this university.

Initially the number of students involved in the program will be small, and it should be possible for the Steering Committee to follow their progress individually and closely. It therefore seems unnecessary and undesirable to spell out in complete detail a rigid set of requirements and regulations. The design of the program is outlined below.

1. Administration of the Program. The mathematical physics program is guided by a Steering Committee composed of members from the Departments of Mathematics and Physics. This Steering Committee administers the program within the rules of the Graduate School.

2. Admission Requirements. The requirements for entrance into the program are acceptance as a degree student either in the Department of Mathematics or in the Department of Physics and a good undergraduate background in both physics and mathematics, obtained by either a double major in undergraduate study or a major in one of the fields combined with suitable subsequent study of undergraduate courses in the other. Acceptance into the program is decided by the Steering Committee on the basis of the foregoing requirements and the student’s general promise. Satisfaction of the second requirement is evaluated in each case individually, partly on the basis of the student’s transcript and partly on the basis of a written examination on undergraduate work in the second field. For a student enrolled in the Department of Mathematics, that examination is the Physics Department’s Preliminary Examination given to entering physics graduate students at the beginning of each fall term. For a student enrolled in the Physics Department, it is a similar examination on undergraduate mathematics administered by the Steering Committee or by a faculty member designated by the committee. The examination is partly diagnostic; as result of it, the Steering Committee or the student’s adviser may recommend further study of certain subjects.

3. Advisory Committee. Each student in the program, as soon as his field of specialization has been chosen, requests the staff member with whom he wishes to work to act as chairman of his advisory committee. The chairman, with the advice and approval of the Steering Committee, selects one member of the graduate faculty from the Department of Mathematics and one from the Department of Physics to serve on the student’s advisory committee. A purpose of the advisory committee (beyond guiding the student throughout his graduate study) is to insure against too narrow a specialization.

4. Course Requirements. To prepare for the Ph.D. in mathematical physics, each student must take appropriate course work in the Department of Mathematics and the Department of Physics. His program of study must be approved by his advisory committee and should be designed in part to prepare him for the second-year examination (see 5 below) in the department in which he is matriculated. In addition, the candidate is expected to pass at least two distinct graduate-level core courses in the second field (see table below) and at least two semesters of the advanced mathematical physics courses (Math. 653, 654, 655, 656 = Phys. 603, 604, 605, 606).

Core Courses in the Second Field

Mathematics Courses for Physics Students
Math. 501, 502. Topology
Math. 513. Algebra
Math. 523, 524. Differential Geometry
Math. 531, 532. Real Analysis
Math. 635, 636. Functional Analysis

Physics Courses for Mathematics Students
Phys. 621. Mechanics
Phys. 625, 626, 627, 628. Quantum Mechanics
Phys. 631, 632. Electromagnetism
Phys. 644, 645. Statistical Mechanics
Phys. 685. Theory of Relativity

These are in addition to subjects like ordinary and partial differential equations, linear algebra, and complex variables required of all physics students and covered, for example, in mathematical physics.

5. Examination Requirements. Each student in the mathematical physics program must pass the second-year examination in the department in which the student is matriculated (i.e., the physics comprehensive or the mathematics preliminary examination) according to the rules of that department. The second-year examination constitutes the Comprehensive Examination required by the Graduate School.

6. Transferring into and out of the Program. Transfer into the program is possible at any time, subject to the entrance requirements mentioned above, and also transfer out of it, because a student in the program retains status as a regular degree student in the department of his or her primary field. Formal acceptance into the program is usually deferred until the student has passed the second-year examination but any student who is interested in the program and has an appropriate background is urged to apply for the program as soon as possible.

7. Master’s Degree. Master’s degrees in mathematical physics are not given. If for any reason a student becomes a master’s degree candidate, he will be transferred out of the mathematical physics program into a regular department major.

8. Research Requirements. Each successful participant in the program is required to submit and to defend a thesis describing original research performed by himself. He may carry out his research under the direction of any graduate faculty member in the Department of Mathematics or the Department of Physics.

9. Language Requirement. Each student in the program must fulfill the language requirement of the department in which he has matriculated.
TELECOMMUNICATIONS

The telecommunications program is interdisciplinary, involving the Departments of Communication, Electrical Engineering, Economics, Political Science, Computer Science, Sociology, and the College of Business, leading to a Master of Science degree in telecommunications. The object of this 12- to 18-month program is to provide graduate professional education for persons interested in the management of telecommunications systems. Such positions require knowledge about the technical aspects of communication theory, about governmental regulations relating to telecommunications, and about the sociological and economic aspects of the operation and growth of telecommunications systems.

It is expected that participants in the program will include both midcareer professional persons and beginning graduate students.

Inquiries should be directed to Chairman, Graduate Committee on Telecommunications, Campus Box 425, Engineering Center OT 2-32, University of Colorado, Boulder 80309.

Although this is basically a 12-month program, it may be longer for students deficient in mathematics, basic science, or economics.

A suitable academic program is planned for each individual. Some of the course offerings are listed below.

Fall Semester  
Semester Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.E. 531</td>
<td>Telecommunications Systems</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 534</td>
<td>Introduction to Telecommunications System Theory</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 535</td>
<td>Independent Study/Engineering Economy</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 581</td>
<td>Introduction to the Systems Approach</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 582</td>
<td>Introduction to Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 594</td>
<td>Telephone Systems</td>
<td>3</td>
</tr>
<tr>
<td>Comm. 506</td>
<td>Management of Communication Systems</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 576</td>
<td>Economics of Public Service</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 580</td>
<td>The Political System and Telecommunications</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 597</td>
<td>Seminar</td>
<td>1</td>
</tr>
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Spring Semester  
Semester Hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>E.E. 537</td>
<td>Telecommunications Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>E.E. 538</td>
<td>Telecommunications System Theory</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 567</td>
<td>Reliability and Queuing Theory</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 582</td>
<td>Introduction to Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 591</td>
<td>Electromagnetic Wave Transmission and Satellites for Telecommunications</td>
<td>3</td>
</tr>
<tr>
<td>Comm. 560</td>
<td>Radio-TV Station Organization and Operation</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 595</td>
<td>Special topics/Engineering Management</td>
<td>3</td>
</tr>
<tr>
<td>Fin. 580</td>
<td>Structure and Financing of the Telecommunications Industry</td>
<td>3</td>
</tr>
<tr>
<td>P.Sc. 580</td>
<td>Legal Structure and Regulation</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 597</td>
<td>Seminar</td>
<td>1</td>
</tr>
</tbody>
</table>

Summer Session

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>E.E. 591</td>
<td>Cable TV</td>
<td>2</td>
</tr>
<tr>
<td>E.E. 592</td>
<td>Contemporary Issues in Telecommunication Policy</td>
<td>3</td>
</tr>
<tr>
<td>E.E. 599</td>
<td>Data Communications</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Telecommunications project or thesis</td>
<td>6</td>
</tr>
</tbody>
</table>

A minimum of 32 hours is needed to graduate, but students are encouraged to take at least 40 hours where possible.

Electives will normally be taken at the 500 level. For students without a previous technical background, and as a review for students with a technical background, E.E. 594 (Introduction to Telecommunications System Theory) is recommended. Frequently chosen electives are EDEE 595 (Selected Topics/Engineering Management), Comm. 564 (Mass Media and Society), and Comm. 660 (Seminar in Broadcasting).

E.E. 537 (Telecommunications Laboratory) is designed for students lacking a prior experience with electrical equipment. E.E. 534 is normally a prerequisite. Students entering the program are expected to be competent at least at the high school level in mathematics and elementary physics and are advised to review such material if necessary prior to commencing course work.

E.E. 532 is concerned with traffic theory, and a student who has taken the introductory course, E.E. 534, will be adequately prepared for it. Students with a suitable technical background would normally take E.E. 567 instead.

E.E. 597, Seminar, is scheduled on a weekly basis. It carries 1 hour of credit and exposes the student to a range of topics by speakers representing many different sides of the telecommunication industry.

The student will register for a total of 6 hours of credit for a project or thesis. The courses registered for will be decided upon by each individual with the help of the student’s adviser.

Graduate School at the Health Sciences Center

ANATOMY

Students wishing to pursue graduate work in anatomy leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees, and Graduate School at the Health Sciences Center Admission Requirements.

Prerequisites. A student wishing to major in anatomy should have completed the following:

1. Equivalent of an undergraduate major in the field of zoology or biology, including general zoology, comparative anatomy, genetics, and embryology.
2. Courses in chemistry (inorganic, organic, and physical), college physics, integral calculus.
3. Reading knowledge of at least one foreign language.

The Graduate Record Examination is required.


Anat. 501B-9. Human Anatomy, Winter. Course provides, in less time than is normally required, a comprehensive study of the structure and function of the human body. Thoracic dissection of one major cadaver area and study of other regions through presentations of dissections by other students in the class. The course also provides training in medical application of anatomy and includes audiovisual and computer approaches. Opportunity is also provided for advanced medical students to enhance their knowledge of anatomy through dissection in a specific area of interest. Temple, Jones.

Anat. 502-5. Microanatomy of Cells and Tissues, Fall. Lectures describe the way in which cells and tissues execute specific physiological functions. Laboratory sessions permit firsthand light microscopic observations of the cellular architecture of mammalian tissues.

May not be necessary for recent engineering graduates or others with relevant experience.
and human tissues. The constant interrelationship extant between structure and function is strongly emphasized. Roper, Moran, Hahn. 

Anat. 503-6. Neuroanatomy. Spring. Provides a basic understanding of the various sensory, motor, and associative pathways of the human central nervous system, through lectures, examination of sectioned or dissected material, and clinical illustrations. Noite, Finger, Selitrennikoff, Lashker.

Anat. 602-1. Departmental Seminar. Fall, Winter, Spring. Weekly scientific reports on various original research projects are presented by faculty, students and guest scientists. Finger.

Anat. 632-3. Human Embryology. Spring. Principles of development are presented through examination of embryogenesis of mammals, especially humans. The first half of the course deals with topics such as fertilization, embryo transport, implantation, formation of extra-embryonic membranes, and early organogenesis. The remaining part of the course covers selected aspects of organogenesis with a strong emphasis upon the relationship between developmental processes and the establishment of adult gross and microscopic anatomy. Congenital malformations and their causes will also be emphasized. Lectures will be supplemented with demonstrations and audiovisual material. Cunha, Lashker.

Anat. 650-credit to be arranged. Research in Anatomy. All quarters. Programs of investigation in fields of anatomy including neuroanatomy, cell biology, developmental biology, endocrinology, fine structure, and chemistry. Lashker and staff.

Anat. 700-credit to be arranged. Master’s Thesis. All quarters. 
Anat. 800-credit to be arranged. Doctor’s Thesis. All quarters.

ANESTHESIOLOGY

Graduate instruction in anesthesiology is offered to develop clinical anesthesiologists, teachers, and investigators. An integrated program is presented over a three-year period. At least the third year may be spent in original investigation in a preclinical department, the anesthesiology department, or in appropriate clinical departments such as surgery, obstetrics, or pediatrics. In certain cases, training for a one- or two-year period may be provided in special aspects such as pediatric, cardiac, obstetric, or transplant anesthesia or in pain management. The experience (didactic and practical) fulfills the requirements of eligibility of the American Board of Anesthesiology.

Eligible candidates should have the M.D. degree and two years of advanced training in anesthesiology. Special consideration will be given to M.D.’s without advanced training, nurse anesthetists, and physician’s assistants in anesthesia who desire to enter either academic anesthesiology or anesthesiology research. A thesis based on original investigation will be required for a master’s degree. This master’s degree may be a step toward a doctoral degree in another discipline.

Anes. 650. Research in Anesthesiology. All quarters. Individual clinical or laboratory research or participation in appropriate ongoing projects in the department. Special permission and individual arrangements necessary. Swanson.

Anes. 700-credit to be arranged. Master’s Thesis. All quarters. Special permission and individual arrangements necessary. Swanson.

BIOCHEMISTRY, BIOPHYSICS, AND GENETICS

The graduate program gives advanced training to candidates for the Ph.D. degree in general biochemistry, biophysics, and genetics; theoretical biophysics; cell biology; human genetics; and for the master’s degree in human genetics.

There are also special interdepartmental programs in human and molecular genetics as well as in cellular and molecular biology. These programs combine this department’s facilities and faculty with those of other basic science and clinical departments to provide unusually diverse training opportunities.

Students considering graduate studies in the department should read carefully the sections of this catalog concerning Requirements for Advanced Degrees and Graduate School Admission Requirements.

MASTER’S PROGRAM

Students wishing to specialize in human genetics may apply for admission to a program leading to a master’s degree in human genetics. Requirements for admission include a baccalaureate degree or its equivalent, a minimum undergraduate grade-point average of 2.75, and satisfactory scores on the Graduate Record Examination. Background necessary for the program includes courses in biology, physical chemistry, general physics, differential and integral calculus, organic chemistry, and genetics. In few cases students may be admitted provisionally while completing course deficiencies.

In general, the program of course work will include instruction in basic sciences fundamental to human genetics, laboratory techniques applicable to human genetics, clinical genetics and genetic counseling, and mathematical genetics. The student will also do research for a thesis.

DOCTORAL PROGRAM

The department welcomes applications from students who have a strong background at the college level in biology and chemistry, preferably students who have majored in both or who have honors degrees in one or the other of these fields. Requests for admission should be sent to:

Committee on Admissions
Department of Biochemistry, Biophysics, and Genetics
University of Colorado School of Medicine
4200 E. 9th Avenue, B-126
Denver, Colorado 80262

Students should make certain that the Committee on Admissions is provided with transcripts relating to their college degrees, with letters of recommendation from their colleges and with the results of the Graduate Record Examination (GRE).

In general, preference will be given to students who meet the following standards:

1. A combined score in excess of 1900 in the Verbal, Quantitative, and Analytical sections of the GRE. Students are encouraged to take the Advanced section of this examination, although this is not a requirement.

2. Completion in college of two semesters, or equivalent, in organic chemistry; one semester, or equivalent, of organic chemistry laboratory; one year of biology; and one year of general physics.

3. Completion in college of a course in physical chemistry that deals in some detail with thermodynamics and the properties of solutions.

4. Completion of college-level mathematics through the calculus.
5. Completion in college of four semesters, or equivalent, in a foreign language.

Students who do not fully meet the requirements in 3 and 5 may be admitted on a probationary basis, but will be required to make up these deficiencies.

For descriptions of research programs in the department, students should request from the department a descriptive brochure covering these programs.


BBGN 600-5. General Biochemistry for Graduate Students. Fall, Winter, Spring. A three-quarter course, 5 credits per quarter. (Elective for medical students.) Stresses the relationships between molecular structure and function in biological systems. Designed for students whose aim is a career in research and teaching in biochemistry and allied disciplines, particularly biophysics and genetics. The major areas of biochemistry and molecular biology will be covered and should provide the foundation for more comprehensive treatment of specialized subjects which a student may wish to pursue further in advanced courses or in the laboratory. Hirs and staff.

BBGN 601-3. Topics in Medical Genetics. Fall, Winter, Spring. This is a three-quarter course, with 3 hours of credit each quarter. Fall: Survey of principles of genetics and introduction to counseling skills. Winter: Biomedical foundation for understanding genetic disorders. Spring: Clinical and laboratory methods in diagnosis and treatment of genetic disorders. Nora.

BBGN 602-2. Human Genetics: Core Curriculum. Winter, Spring. A didactic review of the basic content of genetics suitable for candidates preparing for certification in clinical genetics, genetic counseling, and clinical laboratory genetics. The presentations will be shared by those with special competence in the various areas. Nora.

BBGN 603-1. Interviewing and Counseling in Clinical Genetics: Theory and Applications. Fall, Winter, Spring. Techniques of interviewing and dynamics of counseling will be presented in didactic sessions and practical clinical settings. The impact of genetic disease on the family and the role of the genetic counselor in identifying and responding knowledgeably and compassionately to the needs of the family will be stressed. Nora.


BBGN 605-3. Basic Biomedical Electronics. Fall. (Formerly BBGN 600.) Covers basic electronic concepts through amplifiers and their characteristics; semiconductors, operational amplifiers, types of transducers and their characteristics, electronic filters, and power supplies. Sadler and Rock.

BBGN 606-3. Applied Medical Genetics. Fall, Winter, Spring. Study of and participation in the school operation of a genetic counseling clinic, with exposure to records, patient interviews, pedigree construction and analysis, literature searches, and problem solving. Laboratory experience in biochemical genetics, population genetics and cytogenetics. Preq., Biophys-Gen. 502 or a one-semester genetics course. Sujansky, Morse, and Nora.


BBGN 608-2. Topics in Mammalian Cell Biochemical Genetics. Winter. Students will be expected to demonstrate mastery of the current knowledge, logic, and concepts of a particular area of mammalian cell biochemical genetics agreed upon by both student and instructor. In-depth analysis of relevant literature under the supervision of the instructor will be undertaken. Topics include (but are not limited to) radiation biology, mutagenesis, cell hybridization and its applications, gene expression and mapping, cell surface antigens, malignancy, and biochemical genetics of mutants. Preq., consent of instructor. Patterson and Jones.

BBGN 609-2. Chemical and Biological Aspects of the Environment. Winter. (Formerly BBGN 616.) A survey of the chemical changes in the environment and a discussion of the physical and chemical parameters responsible for the alterations. Topics include: the components of the air environment, the gases, particles and aerosols and their rate of formation, dispersion, and degradation. The effects of the various pollutants on animal and plant systems. The water environment and the effect of certain water pollutants on mammalian systems. The common sources of contamination of the environment by heavy metals and their effect on the health of man. The common preservatives used in food and other household goods. Examples of the production of temporary and permanent changes in the ecology due to the exposure to the various pollutants will be discussed. Some social and political aspects essential to the control of the various pollutants will be discussed. Preq., biochemistry or consent of instructor. Reiss and staff.


BBGN 612-3. Eukaryotic Genetics. Spring. Is intended to provide a general survey of important developments in genetic analysis of eukaryotic systems. Topics include genetic analysis in somatic cells, structure and function of eukaryotic genes and chromosomes, genetic regulation and differentiation, biochemical genetics in eukaryotes. Other important genetic studies in eukaryotes of current interest will also be selected for discussion. Preq., biochemistry. Kao and staff.

BBGN 613-1. Nucleic Acids. Spring. Biological and physio-chemical properties of nucleic acids, with emphasis on very recent development and recent literature. Replication and transcription of DNA and associated control mechanisms in prokaryotes and eukaryotes. Preq., BBGN 600 or equivalent. Face.

BBGN 614-3. Physical Chemistry of Biological Macromolecules. Spring. Thermodynamics and kinetics of the antigen-antibody and other biologically important reactions; transport properties of biological macromolecules including electrophoresis, ultra centrifugation, translational and rotational diffusion, and viscosity; the influence of competing factors on the behavior of in protein-DNA interactions and helix stability; interactions of macromolecules with each other and with small molecules. Cann and Hagerman.

BBGN 615-3. Topics in Molecular Neurobiology. Spring. A lecture course designed to give students who lack formal training in neuroscience a basic understanding of neurobiology. An introduction to the embryology, pharmacology, and physiology of the nervous system will be presented; however, the major emphasis will be placed on neurobiochemistry. The following topics will be discussed: morphological and biochemical development of the nervous system; macromolecular synthesis; metabolism, localization, and regulation of neurotransmitters; properties of neuronal membranes and receptor mechanisms. Discussions will focus on some of the major problems in neurobiology and the model systems that may solve them. Preq., biochemistry. Seeds.

BBGN 621-1. Genetic Epidemiology. Spring. This discipline underlines a major area of studies of disease causation as investigated in families and populations. The seminar will look at several problems including common birth defects, cancer, IQ, teratology, and coronary disease in a lecture/discussion format. Preq., course in genetics, epidemiology, or biometrics. Nora.

BBGN 623-1. Cytogenetics Laboratory. Spring. Practical exercise in current cytogenetic techniques including various banding and other new techniques on a variety of human tissues. Robinson and Cox.

BBGN 630-3. Laboratory Techniques of Mammalian Cells in Vitro. Fall. Basic techniques in mammalian cell culture and its applications to study of mammalian cell biology, biochemistry, and genetics. Lab. exercises include incubator design and operation, media preparation, sterile techniques, initiation of cell culture, single cell plating, clone isolation, cell growth kinetics, mutant induction and isolation, cell fusion techniques, complementation analysis, chromosome analysis, isozyme techniques, and antigenic analysis. Waldren, Patterson, and Puck.

BBGN 631-credit to be arranged. Statistical Physics and Mathematical Modeling in Biological Systems. Fall. The connection between microscopic and macroscopic behavior of biological systems at the molecular and cellular levels will be examined using statistical mechanics, information theory, and population mechanics. There will be a workshop in application of the computer to these problems. Bell and Goad.

BBGN 650-credit to be arranged. Research in Biochemistry. All quarters. Research in Biochemistry, Biophysics, and Genetics. Consent of instructor. Hirs and staff.


BBGN 700-credit to be arranged. Master's Thesis. All quarters.

BBGN 800-credit to be arranged. Doctor's Thesis. All quarters.

BIOMETRICS

The Department of Biometrics offers training leading to either an M.S. or Ph.D. degree in biostatistics or medical information sciences. Applicants are expected to have a bachelor's degree in a scientific field with mathematics through intermediate (second year) calculus, two years of course work in the physical and/or biological sciences and a working knowledge of a higher level computer programming language such as FORTRAN. No beginning students will be accepted who do not have at least a 3.0 grade-point average as undergraduates. Applicants should arrange to take the verbal and quantitative portions of the Graduate Record Examination no later than the December testing of the year preceding admission. Complete applications, including transcripts of all colleges and universities attended, letters of reference, and GRE scores should be received by the department by March 1 for admission during the fall quarter.

The master's program consists of three quarters of course work followed by a preliminary oral and written examination given at the beginning of the second year and covering the course work. The second year is devoted mainly to the thesis with a comprehensive final oral examination covering the area of the thesis topic, and given when the thesis is essentially finished.

Admission to the Ph.D. program requires a master's degree in statistics or its equivalent. The first post-master's year consists of course work in both biometrics and a minor area, and fulfillment of the language requirement. Ph.D. students usually remain in residence during the summer quarter involving themselves in research, possibly in connection with the minor area, and preparing for the Ph.D. comprehensive examination, usually taken at the beginning of the fall quarter of the second year. The student then proceeds with dissertation research with a final oral examination on the dissertation topic given when the dissertation is complete.

Biomet. 601-2. Biostatistics Methods. Fall. This is the first of a two-quarter sequence designed primarily to equip graduate students with a practical knowledge of the techniques methods most frequently applied in epidemiological research. This quarter deals with elementary probability, linear regression methods for handling one- and two-sample estimation and testing problems with continuous data, and various uses of chi-square statistics with frequency data. Prer., consent of instructor. Archer.

Biomet. 602-2. Biostatistics Methods. Winter. This is a continuation of Biomet. 601. Includes further applications of the chi-squared statistics, linear and nonlinear regression, parametric and nonparametric methods of analysis of variance, life table methodology, and miscellaneous topics. Prer., consent of instructor. Archer.

Biomet. 611-3. Computer-Oriented Statistical Methods. Fall. This is the first of a three-quarter sequence designed to acquaint the student with the fundamental techniques of applied statistical analysis. Selection, use, and interpretation of packaged statistical programs such as the BMD series will be emphasized.


Biomet. 621-3. Consulting Methods. Fall. The practical and computational aspects of research problems. The student will analyze problems of increasing complexity throughout the first two quarters.


Biomet. 631-3. Statistical Theory. Fall. This course will present an introductory coverage of the theory of both discrete and continuous random variables and the application of this theory to statistical problems.

Biomet. 632-3. Statistical Theory. Winter. This course will present the theoretical development of the standard parametric procedures most used in both theoretical developments and applied work, including detailed coverage of both estimation and statistical testing procedures.


Biomet. 643-3. Nonparametric Statistical Methods. Nonparametric methods are used in statistical applications when the more standard techniques are inapplicable. This course will cover the most useful of these tools pertaining to estimation, testing, and measuring association.


Biomet. 646-3. Survival Curves and Life table Analysis. An introductory course in survival curve analysis with emphasis on medical applications.
Biomet. 650. Research. All quarters. Credit to be arranged. Staff.
Biomet. 661-3. Longitudinal Data Analysis. Fall. This is the first of a three-quarter sequence in the application of advanced multivariate techniques. The principal topic in the first quarter is the multivariate general linear model, including the underlying theory and usage of available multivariate computer programs. Zerbe.
Biomet. 662-3. Longitudinal Data Analysis. Winter. Continuation of Biomet. 661. The theory and application of multivariate techniques appropriate for longitudinal data are discussed with emphasis on the growth curve models developed principally in the 1960s. Zerbe.
Biomet. 663-3. Longitudinal Data Analysis. Spring. Continuation of Biomet. 662. Students will conduct supervised individual investigations of large data collections which are the center of current research at the Health Sciences Center. They will encounter and solve many of the problems typical of multivariate computer analysis of massive collections of real data while applying the techniques discussed in Biomet. 661 and 662. Zerbe.
Biomet. 665-3. Applied Time Series Analysis. Winter. Introduction to time and frequency domain analysis of stationary time series including computer assignments. Topics include: fast Fourier transform (FFT) covariance function, spectral density, autocorrelation and ARMA models for prediction and spectrum estimation, data smoothing, and prediction of multivariate time series. Jones.
Biomet. 667-3. Mathematical Modelling in Medicine. Fall. Mathematical models of dynamic phenomena are becoming more common in all branches of biology and medicine. This course will survey the mathematical tools necessary for the construction of such models and illustrate some of the currently used models. Swanson.
Biomet. 671-3. Epidemiology. Fall. Offers an introduction to the approaches and methods used in describing the natural history of disease in the community, for locating clues to the causes of disease and of ways to develop and evaluate preventive strategies and other medical services. Lecture-discussions are supplemented with problem-solving exercises. Hamman.
Biomet. 672-3. Cancer Epidemiology. Winter. A survey of present knowledge of causes of human cancer, emphasizing critical analysis of published reports and ways of obtaining further evidence. Each 3-hour unit consists of two informal lectures, one on a group of causal agents and one on a group of related cancers, and a seminar where student reports are presented and discussed. Designed for medical students (after Pathology) and graduate students with background in biometrics or other biomedical sciences. Berg.
Biomet. 700-credit to be arranged. Master's Thesis. All quarters.
Biomet. 800-credit to be arranged. Doctor's Thesis. All quarters.

CHB Biol. 514-1. ENT Lecture Series and Practicum. Fall. Includes lectures on medical aspects of otolaryngology as well as sessions on audiology and speech pathology. The class is split into small groups for demonstration and practice of specialized ENT examination procedures, and audiometry/speech examination. Jain.


CHB 519-2. Pediatric Pharmacology I. Fall. Discussion of the practical aspects of drug absorption, metabolism, excretion, pharmacologic actions, adverse reactions, and toxicologic effects. Half the major drug categories will be covered this quarter including antihypertensives, anticholinergics, antibiotics, vaccines, bronchodilators, minor and major analgesics, anticonvulsants, and emergency drugs. Staff.


CHB 529-2. Pediatric Pharmacology II. Winter. Discussion of the practical aspects of drug absorption, metabolism, excretion, pharmacologic actions, adverse reactions, and toxicologic effects. The major drug classes covered this quarter include local anesthetics, sedatives, tranquilizers, muscle relaxants, local and systemic steroids, thyroid drugs, anti-hypertensives, antacids, cardiac glycosides, antiemetics and anti-diarrheal agents and others. Staff.

CHB 531-2. Problem Solving in Medical-Surgical Pediatrics I. Fall. Discussion of various medical and surgical pediatric conditions covering pathophysiology, diagnosis, and management followed by case presentations requiring application of this knowledge in problem solving. Common pediatric entities will be emphasized. Areas covered include: hematology, oncology, neurology, allergy, infectious disease, and laboratory medicine. Berman.

CHB 532-4. Problem Solving in Medical-Surgical Pediatrics II. Winter. Discussion of various medical and surgical pediatric conditions covering pathophysiology, diagnosis, and management followed by case presentations requiring application of this knowledge in problem solving. Common pediatric entities will be emphasized. Areas covered include renal disease, neonatology, genetics, pulmonary disease, dentistry, endocrinology, and ophthalmology. Berman.

CHB 533-4. Problem Solving in Medical-Surgical Pediatrics III. Spring. Discussion of various medical and surgical pediatric conditions covering pathophysiology, diagnosis, and management followed by case presentations requiring application of this knowledge in problem solving. Common pediatric entities will be emphasized. Areas covered include renal disease, neonatology, genetics, pulmonary disease, dentistry, endocrinology, and ophthalmology. Berman.

CHB 534-1. Emergency Medicine in Practice. Winter. Provides students with the knowledge and skills to handle various types of emergent situations. Didactic sessions will be held and application emphasized by the use of demonstrations, simulations, mannequins, animal laboratories, and audiovisual support. Each student will spend about 10-15 evenings rotating in four different emergency rooms.

CHB 537-2. Pediatric Clinical Preceptorship I. Fall. Involves approximately 9 hrs per week of time in one-on-one assignments with preceptors in various clinical sites (general pediatrics, adolescent, allergy, emergency rooms) and the proficiency laboratory. Students under the tutelage of individual preceptors must perfect clinical skills, establish assessments, and derive management plans, thus developing problem-solving capabilities of common pediatric problems. In the laboratory they must demonstrate proficiency of 35 essential clinical psychomotor and laboratory procedures necessary for primary care practice. Prer., CHB 337 and consent of instructor. Moore.

CHB 538-3. Pediatric Clinical Preceptorship II. Winter. See CHB 537 for description.

CHB 539-3. Pediatric Clinical Preceptorship III. Spring. See CHB 537 for description.

CHBT 520-1. Advanced Quantitative Methods. Spring. Stressess the epidemiological approach to various medical problems and the interpretation of medical data and journal articles as well as drug

CHILD HEALTH ASSOCIATE PROGRAM

Interested students should read carefully the requirements listed below regarding admission to the Master of Science Child Health Associate degree program to determine eligibility.

1. A satisfactory grade on the GRE as established by the Child Health Associate Program.
2. Entrance into the Child Health Associate Program with sufficient hours of college-level credit to be able to complete a bachelor's degree prior to the beginning of the second year of the program.
3. Satisfactory completion of the first four quarters of the Child Health Associate Program.
advertisements, thereby relating quantitative methodology to the practice of pediatrics. Pr, consent of instructor. Walker.

CHP 512-2. Psychosocial Problem Solving. Fall. Emphasizes problems in communication which occur in working with patients, rather than in the details requested in obtaining a history. Role playing, videotapes, and other specialized techniques are utilized. A paper or project is done by graduate students concerning patient(s) with a social or emotional problem. Pr., CHB 337 and consent of instructor.

CHP 517-1. Graduate Seminar I. Fall. Provides time to discuss topics of interest which could not be included elsewhere in the curriculum. Unstructured time is also provided for topics students desire to explore in greater depth. Emphasis is more on the art of pediatrics and practical performance than on the science of pediatrics. A presentation to the class or a short research paper may be done on a topic of general pediatric concern.

CHP 518-2. Psychosocial Aspects of Pediatrics I. Fall. Discussions of the evaluation and management of commonly encountered emotional and psychological disorders in pediatric practice. Topics to be discussed include healthy emotional development, "normality," colic, behavior modification techniques, discipline, sleep and eating problems, toilet training and soiling, dependency problems, responsibility problems, and family crises. A paper may be done in this course. Schmitt.

CHP 527-1. Graduate Seminar II. Winter. See CHP 517 for course description.

CHP 528-2. Psychosocial Aspects of Pediatrics II. Winter. Discussions of commonly encountered emotional and psychological illness in pediatrics which emphasize their evaluation and management. Topics to be discussed include child abuse and neglect, suicide, possible repetitions of psychiatric conditions for genetic and hospitalization, side effects of hospitalization, managing difficult parents, obesity prior to adolescence, adjustment to acute disease, and adjustment to chronic and chronic disease. A paper may be done in this course. Pr., consent of instructor. Schmitt.

CHP 532-1. Pediatric Sexual Problems. Spring. Discussions of the evaluation and management of commonly encountered sexual problems in pediatric practice. Topics to be discussed include normal and abnormal sexual development, masturbation, psychosexual aspects of the genital examination, menstrual problems, contraception, out-of-wedlock pregnancy, abortion counseling, venereal disease, and rape. Pr., consent of instructor.

CHP 537-1. Graduate Seminar III. Spring. See CHP 517 for course description.

CHP 538-2. Psychosocial Aspects of Pediatrics III. Spring. Discussions of commonly encountered emotional and psychological illnesses which emphasize their evaluation and management. Topics to be covered include an approach to pain in general, recurrent headaches, muscle and joint problems, school phobia, office anxiety, and guidance to prevent emotional problems, patient satisfaction and compliance, a review of pediatric emotional therapy, and what and how to refer to a mental health clinic. A paper is done in this course. Pr., consent of instructor. Schmitt.

CHP 620. Master's Project — Proposal. All quarters. This first segment of the clinical research project involves formulating a worthy problem for investigation including an in-depth review of the literature, overview of the methodology, analysis of data, and timetable of the study. An expert in the field and a program faculty sponsor should be solicited as advisors. Credit to be arranged. Moore.

CHP 621. Master's Project — Final Report. All quarters. This second segment of the project includes carrying out all field work and data collection of the approved proposal, analysis of data, and preparation of the final complete report. Advisors/consultants should be utilized to monitor each step as it proceeds. Credit to be arranged. Moore.

CHP 622. Master's Project — Oral Presentation. The third segment of the graduate project demands an oral presentation of the completed project to CHAP faculty, students, instructors, project sponsors, and other interested parties. Preparation of effective audio-visual aids and fielding questions after the presentation are integral parts of this presentation. The study should also be prepared for publication in the appropriate journal if feasible. Credit to be arranged. Moore.

CHP 623-5. Internship Summary Report. All quarters. These credit hours entail completion of a summarizing report of the internship clinical experiences and accomplishments quantifying numbers and types of patients seen; comparing health care services and provision formats in the varied clinical sites; delineating patient, preceptor, other health care personnel acceptance; noting variations in self-utilization at different sites; discussion of other factors influencing on them as nontraditional health care providers; discussing factors both positive and negative as related to the internship goals; describing personal and professional accomplishments during the year. Moore.

CHA 950. Independent Study-credit to be arranged. All quarters. Students, after consultation regarding their special interests and needs, may select a topic for in-depth independent study with credit hours commensurate with time given to study. This effort must be documented by written or verbal presentations and demonstrated functional knowledge on the topic studied. Moore.

DIVISION OF HEALTH ADMINISTRATION

Students wishing to pursue graduate work in health administration leading to candidacy for the M.S. degree should read carefully Requirements for Advanced Degrees and Graduate School Admission Requirements.

The following courses are offered at the Health Sciences Center by the Division of Health Administration. Additional elective courses for students in this graduate program leading to an M.S. degree are available through other divisions of the Department of Preventive Medicine and Comprehensive Health Care, as well as in other departments of the University. Students should contact the instructors for the following courses available as electives to students not enrolled in the health administration program. (All are semester courses.)

H.A. 601-3. Medical Care Organization. Fall. An introduction to the structure and function of the medical care delivery system. Discussion will focus on basic concepts of medical care; costs, values, needs, and utilization; issues in health care manpower, institutions, and system organization; general issues in public policy, reimbursement, and regulation; and broad community and organizational considerations in medical care organization. Luke.

H.A. 602-3. Health Economics. Spring. An intensive analysis of issues in health economics, with primary emphasis on microeconomic considerations. Discussions will focus on the demand, supply, distribution and production of health services; inflation; and the economics of health care policy. Luke.

H.A. 603-2. Regulation I: Cost Containment and Reimbursement. Fall. Provides students with a working knowledge of major cost containment and reimbursement programs and their effect on major providers. Topics covered include a review of Medicare, Medicaid, and other third-party reimbursement procedures for hospitals, nursing homes, physicians, and other health care providers; prospective rate setting systems for hospitals; hospital cost containment efforts at the federal level; certificate of need planning and private sector initiatives as cost containment mechanisms; and efforts to control the costs of nursing home care and physician services. Throughout the course, emphasis is placed on how both health institution managers and policy makers and regulators must learn to live with and help shape as increasingly cost conscious environment. Luke.


H.A. 605-2, 607-2. Policy Analysis I, II. Fall, Spring. A sequence of elective dealing with the formulation and analysis of health policy at all levels of government. Students develop a conceptual and analytic framework for policy analysis based on the theoretical constructs of political science, sociology, and economics. Staff.

H.A. 610-3. Quantitative Methods I. Fall. A study of scientific problem-solving and decision-making techniques with health care applications. Focuses largely on statistical inference and related topics, including the statement of the problem, data collection, consideration, data processing, hypothesis testing and estimation, parametric statistical analysis, and interpretation of the results.
H.A. 811-2. Quantitative Methods II. Spring. Focuses on particular problem, data collection considerations, data proformas, semester work through packaged programs, management information systems, nonparametric statistics, and operation research methods such as forecasting, queuing, inventory management, and decision making under uncertainty.

H.A. 614-2, 615-2. Topics in Quantitative Methods I, II. Fall, Spring. An elective sequence for students choosing this area of emphasis. The course will consist of project-directed work. Staff.

H.A. 819-2. Seminar in Research Methods. Fall. An introduction to research methods focusing on health care problems. Students develop a research protocol as part of the course.

H.A. 620-2. Health Sciences. Fall. An introduction to concepts of holistic health and high level wellness as well as disease. The course introduces students to the terminology and interventions of health and medical care. Epidemiological methods are explained as tools useful not only for explaining disease phenomena but for the planning and evaluation of health services. Provides students with a better understanding of the scope of health services, health professionals, and levels of care.

H.A. 521-3. General Systems Theory. Fall. General systems theory is presented as a conceptual tool in health administration. Health is viewed as a subsystem of society, and interfaces among health and other social subsystems are analyzed. Broad social and cultural issues form a context for meaningful discussion of health planning and administration in the current and future decades. Kaiser.

H.A. 622-2. Health Planning I. Fall. An introduction to basic planning theory and methodologies. Data analysis and various approaches to problem solving for planning activities such as facilities and the financial aspects will be considered. The role of major legislative planning initiatives such as PL93-6 and strategy development.

H.A. 623-3. Health Planning II. Spring. The primary focus of this course is on the planning process. Various planning approaches, styles, and theories will be considered from a corporate decision-making view. Special emphasis will be placed on the relationship between regulation and planning, the interaction between the public and private sectors, and the issue of centralization.

H.A. 624-3. Health Planning III. Spring. The primary focus of this course is on the planning process. Various planning approaches, styles, and theories will be considered from a corporate decision-making view. Special emphasis will be placed on the relationship between regulation and planning, the interaction between the public and private sectors, and the issue of centralization.

H.A. 625-2. Health Planning Practicum. Fall, Spring. A field work project elective which provides an opportunity for the student to gain skills in health consulting, community studies, area-wide health planning, institutional planning, and specialty health planning. Staff.

H.A. 826-2. Research Seminar in Needs Assessment. Fall, Spring. An elective which provides an opportunity for the student to conduct a health needs assessment. The course involves research project techniques and assessment methodologies and is designed to train students in the basic skills and methods used in health planning. Staff.

H.A. 535-B. Program Evaluation I. Fall. This course is designed to equip the student with the basic skills and methods involved in assessing the effectiveness of health care programs. The development of conceptual and quantitative evaluation techniques is based on examples and projects, with the intent of motivating general methods through specific illustrations. Topics include quantitative methods, research and policy management, the development of a multidisciplinary framework for the analysis of health care policy, planning and monitoring research and evaluation, and acquiring and maintaining grants and contracts. Several topics in this course assume a familiarity with the material covered in H.A. 810 and 811.

H.A. 628. Program Evaluation IV: Policy Analysis. Spring. This course is intended to provide an overview of policy formulation, adoption, implementation, operation, evaluation and termination stages of the policy cycle. Emphasis is placed on pragmatic application of policy analysis tools at both the institutional and community levels. Students are presumed to be familiar with topics covered in H.A. 684 and 685.

H.A. 630-2. Principles and Practices of Community Health Education. Fall, Spring. An introduction to the basic concepts and implementation strategies for health education and behavior change on one-to-one, small group, and mass levels. The interaction of the individual, the family, and the community will be stressed, as well as corresponding interactions among health professionals. Some of the topic areas covered will be: the health care system from the consumer's viewpoint, with special emphasis on cost-containment measures that can be developed through community education; trend in consumer self-care and prevention-oriented systems; governmental policy making regarding consumer health issues; and the administrator as change agent within the health care system. Staff.

H.A. 631-2. Introduction to Clinical Medicine. Fall. Health administration, medical, nursing, and dental students will examine the role of the clinician in the context of other professionals and consumers. Lectures will address facets of the health system: the concept of primary care and other organizational issues, definitions of health and illness, provider vs. consumer responsibility in health maintenance.

H.A. 641-2. Administrative Communication. Fall, Spring. Concerned with the communication skills needed by a modern health administrator. Students will increase their proficiency in written and oral communications, verbal communications, public presentations, audiovisual methods, grantmanship, and office correspondence. Staff.

H.A. 642-2. Organization and Management I. Fall. A historical overview of organizational, management and change concepts, principles, and practices. The contributions of the classical, behavioral, and management science schools of thought are examined in an attempt to show that the contemporary health administrator can benefit by understanding and blending the approaches offered by all three. The student will be able not only to manage but also to design innovative health care organizations. Staff.

H.A. 643-2. Organization and Management II. Spring. An analysis of organizational structure, processes, and the behavior of individuals and groups within organizations. Other areas examined include organizational climate, change, effectiveness, and development. Staff.

H.A. 644-2. Legal Problems in Health Care Administration. Spring. Designed to acquaint the student with legal issues experienced by the health administrator. Special emphasis is placed on issues such as malpractice, informed consent, medical staff appointments, directors and administrators' liability, medical records, and refusal of treatment. The course should make the student aware of the multitude of legal problems which confront the health administrator on a daily basis. Staff.

H.A. 645-2. Manpower Management and Labor Relations. Fall. A survey of the manpower management field, including personnel administration and labor relations, with an emphasis on the health field. Specific attention is directed to recruiting techniques, wage and salary administration, career development programs, labor negotiations, and union-management relationships. Staff.

H.A. 650-credit to be arranged. Research. Fall, Spring. Practicum in health administration. Staff.

H.A. 663-3. Finance I. Fall. This course will focus on the financial management process in health care organizations. Attention is placed on the management of assets and the budget process, sources of funds, short- and long-term needs, and the financial accounting environment. A comprehensive case will serve as the focal point. Staff.

H.A. 663-2. Finance II. Spring. This course will explore in-depth the financial management systems utilized in hospitals, with emphasis on the decision-making process. Management accounting techniques will be thoroughly covered. Such current topics as break-even analysis, flexible budgeting, and capital budgeting will be explored, along with their impact on the health care environment. Problems will serve as the primary pedagogical tool, with a comprehensive case serving as the integrative device. Staff.

H.A. 664-3. Finance I. Fall. This course will further develop the tools available to the financial manager for decision making. Considerable emphasis is placed on the practical application of these tools and the limitations of their use. Current articles, guest speakers, and cases are used to stimulate discussion. Staff.

H.A. 665-3. Finance II. Spring. The primary focus of this course will be an in-depth research report on a current problem. Students will be responsible for identifying their own research sites and will present both the client and the class on the interim progress and the final recommendations. A hospital simulation game will be utilized to integrate the financial management concepts introduced in the preceding finance courses. Staff.

including ownership, administration, professional and nonprofessional departments, and personnel. Staff.

H.A. 671-3. Institutional Management II. Spring. A capstone course which synthesizes and summarizes the material presented in all previous course work and applies it to real problems. Designed for students preparing for graduation, this course will help the students review material and will integrate various aspects of the curriculum through seminars in which students will be encouraged to actively participate, often in a role-playing situation. Staff.

H.A. 672-2. Ambulatory Care Administration. Fall, Spring. The health administration student is exposed to the rapidly developing career area of ambulatory care. Various ambulatory care settings are studied. Problems in the planning, implementation, administration, and evaluation of ambulatory care are highlighted in this course. Field trips are an important aspect of the student's learning experience. Guest faculty.

H.A. 674-1. Multi-institutional Management. Fall, Spring. Multi-institutional management is a developing trend in health administration. Students are exposed to both profit and nonprofit hospital networks. Shared services, merger, management contracts, hospital acquisitions, and satellite clinics are studied and discussed. Guest faculty.

H.A. 675-2. Rural Health Systems I. Fall. Introduces the student to the history and evolution of rural health care in the United States. Also to be examined are past attempts to improve rural health and the impact of past national programs affecting rural health. The present status of rural health in the United States will be explored. The course will end with a review of private, local, state, and federal programs directed toward solutions for rural health problems. Concurrent with this course will be eight sessions in practice management for ambulatory care centers. Warren.

H.A. 677-2. Rural Health Systems II. Spring. The course begins with a close look at existing programs and funding sources which can serve as resources to the student in developing a rural health system. The student will also participate in the establishment of new sites around Colorado. This experience includes feasibility studies, selection of practice model, provider recruitment, community organization, organization of a practice, program financing, and private management. Various federal, state, local, and private resources will be applied to the creation of this health system. Warren.

H.A. 678-2. Health Care Marketing. Fall, Spring. An introduction to the application of marketing concepts and techniques to health care. Discussion will focus on implications of a changing regulatory environment for marketing health services, specific concepts and tools, and marketing applications to various types of health delivery systems.

H.A. 700-credit to be arranged. Master's Thesis. All semesters. Staff.

INTERDEPARTMENTAL PROGRAMS

Molecular and Cellular Biology

This interdepartmental program leading to the Ph.D. degree provides training in molecular and cellular biology with a strong emphasis on the basic mechanisms of disease. Its faculty is composed of members of the basic science departments of the University of Colorado Health Sciences Center School of Medicine.

All entering students participate in a rigorous one-year core program of formal course work and seminars designed to provide them with the fundamental knowledge necessary for research in molecular and cellular biology. During the first year, each student also rotates through at least three laboratories of the participating faculty. Students then select a faculty sponsor for their advanced research training. The diverse research interests of the participating faculty ensure a broad range of fields from which to choose an area of specialization.

Candidates for admission should have theoretical and laboratory training in general biology, including genetics, inorganic and organic chemistry, physics, physical chemistry, calculus, and statistics. Students must meet all the usual requirements of the University of Colorado, including the foreign language stipulation. Students are required to take the Graduate Record Examination (GRE) and have their scores forwarded prior to admission.

Interdepartmental courses and selected courses from individual departments at the Health Sciences Center are offered for this program.

Molecular and Human Genetics

This interdepartmental program leading to the Ph.D. degree provides training in genetics with specialization extending from basic molecular studies to more clinically oriented research and genetic counseling. The faculty is drawn from the Departments of Biochemistry, Biophysics, and Genetics; Pediatrics; Medicine; and Obstetrics and Gynecology of the University of Colorado Health Sciences Center School of Medicine.

A wide range of course work and research training is provided in the first year of study. This includes studies in genetics as well as training in allied fields. Students do laboratory rotations in four areas of genetics: (1) molecular and microbial genetics, (2) somatic cell genetics, (3) biochemical genetics, and (4) clinical and cytogenetics. During the second year of the program they select a faculty adviser for advanced research training.

Candidates for admission should have theoretical and laboratory training in general biology, including genetics, inorganic and organic chemistry, physics, physical chemistry, calculus, and statistics. Students must meet all the usual requirements of the University of Colorado, including the foreign language stipulation. Students are required to take the Graduate Record Examination (GRE) and have their scores forwarded prior to admission.

The following interdepartmental courses are taken in the above interdepartmental graduate programs and/or in other Health Sciences Center programs.

IDPT 602-3. Basic Oncology. Fall and Winter. Designed for both medical and graduate students, part of the content of which is based upon the cell biology and molecular biology of the cancer cell. The focussing of this knowledge to the understanding of the problems and the management of the cancer patient is emphasized. While clinical illustrations are used, this is not a course in the systematic management of the cancer patient. Lehman and Kerr.

IDPT 607-2. Drugs and the Developing Organism. Fall. Designed to provide an understanding of basic physiologic mechanisms involved in pediatric pharmacology. It covers liver enzymes, renal function, placenta-barrier, and blood-brain-barrier. Child disorders such as the hyperkinetic syndromes, epilepsies, and newborn addiction are discussed. Presented by the Departments of Pharmacology and Psychiatry. Venndakis and Manchester.

IDPT 608-credit to be arranged. Clinical Research Techniques and Studies of Human Disease. Spring. The course will focus on experimental design, execution, and interpretation of clinical research studies with reference to current techniques and effective use of methods. Discussions of current and future clinical research problems will be presented by members of different divisions and departments in an effort to provide the student with an understanding of recent advances in clinical research in several subspecialties. Students will write a literature report on a clinical research subject of their choice and present it to the class. Gordon.

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LABORATORY MEDICINE

Students wishing to pursue graduate work in Medicine leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees and Graduate School admission requirements.

Med. 646. Special Problems in Analytical Clinical Chemistry. Fall, Winter, Spring. A problem will be selected jointly by the instructor and student. The purpose of the course is to give experience in formulating and solving current problems of importance and interest in clinical chemistry. Special emphasis will be placed on the use of advanced analytical instrumentation. Pearson.

Med. 650. Research in Medicine. All quarters. The course will focus on learning biochemical research techniques with emphasis toward their utilization in clinical research. S. Gordon.

Med. 655. Clinical Research in Medicine. All quarters. The student will participate in the execution of clinical research studies under the direct supervision of the faculty member responsible for the clinical research study. The student will perform clinical and laboratory research procedures associated with the study. A brief project including background, experimental design and progress of the study will be submitted at the end of the quarter. Gordon.

Med. 700-credit to be arranged. Master's Thesis. All quarters. S. Gordon.

MICROBIOLOGY AND IMMUNOLOGY

Candidates for admission to graduate work in microbiology and immunology should have theoretical and laboratory training in general biology, inorganic and organic chemistry, physics, physical chemistry, calculus, and statistics. Some knowledge of genetics and the history of biology is desirable.

The Graduate Record Examination is required.

Students wishing to pursue graduate work in microbiology leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees and Graduate School Admission Requirements.

The Department of Microbiology and Immunology has no specific Ph.D. foreign language requirement, but proficiency in at least one foreign language is required.

All courses in microbiology are quarter-hour courses.

Microbiol. 520-5. Properties of Bacteria, Viruses, and Protozoa and Their Interaction With Their Hosts. Fall. A one-quarter course of 11 weeks, introducing students to certain fundamental features of microorganisms and their ability to cause disease. Includes a description of the properties of various pathogenic bacteria, viruses, fungi, and parasites and the diseases caused by these organisms. Patients will be presented to illustrate a number of these diseases. Also included will be a description, at the cellular and molecular level, of bacterial physiology, microbial genetics, virus structure, and virus reproduction. Four lect. per wk., one hr. of Infectious Disease Clinic. Pizer and staff.

Microbiol. 521-3 1/2. Microbiology Laboratory. Fall. A seven-hour lab. course accompanying Microbiol. 520 and 524 and concerned with the growth and properties of microorganisms and fundamental techniques of immunology. Roberts and staff.

Microbiol. 629-2-5. Immunology. Fall. This course is the same as Microbiol. 524, the medical course, but is adapted for graduate students. Such students will not be required to attend clinical correlation sessions, but will attend a weekly in-depth discussion of the material presented in lectures at a time to be chosen. J. Cohen.

Microbiol. 630-3. Advanced Immunology. Spring. Given even-numbered years. An advanced course in immunology focusing on immunobiology and advanced topics in cellular immunology. Students must have a considerable background in immunology. Claman.


Microbiol. 635-3. Viral Pathogenesis. A lecture and literature review course emphasizing current methods of experimental analysis of virus infections of mammalian hosts. Includes a discussion of viral strategies of evading normal host resistance, immunopathogenesis,
GRADUATE NURSING PROGRAM

Master of Science Nursing Degree

The Master of Science program focuses on specialization in nursing and prepares graduates who can assume leadership roles in clinical, administrative, and educational settings. Within the master’s program there are five specialty areas of nursing:

- Community Health Nursing
- Medical-Surgical Nursing
- Nursing Administration
- Parent-Child Nursing
- Psychiatric-Mental Health Nursing

In addition, students may elect to develop a functional area in teaching. Study of clinical nursing focuses on the utilization of existing theories and the development and testing of nursing theories. Study of systems through which nursing is delivered includes the theories, policies, and processes which shape and maintain practice environments and assess the outcomes of nursing practice. Introductory preparation in teaching is offered. Research education and advanced clinical nursing are integral parts of all of the programs. Substantive knowledge of critical supporting fields is included in the specialty areas. Flexibility is provided to allow students to pursue individual interests within the specialty areas.

Curricula in the various programs are based on the following assumptions:

1. The study of known theories, the testing of theories, and the development of new theories are basic to the acquisition of knowledge.
2. Competent practice is based on depth and breadth of knowledge.
3. Teaching in nursing is based on clinical competency.
4. Each specialty area in nursing requires a synthesis of advanced knowledge of nursing theories and processes.
5. The student will take primary responsibility for self-growth through planning, implementing, and evaluating learning experiences.
6. The nurse with graduate education will take responsibility to initiate, implement, and evaluate changes in health care delivery.
7. Theories and concepts of social change and processes which influence health care are shared with other disciplines.

The primary goal of the master’s degree program is to provide educational preparation for specialization in selected areas of nursing. Graduate education offers opportunities for students to:

1. Pursue knowledge in depth in a selected field of interest.
2. Develop competencies in a selected field which, with experience, will qualify the student as a specialist in that area of practice.
3. Acquire and extend competencies in the assessment, use, and conduct of research.
4. Pursue further course work in related areas.
5. Collaborate with members of other disciplines in their endeavors in education, research, and delivery of health care.
6. Develop the ability to conceptualize and abstract from clinical data.
7. Acquire and extend competencies in leadership.

Time required for program completion varies with the individual program of study. Students may be admitted for full-time study in either summer or fall. Students may pursue part-time study with approval of academic advisors.

Nursing majors must take a minimum of three hours of non-nursing credits. If a minor is elected, the number of hours in the minor field is determined by the selected department and may vary with departmental requirements. Possible fields include health administration, education, business, philosophy and social, behavioral, or biological sciences, depending upon the student’s interest and undergraduate background for study in the minor areas. If a student does not elect a minor, the credit hours in non-nursing courses may be distributed throughout several related fields.

The master’s program in nursing, like the undergraduate program, is accredited by the National League for Nursing.

Additional information and application materials are available on request from the Office of Student Affairs, University of Colorado Health Sciences Center, C-288, 4200 East Ninth Avenue, Denver, Colorado 80262.

ADMISSION REQUIREMENTS

Requirements for admission to the Master of Science program in nursing are as follows:

1. Professional registered nurse licensure (state of Colorado) and a baccalaureate degree in nursing from a school of nursing accredited by the National League for Nursing. If the baccalaureate program was not accredited by the N.L.N. at the time of graduation, each nursing course and the program as a whole will need to be evaluated for equivalency to the University’s baccalaureate course offerings. Therefore, the following credentials will be required to support the application:
   a. Outlines of nursing courses, including descriptions of clinical experiences.
   b. A letter from the dean stating progress being made toward accreditation.
2. A minimum grade-point average of 2.75 on the baccalaureate level. This is essential for advanced study.
3. Evidence of successful completion of a course in elementary statistics.
4. Acceptable performance on the Graduate Record Examination, aptitude portion only.
5. A personal interview may be required.

Doctor of Philosophy Program in Nursing

The Doctor of Philosophy program in nursing offers the professional nurse with a master's degree an opportunity to pursue doctoral study. The purpose of the program is to prepare nurse investigators who are able to advance the knowledge of nursing.

Graduate studies and research opportunities are available in three areas:
1. *Psychosocial Nursing* is the study of health, stress, and illness behaviors of individuals and groups. A major focus is the promotion of wellness through psychosocial nursing interventions. Available within psychosocial nursing is the mental health program, which prepares nurses to improve practice and advance nursing knowledge in the promotion of mental health and the prevention of mental illness. A concentration on aging is also available within psychosocial nursing.
2. *Psychobiological Nursing* is the study of the interrelationship of psychological and biological processes in determining human behavior in health and illness. The development of biological and behavioral intervention strategies to improve the psychobiological function of the individual is the primary research goal. Concentrations on aging and developmental psychology are available within psychobiological nursing.
3. *Nursing Care Delivery Systems* is the study of developing, managing, and evaluating systems through which nursing is provided. It encompasses environments and systems in which nursing is practiced and external systems which impinge on the practice of nursing or the delivery of care.

Admission Requirements

All applicants must meet the general admission requirements for doctoral applicants of the Graduate School of the University of Colorado, as outlined in the Graduate School section of the catalog. The following are additional requirements of the Department of Nursing:
1. Completion of a master's degree in nursing or its equivalent.
2. Completion of the Graduate Record Examination (Verbal and quantitative portions).
3. A thesis or its equivalent.

An interview is required for applicants meeting these admission requirements. To insure diversity of student body, consideration will be given to relevant backgrounds, strengths, interests, and experiences of the individual applicant.

Applicants should request the Educational Testing Service to send their scores on the Aptitude Test (verbal and quantitative) of the Graduate Record Examination (GRE) to the School of Nursing, Doctoral Program. An analytic score will be included for applicants taking the examination after 1977.

Applicants are not cleared for admission if GRE scores are lacking or if the faculty finds the scores unsatisfactory. The GRE is administered at many centers throughout the world. Information about the GRE will be sent with application materials or may be obtained from the Educational Testing Service, 20 Nassau Street, Princeton, New Jersey 08540, or from the graduate office of a university in the applicant's area.

Degree Requirements

Awarding of the Ph.D. degree will be based on completion of a minimum of 72 semester hours of acceptable postbaccalaureate graduate work, including 30 semester hours awarded for the dissertation. If the master's degree has been completed, the requirements for the Ph.D. can be expected to take approximately three years of full-time study and research. Approval of up to 10 hours of transfer credit will be based on the relevancy and recency of the applicant's prior work.

Each student will be expected to demonstrate competence in certain basic areas of theory and research and each specialty area will identify required seminars. In addition, each student will select courses supportive to that specialty area. Some courses may be selected from those available within the School of Nursing, but students will be encouraged to elect supportive courses from other academic departments in the University.

Students will take written preliminary examinations within the first year of their program as well as comprehensive examinations to advance to Ph.D. candidacy. The dissertation is to be an original piece of work based on investigation of a problem in nursing practice or nursing care delivery.

Course Requirements

All doctoral students are required to enroll initially in a two-semester sequence on theory construction and analysis.

Most students also will be in their programs of study with a survey course on research designs used in applied sciences as well as in biological and behavioral sciences. Each student will be required to take course work necessary to develop a level of competence in research methods and statistics. As a minimum, students will be required to take two research design courses beyond the survey course and two advanced statistics courses and to develop facility in the use of computers.

Depending on the specialty area elected, students may begin required specialty courses in the first year of study or may need to take other courses prerequisite for enrollment in the required seminars. In addition to the required seminars in specialty areas, students will elect course work most supportive of the specialty area in view of the student's career goals. Students are required to enroll in a seminar on issues of concern to researchers and research administrators. Depending on their interests, students will supplement any of the above-described courses with additional courses or through independent study in other departments or in the School of Nursing.

Preliminary Examination

Each student will take a written preliminary examination within one year of admission to regular degree status. The purposes of this examination are to
try to determine which students are capable of successful completion of the program and to use the results in subsequent academic advising. The examination will test knowledge in three areas: theory construction and analysis, research design and statistics, and the general field of nursing. A student who does poorly in the written examination may be permitted to repeat it the next time it is offered. A student who fails the examination two times will not be continued in the program.

COMPREHENSIVE EXAMINATION

The student is advanced to Ph.D. candidacy upon successful completion of written examinations in each of the following: theory construction and analysis, research design and statistics, and the specialty area. These examinations ordinarily will be offered twice a year, in November and April. Written examinations may be supplemented by oral examinations at the option of the examining committee.

DISSERTATION

The dissertation is to be an original piece of work based on investigation of a problem in nursing practice and related to the candidate’s field of specialization. Supervision of the candidate is the responsibility of the dissertation committee which will include nursing faculty directly involved in the field of the student’s specialty as well as faculty members involved in supportive and related areas.

Additional information and application materials may be obtained by writing to the Office of Student Affairs, School of Nursing, University of Colorado Health Sciences Center, 4200 E. Ninth Avenue, C-288, Denver, Colorado 80262.

FINANCIAL ASSISTANCE

A doctoral student may wish to apply for financial aid in the form of a traineeship, fellowship, assistantship, loan, or scholarship. Some sources of financial assistance available are:

Mental Health Traineeships. Students in the mental health sequence are eligible for a traineeship including payment of tuition, fees, and a monthly stipend of $325.

Professional Nurse Traineeships. Students who have not already received three one-year appointments in the Federal Professional Nurse Traineeship Program may be appointed for time unused. This program provides tuition, fees, and a variable small monthly stipend.

National Research Service Awards for Individual Predoctoral and Postdoctoral Nurse Fellowships. The National Research Service Award Act authorizes the Division of Nursing to provide National Research Service Awards (NRSA) to nurses for predoctoral and postdoctoral training in specified areas of nursing and in biomedical and behavioral fields important to nursing. Application is made after admission to the program.

Graduate Nursing Student Loan and Scholarship Program. Some funds have been allocated by the federal government for graduate nursing student loans and scholarships. Further information and applications may be obtained from the Office of Student Financial Aid, University of Colorado Health Sciences Center, 4200 E. Ninth Avenue, Denver, Colorado 80262.

Additional sources of support are available for students not otherwise supported.

Nurs. 503-2. Women’s Role and the Health Care System. Fall. A graduate-level seminar for nursing students and other eligible Health Sciences Center students. The focus is on the feminine role in leadership and decision making. Emphasis is on interactions within the health care systems. Role playing, simulation, and other projects are designed to support these concepts and afford an opportunity for developing effective strategies for acquiring and using power in leadership roles. McKee.


Nurs. 520-2. Issues in Clinical Nursing.1 The nurse’s role in increasingly complex patient care and current concepts in professional nursing practice.

Nurs. 560-3. Research in Nursing. Fall. Required of all master’s degree candidates. Consideration of the philosophy and application of scientific investigation to nursing.

Nurs. 601-2. Seminar in Nursing Research. Spring. Seminar discussion of selected issues in nursing research; opportunity to explore and evaluate techniques of measurement to conduct research. Prer. Nurs. 400.


Nurs. 603-2. Theories of Developmental Aging. Fall. Seminar on theories and research relevant to developmental changes in adulthood and aging. Topics will include normal biophysiological, psychological, and sociocultural changes; developmental tasks; socialization processes and psychosocial theories of successful aging. Quayhagen.


Nurs. 605-3. Seminar in Transcultural Health.1 Spring. Designed to build on the theoretical base of Nurs. 508 (Transcultural Health). A field experience will provide an opportunity for the student to acquire skill in gathering transcultural data on health-related issues and to develop conceptual models central to the emerging area of study of transcultural health. Prer. Nurs. 508.


Nurs. 625-2. The Adult—Illness Management and Health Maintenance I. Fall. An integrated approach to nursing assessment and management involving the person, his or her health status and life circumstances, the practitioner, and the health care delivery system. Conceptual and phenomenologic aspects explored in relation to selected clinically oriented health illness problems (exclusive of critical and intensive care) and will include biological and behavioral dimensions. Lecture and clinical practice. Prer. or coreq. Nurs. 602 and 620. Kaufmann.

1 Not offered on a regular basis.

Nurs. 627-3 or 4. Pulmonary Nursing I. Fall. Skill in performing and understanding basic pulmonary function testing including blood gases; current concepts in epidemiology and pathophysiology of more common respiratory disease including medical and nursing management (diagnosis and physical therapy administered by nurse). Conceptual models of management of the chronically ill will guide discussions of nursing care. Consideration will be given to integration of conceptual models for practice by various practitioners toward the end of promoting coordinated care for pulmonary patients. Prer., Nurs. 478 or equivalent, or coreq., Nurs. 620. Harrison.

Nurs. 628-4. Pulmonary Nursing II. Spring. Seminar and practical in pulmonary care. Participants will participate in the management of cases requiring respiratory care. Seminar presentations by students will include clinical evaluations, pathophysiology, psychosocial needs and management. Prer., Nurs. 627. Harrison.

Nurs. 629-3. Topics in Psychobiological Nursing. Fall, Spring. A seminar to increase participants' knowledge of current research in psychobiology relevant to nursing, provide experience in giving formal presentations, and foster critical evaluation abilities. Prer., undergraduate physiology or consent of instructor. Fuller.

Nurs. 630-3. Advanced Parent-Child Nursing I. Fall. The primary focus is the study, analysis, and application of concepts, theories and models specific to family life. Research and current social issues having impact on family life are studied in detail. Each student selects and works with a family throughout the year utilizing a conceptual framework as basis of practice. A clinical nursing problem is identified and systematically investigated by each student. Parent-child nursing faculty.


Nurs. 632-2 to 6. Health Assessment and Maintenance in Maternity and Perinatal Nursing. Fall, Spring. This series, comprised of 2 credit modules, has been developed to enable the student to assess and help maintain an optimal level of wellness within a client population of parents expecting a child and/or children. Parent-child nursing faculty.

Nurs. 633-3 to 6. Health Assessment and Restoration in Maternity and Perinatal Nursing. Fall, Spring. This course, comprised of multiple modules, concentrates on the assessment of states and stages of wellness and concepts related to maintenance and promotion of health of children. Parent-child nursing faculty.

Nurs. 635-2 to 6. Health Assessment and Restoration in Pediatric Nursing. Fall, Spring. This series, comprised of 2 credit modules, enables the student to assess and help maintain an optimal level of wellness within a client population of parents expecting a child and/or children. Parent-child nursing faculty.

Nurs. 636-2 to 6. Current Issues in Parent-Child Nursing. Fall, Spring. This series, comprised of 2 credit modules, provides the student opportunities to gain greater depth of inquiry in areas directly related to the philosophy and practice of parent-child nursing. Parent-child nursing faculty.


Nurs. 651-2. Teaching Nursing in Associate Degree Programs. Organization of content characteristic of associate degree programs in nursing.

Nurs. 652-3. Teaching in Continuing Education. A seminar course for graduate students in nursing to develop and enhance their teaching skills in the area of continuing education. The major focus will be on principles and theory of continuing education and the development and implementation of continuing education programs. Theories and principles of adult education will be emphasized throughout the course. Field and simulated experiences on a selected basis will be provided. Prer., Nurs. 657.

Nurs. 653-3. Nursing Leadership of Discussion Groups. Fall, Spring. Seminar and practical: nursing leadership techniques and skills utilized in group education. Emphasis is on group dynamics, process, and learning through group discussion. Students will conduct group discussions with adolescents or adults from hospital and community settings. Ford.


Nurs. 658-3. Nursing Administration I. Fall, Spring. A seminar-seminar course in which organizational theory and basic concepts of management are explored as they relate to nursing. Topics include administrative functions, leadership and management ideologies, human relations, and organizational goals. Marriner.

Nurs. 659-3. Nursing Administration II. Spring. A seminar-seminar course which continues the study of theories as applied to nursing administration. Complex aspects of the administrative process such as power, change, evaluation, integration of research, and political influences are included. Prer., Nurs. 658 and 660. Marriner.

Nurs. 660-3. Field Study in Nursing Administration. Summer. A field experience designed to afford students the opportunity to integrate administrative theory and practice through participation in selected aspects of the administrative process within a health care system. Weekly seminars which are coordinated by the faculty of the School of Nursing are a part of the field study experience. Prer., Nurs. 658 and 659. Krueger.


Nurs. 663-3. Concepts for Practice. Fall. An examination of selected concepts and theories applicable for the delivery of nursing care for specific populations. Students will develop and test a conceptual framework for clinical practice in a selected setting for specific patient/client population.

Nurs. 664-4. Community Health Nursing I. Fall. Seminar discussion of theoretical frameworks from the biological and behavioral sciences and their application to the nursing of family groups in their neighborhood settings. The seminar includes analysis of practice in community settings. Community health nursing faculty.

Nurs. 666-2 to 6. Community Health Nursing II. Spring. Focuses on community health needs, strategies of community change, theory and methods of planning and evaluating delivery systems, and multidimensional forces which influence community health nursing. Localized is a practice which helps students develop a style of professional practice which is based on substantive knowledge and research. Community health nursing faculty.

Nurs. 670-4. Nurse-Midwifery Process I. Fall. Theory and clinical practice in the nurse-midwifery management of the health care of women from puberty through menopause. Areas of emphasis are gynecological health maintenance, family planning, and counseling in sexuality, genetics, infertility, and pregnancy termination are examined in accord with the management process.


Nurs. 673-8. Nurse-Midwifery Process IV. Spring. Clinical practice experiences are a synthesis of nurse-midwifery management experiences. The focus in the clinical area is on refinement of practice. Emphasis is placed on the application of knowledge, judgment, and management skills needed to safely manage the patient/mother and the use of sound rationale for management within ordered priorities. Intensive clinical practice is integrated with conferences, case presentations, and seminars. Prereq., Nurs. 602.

Nurs. 675-4. Primary Care of the Family I. Fall. First semester of a three-course sequence designed to provide knowledge and skills to determine the health status of families as well as individual members and to offer appropriate therapeutic interventions. Provides clinical practicum. Carter.

Nurs. 676-4. Primary Care of the Family II. Spring. Second semester of a three-course sequence designed to provide knowledge and skills to determine the health status of families as well as individual members and to offer appropriate therapeutic interventions. Includes clinical practicum. Carter.

Nurs. 677-4. Primary Care of the Family Practicum. Summer. An 8-week summer course which is the third course in a sequence designed to provide the student with extensive practice in determining health status of families as well as individual members and to offer appropriate therapeutic interventions. Prereq., Nurs. 676. Carter.


Nurs. 685-2. Elective Clinical Psychiatric Nursing I. Fall. Individually tailored clinical experience developed around a specific clinical interest of the student and guided by a faculty member. Prereq., Nurs. 645. Psychiatric nursing faculty.

Nurs. 686-2. Elective Clinical Psychiatric Nursing II. Spring. Individually tailored clinical experience related to a student’s particular interest and need. The clinical project may be a continuation of the student’s work in a previous course or a separate project. Prereq., Nurs. 683. Psychiatric nursing faculty.

Nurs. 690-1 to 4. Selected Topic in Graduate Study.

Nurs. 691-1 to 3. Guided Research in Nursing. Fall, Spring. Independent research in an area of interest to graduate nursing students. Approvals must be obtained from the student’s advisor and the faculty member involved. Prereq., satisfactory completion of graduate-level courses in the student’s specialty and Nurs. 660 or its equivalent. Doctoral teaching faculty.

Nurs. 692-3. Methods of Scientific Inquiry in Nursing. Fall. This seminar focuses on the processes of research design appropriate for developing and testing nursing theories. Nature of scientific inquiry and issues in design are addressed in a comparative analytic approach. Prereq., Nurs. 694-3. Interpersonal Statistics in Nursing. Fall. An intermediate-level statistics course for graduate nursing students. Topics covered include correlation, prediction and regression, hypothesis testing, t-tests, one- and two-way ANOVA, ANCOVA. Material is made relevant to nursing by use of actual nursing research article and strategies as examples.


Nurs. 710-3. Theory Construction and Analysis in Nursing I. Fall. Philosophical problems and issues basic to theory construction in a practice discipline are examined. Using concepts relevant for clinical practice (pain, stress, health), students will address philosophical issues inherent in the development of science. Prereq., admission to Ph.D. program or consent of instructor.

Nurs. 711-3. Theory Construction and Analysis in Nursing II. Spring. A brief history of the development of theories in nursing and an awareness of need to develop theory in nursing are examined. Selected nursing theories are critically analyzed.

Nurs. 712-2. Professional Seminar. Fall, alternate years. Political, administrative, and technical knowledge required of a nurse researcher or research administrator. Includes selection of appropriate funding agencies, experience in proposal writing, and scientific personnel and financial support of research grants. Prereq., admission to Ph.D. program or consent of instructor.

Nurs. 713-2. Evaluation Research in Nursing: Issues and Frameworks. Fall. This course examines conceptual approaches to evaluation research with particular emphasis on the politics of evaluation. Approaches to the process of developing and conducting evaluation studies and a critical review of existing evaluation research studies of nursing practices will be included. Prereq., admission to Ph.D. program in nursing or consent of instructor.

Nurs. 714-3. Quasi and Nonexperimental Design and Analysis in Nursing. Fall, Spring. Selected quasi and nonexperimental designs, related statistical techniques, sampling methods, and sources of data for the study of selected clinical nursing problems. Included is the study of research, correlational methods, and the selection of appropriate comparison groups, sampling issues, and execution of selected design in clinical settings. Prereq., admission to Ph.D. program in nursing or consent of instructor.


Nurs. 716-3. Advanced Measurement in Nursing. Fall, Spring. General issues in measurement, instrument development, reliability and validity of nursing measures are discussed. Emphasis is placed on evaluation of existing nursing measures, obtaining and interpreting empirical estimates of validity and reliability, and the process of instrument development. Prereq., Nurs. 714.

Nurs. 720-3. Psychosocial Theories in Wellness and Illness I. Fall. Introduction to a scientific nursing framework from which to pursue advanced study and research in psychosocial nursing. The framework provides structure for understanding human behavior in wellness and illness. Nursing interventions will be examined. Coreq., Nurs. 692, 710. Prereq., admission to Ph.D. program or consent of instructor.

Nurs. 721-3. Psychosocial Theories in Wellness and Illness II. Spring. Introduction to specialized knowledge from which to pursue advanced study and research in psychosocial nursing. Theories and concepts will be examined to aid in understanding internal and external factors that mediate between wellness-illness responses. Prereq., Nurs. 720; coreq., Nurs. 711.

Nurs. 730-4. Psychobiological Nursing: Determinants of Behavior. Fall, Spring. A conceptual approach for nursing to select psychobiological factors influencing behavior. The interplay of factors such as sensation, motor response, cognitive processes, motivation, emotion, and stress in determining behavior will be included. Include advanced research design and coursework. Prereq., admission to Ph.D. program or consent of instructor.
Nurs. 731-4. Psychobiological Nursing: Developmental Perspectives. Fall, Spring. A conceptual approach for nursing to the interplay between psychological and biological factors determining growth and development. Analysis of stages of psychobiological growth and development and of the roles of genetic and environmental factors will be included. Implications for nursing research will be discussed. Prer., admission to Ph.D. program or consent of instructor.

Nurs. 750-3. Ideologies and Current Trends in Mental Health Nursing. Fall, Spring. Introduces historical and contemporary ideologies relevant to examining the field of mental health. Philosophical and theoretical models will be examined in relation to current trends in total health care system. An empirical nursing study will be required. Prer., admission to Ph.D. program and consent of instructor.

Nurs. 752-3. Clinical Assessment in Mental Health Nursing. Fall. Critically examines the components of the psychosocial nursing model with the purpose of identifying, critiquing, and developing protocols for clinical assessment of mental health nursing. Prer., Nurs. 720, 721, 750.

Nurs. 753-3. Health Promoting Models of Behavioral Change. Spring. A course designed to critically examine selected affective, cognitive, and behavioral change models and research outcomes relevant to mental health nursing. Among the models to be considered are relationship enhancement, attitude modification, autogenic measures and cognitive restructuring. Prer., Nurs. 752 or consent of instructor.

Nurs. 755-3. Preceptorship: Psychosocial Mental Health Nursing A-B. Fall (A), Spring (B). This course is designed as a field experience in which the mental health nursing doctoral student can acquire both advanced clinical and research competencies in applying relevant knowledge and evaluating one advanced clinical nursing intervention with a designated population. Prer., Nurs. 750, 752, 755.

Nurs. 760-3. Processes of Aging: Theory and Research for Nursing. Fall, Spring. Seminar on selected biological and behavioral theories of aging, their interrelationships, and application to nursing theory and research. The focus is on identification of problems applicable to intervention research and designs relevant for study of nursing care of the aged. Prer., admission to Ph.D. program or consent of instructor.

Nurs. 770-3. Nursing Care Delivery System I. Fall, alternate years. The study of research-based theories underlying nursing care delivery in complex organizations. Focus is on critical examination of studies of intranorganizational structure and process. Quality of design and application of findings to administrative nursing practice are evaluated. Prer., admission to Ph.D. program or consent of instructor.


Nurs. 772-3. Nursing Care Delivery System III. Summer, alternate years. Using the research generalizations formulated in NCDS I and II, the student will develop an original framework which will be validated for potential use in nursing administration, research, and practice. Prer., Nurs. 710, 711, 790, 771.


Nurs. 775-3. Theories, Concepts, and Research in Chronicity: Nursing Implications. Fall, Spring. In-depth analysis of theories, concepts, and research relevant to chronicity across the life span and their implications for nursing theory, research, and practice. Included will be issues related to sociocultural variations, attitudes, and behavioral change. Prer., admission to Ph.D. program or consent of instructor.

Nurs. 790-2-4. Selected Topics in Nursing. Fall, Spring, Summer. Designed to examine selected topics of concern for advanced research and theory development appropriate to the practice and discipline of nursing. The topics to be studied will vary according to social significance of problem, faculty expertise, and students' interests. Prer., admission to Ph.D. program or consent of instructor.

Nurs. 950-1 to 4. Independent Study (Master's). Fall, Spring, Summer. This course provides an opportunity for a doctoral student to study in an area of interest not taught in a seminar format.

Nurs. 800-1 to 6. Doctoral Thesis. Fall, Spring, Summer.

PATHOLOGY

Students wishing to pursue graduate work in pathology leading to candidacy for advanced degrees should read Requirements for Advanced Degrees and Graduate School Admission Requirements.

Candidates with the B.S. or B.A. degree as well as those with the M.D. degree are considered for the Ph.D. in pathology.

The Ph.D. program requires a minimum of 45 hours of graduate work, including anatomy, biochemistry, biophysics, cytology, genetics, advanced organic chemistry, physical chemistry, and a selection of the graduate courses given by the Department of Pathology. In addition, extensive experience leading to a thesis is required.

A stringent two- to three-year program for postdoctoral students who wish to attain a real understanding of and research competency in modern biology is also available. In addition to regular course work, the first year can be spent in rotating through three or four research laboratories of varied interests. The second and possibly third years are then spent in one laboratory, determined by the experience and interest of the individual toward the close of the first-year rotation. Areas of research interest include virology, cell biology, membrane structure and biochemistry, tumor biology, and experimental pathology.

Detailed brochures are available.

Path. 501a-11½. General and Systemic Pathology. Winter, Spring. A survey of human disease with emphasis on clinical-pathologic correlation in preparation for the practice of medicine. A short introduction covers disease mechanisms. This is followed by a series of lectures and laboratory sessions devoted to each of the organ systems. The laboratory sessions entail small group study of selected cases. The last two weeks include a series of C.F.C.'s and seminars covering specific topics in pathobiology. Staff.

Path. 501b-11½. General and Systemic Pathology. Winter, Spring. As in Path. 501a, this course presents a survey of human disease in preparation for the practice of medicine. In addition, the biologic bases and mechanisms of disease are presented in depth and are integrated with clinical-pathologic manifestations. Lectures, seminars, and small group study of cases are used. Staff.

Path. 605-2. Topics in Experimental Oncology. Spring. Lectures and seminars covering selected topics of interest in the field of experimental oncology. This year's topics will include cytokinetics in cancer, surface changes in cancer cells, onco-fetal antigens, and fine structure of cancer cells. Sophomore medical students and graduate students. Prer., first quarter of Path. 501. Lehman and staff.

Path. 613-1. Research Seminars and Journal Club. Fall, Winter, Spring.

Path. 627-4. Basic Mechanisms in Virology. Spring. Molecular aspects of the structure and replication of viruses will be presented. Bacteriophages will be considered, but primary emphasis will be placed on animal viruses and a significant part of the course will deal with tumor viruses. Among topics to be considered are: transformation by RNA and DNA tumor viruses, genetics of animal viruses, biosynthesis of viral nucleic acids and proteins, virus assembly, latency, and expression of endogenous viral genes. When appropriate material is available, laboratory demonstrations will be presented. Erikson.

Path. 650. Research in Pathology. All quarters. Credit to be arranged.

Path. 700-credit to be arranged. Master's Thesis. All quarters.
Path. 800-credit to be arranged. Doctor's Thesis. All quarters.
PHARMACOLOGY

Students wishing to pursue graduate work in pharmacology leading to candidacy for the Ph.D. degree should read carefully Requirements for Advanced Degrees and Graduate School Admission Requirements.

Prerequisites. The preliminary training of students desiring to major in pharmacology should include the following college courses:

1. Biology: introductory biology or general zoology, or their equivalent. Work in invertebrate and comparative zoology and genetics is desirable.
2. Chemistry: at least two years of college chemistry, including inorganic, organic, and physical chemistry.
3. Physics: general introductory. Advanced physics, particularly in mechanics and electricity, is desirable.
5. Language: A reading knowledge of a foreign language is required. This may be demonstrated by satisfactory performance on an examination or by satisfactory completion of the second semester of a second-year college language course. The department strongly recommends German as the most appropriate foreign language for pharmacology.

PHCL 510-3.5. Pharmacology. Fall. Intensive study of the drugs used in medical practice. This quarter includes general principles, endocrine therapy, antimicrobial and cancer chemotherapy, toxicology and drug metabolism. Lectures and clinical correlations. Prereq., physiology and biochemistry. Weiner and staff.

PHCL 511-1. Laboratory in Pharmacology. Winter. Second year. Laboratory exercises are designed to provide a basis for discussion of basic pharmacologic principles in a laboratory setting. Prereq., biochemistry and pharmacology. Weiner and staff.


PHCL 605-3. The Regulation of Metabolism and Cell Function. Winter. Detailed treatment of mechanisms by which cells regulate metabolic processes and macromolecular synthesis. Emphasis will be placed on mechanisms of hormonal regulation, on the regulation of enzymatic activity by protein phosphorilation and calcium-dependent processes, and on enzyme regulation by allosteric mechanisms. The current status of the structure and regulation of active karyolytic chromatins will be considered. Prereq., Biochem. 600 or equivalent. Lenzner and Miller.

PHCL 603-3. Biochemistry of Neurotransmission. Even-numbered years. Lecture topics will include (1) the synthesis, metabolism, storage and release of norepinephrine, acetylcholine, and other putative transmitters in the peripheral and central nervous systems; (2) the identification and assay of properties of receptors; (3) CNS neuropathology including the biochemical mechanisms of action of CNS active drugs and current knowledge of the biochemical basis for neurologic and psychiatric disease. Molinoff, Hoffer, and Weiner.

PHCL 612-3. Drug Metabolism and Drug Interactions. Spring. Mechanisms by which drugs are chemically altered in the body will be discussed. Emphasis will be given to drug interactions. Prereq., biochemistry. Deitrich and Murphy.


PHCL 620-3. Introduction to Pharmacology. Fall. Principles of pharmacology, including pharmacokinetics, receptor-ligand interactions, dose-response and structure-activity relationships, and drug metabolism are presented. Staff.

PHCL 620-3. Research in Pharmacology. All quarters. Directed laboratory research in selected area by the faculty. Credit to be arranged. Weiner.

PHCL 700-credit to be arranged. Master’s Thesis. All quarters. Weiner.

PHCL 800-credit to be arranged. Doctor’s Thesis. All quarters. Weiner.

PHYSICAL THERAPY

Students wishing to pursue graduate work in physical therapy leading to candidacy for an advanced degree should read carefully Requirements for Advanced Degrees and Graduate School Admission Requirements.

Prerequisites. Students contemplating graduate work in physical therapy must have completed an undergraduate major in the field or an approved professional course in physical therapy. Undergraduate courses must have included general biology, physics, organic chemistry, algebra, trigonometry and introductory statistics. Additional biological sciences, such as histology and embryology, and inorganic chemistry, are desirable.

A reading knowledge of one foreign language is recommended.

P.T. 631-6. Physical Therapy Seminar. Summer, Fall. Students will prepare oral reports based on a comprehensive survey of literature on assigned topics. Both the content and the presentation of the reports will be evaluated by an audience of faculty, staff, and graduate students. Cenkovich.

P.T. 632-5. Advanced Physical Therapy. Summer, Winter. Practice teaching in curriculum in physical therapy. Advanced skills in patient evaluation and treatment in selected areas, i.e., muscle testing and training, electrical diagnosis and treatment, gait, function, relearning, neurodevelopmental evaluation, therapeutic exercise. Treatment program planning and course construction. The student also has an opportunity to do a clinical affiliation in his area of interest. Pediatric and cardiopulmonary rehabilitation are among the areas available. Barnett.


P.T. 700-credit to be arranged. Master’s Thesis. All quarters. Faculty.

PHYSIOLOGY

Students wishing to pursue graduate work in physiology leading to candidacy for advanced degrees should read carefully Requirements for Advanced Degrees and Graduate School Admission Requirements.
The Department of Physiology has no Ph.D. tool foreign language requirement.

Prerequisites. The preliminary training of the student desiring to major in physiology should include:
1. One year of advanced biology (genetics, embryology, invertebrate or comparative zoology, general or cellular physiology).
2. Physics (one year), chemistry (including physical), and mathematics (including calculus and statistics).

Physiol. 501-8.5. Principles of Mammalian Physiology. Lectures, demonstrations, and laboratory. Graduate students may elect lectures only for 8.0 credits. Martin and staff.

Physiol. 603-credit to be arranged. Physiology Seminar. Fall, Winter, Spring. Prer., Physiol. 501. Martin and staff.


Physiol. 650-credit to be arranged. Research in Physiology. Laboratory and library problems. Primarily for graduate students. Martin and staff.

Physiol. 700-credit to be arranged. Master's Thesis. All quarters. Study for the master's degree is not encouraged except in special situations. Martin.

Physiol. 800-credit to be arranged. Doctor's Thesis. All quarters.

PREVENTIVE MEDICINE AND COMPREHENSIVE HEALTH CARE

This department offers courses leading to a master's degree in preventive medicine. The program is designed for physicians interested in community-oriented careers that might include environmental and occupational health, epidemiology, medical care administration, or child health development. Skills required for population-based research are emphasized. Independent projects are conducted in order to fulfill the thesis requirement. This program would be of interest to physicians expecting to work in academic settings, industry, government health agencies, or in international health. The department's Division of Health Administration also offers a degree in health care management.

PRMD 608-3. Ethical Decision Making in Health Professions. Fall, Winter, Spring. Interdisciplinary faculty-student seminars to explore various ethical and legal problems which arise in the delivery of health care. Assigned and elective readings and presentations in the areas of overlap between the health professions, ethics and law will be discussed and applied to real life decision making in the health professions. Cobb.

PRMD 612-2. Concepts of Health. Spring. This interdisciplinary seminar, primarily for medical students and other health professionals, will discuss readings and examine the implications of various concepts of health to the responsibilities of health professionals and to the future of medical practice. Cobb.

PRMD 613-1.5. Methods of Inquiry in Medicine. Fall, Spring. This is a two-semester course with 1.5 hours of credit each semester. The course will familiarize medical and nursing students with scientific research methods and applications, in order to encourage objectivity in medical evaluation and practice. Course activity will revolve around a scientifically designed research project, with application of techniques learned during core teaching hours. Faculty will provide guidance throughout the course.

PRMD 614-3. Introduction to Occupational and Environmental Health. Fall. The purpose of this course is to increase the awareness of future primary care practitioners of occupational and environmental health issues, so they can make full use of the potential of the primary care area in the prevention and management of these health problems. Martini.

PRMD 613-3. Perspectives in International Health. Fall. Previously listed as Prev. Med. 615. Course will engender for students an awareness of the determinants of health and health care services in cultural settings other than their own. Core faculty and both local and international guests will help students better understand how environmental, socioeconomic, and biologic differences contribute to health status and the delivery of services in a large group of nations (including the U.S.). Practical use of population data and indices will provide students the ability to compare and study different health and medical care patterns that may be encountered in the course of their professional careers. Paterson.

PRMD 624-2. Technology Assessment and Medical Care. Spring. Considers some of the current approaches to the assessment of medical technology. The differing methodological requirements of current modes of assessment will be reviewed, including consensus conferences, evaluation research, the review of literature as to the nature of evidence, and the movement toward controlled trials. Prer., Epidemiology or Research Methods. Orleans.

PRMD 626-2. Methods of Inquiry in Medicine I. Winter. This is the first of a two-quarter sequence to familiarize graduate students, medical students, and practitioners with research methods in clinical trials, medical care evaluation, and other epidemiologic research. Lectures and discussion cover proposal writing, study design, data collection and analysis, oral and written presentation of results. Participants and faculty provide a forum for addressing specific methodologic issues as encountered by students in their current research. Martini.

PRMD 627-2. Methods of Inquiry in Medicine II. Spring. This is the second of a two-quarter sequence. Special issues in research are discussed, including grants and contracts, the grant review process, and technology assessment. Topics are chosen by interest of participants. Increased time is spent consulting on student research projects. Martini.

PRMD 650-credit to be arranged. Research in Preventive Medicine. All quarters. Staff.


PRMD 671-2. Environmental Health Seminars. Spring. Weekly meetings with graduate students in mining, engineering, and occupational health to discuss environmental and occupational health problems related to mining and processing of mineral products, including oil shale, uranium, etc. Alternate meetings at UCHSC and School of Mines in Golden. Cobb.

PRMD 700-credit to be arranged. Master's Thesis. All semesters. Cobb.

PSYCHIATRY

The Department of Psychiatry carries on active research programs in psychopharmacology, neuropharmacology, sleep physiology, infant development, cognition, brain-behavior relations, subhuman primate experimentations, etc. Facilities include appropriate laboratories, laboratory computers, and structured
courses and seminars in psychomatics, development, biometrics, and research design for psychiatry.

Psy. 650-credit to be arranged. Research in Psychiatry. All quarters. Students, under consultation regarding their special interests or needs, are assigned to investigators in the Department of Psychiatry, with ongoing research relevant to the student's desires and/or experience. Staff.

Psy. 700-credit to be arranged. Master's Thesis. All quarters. Staff.

RADIOLOGY

Graduate study leading to candidacy for the M.S. degree is offered in the fields of medical physics and radiation biology.

Departmental Requirements. Students planning to pursue graduate work in radiology should read carefully the section Requirements for Advanced Degrees, and Graduate School Admission Requirements.

Prerequisites. The undergraduate training of students wishing to major in radiology should include one year of biology, one year of physics, physical chemistry, and differential and integral calculus. Additional undergraduate requirements include one year of advanced physics or its equivalent, differential equations, and introductory probability theory and statistics for students wishing to study physics; and one year of advanced biology or its equivalent and organic chemistry for students wishing to study radiation biology.

Course Requirements. For students interested in medical physics, two plans of study are available. Plan I includes a thesis, certain required courses, and electives. Plan II includes required courses and electives but does not require a thesis. Only Plan I is available to students wishing to study radiation biology.

Language. The department has no tool requirement in foreign languages.

Qualifying Examination. Students must pass a written qualifying examination during the first 14 weeks of the first semester of graduate study.

Comprehensive-Final Examination. After other requirements for the master's degree are completed, each candidate must take an oral comprehensive-final examination. If the student is following Plan I, in which a thesis is required, the examination will include the thesis.

Radiol. 600-C. Clinical Experience. All semesters. Practical experience available in all areas of radiology. Students will spend six to eight weeks in the major clinical divisions, approximately 20 hours per week. An additional three to four weeks will be spent in each of several other activities. Students spend their time primarily with the physicists in the various divisions, but also will be expected to interact with clinicians and technologists during a variety of clinical procedures. Hendee and staff.


Radiol. 613-C. Basic Radiologic Physics. Fall, Spring. Structure of matter, radioactive decay, decay schemes, transient and secular equilibrium; production of radioactive nuclides; interaction of particulate radiation; production of x-rays, x-ray tubes and circuits; radiation-generating equipment; interaction of electromagnetic radiation; attenuation of x and gamma rays; radiation intensity, exposure, and dose; ionization measurements; in-air and in-phantom calibration of x-ray, gamma-ray, and electron beams; radiation quality; measurement of low- and high-energy radiation; introduction to radiation protection. Includes experiments at the TRIGA reactor and at the nuclear reactor. Hendee and staff.


Radiol. 615-C. Physics of Radiation Therapy. Fall. Interactions of x and gamma rays in tissue, backscatter, depth dose, tissue-air ratios, differential and integral doses, and operation of medical linear accelerators. Radiobiology, radiophysics, radioclinical theory, calibration of high-energy photon and electron beams, treatment planning, isodose distributions, corrections for surface obliquities and heterogeneities, wedge and tissue compensating filters, field separation, integral dose, intestinal and intracavitary implants. Hendee and Casak.

Radiol. 616-C. Physics of Medical Imaging. Fall. Conceptual approach to medical imaging, illustrating principles such as unsharpness, contrast, distortion and noise, with applications to roentgenography and nuclear medicine. Characteristics of imaging systems and the image forming process are explored in depth. Hendee, Casak, Benavie, Spitzer, and Rossi.

Radiol. 617-C. Physics of Medical Imaging. Spring. Conceptual approach to medical imaging, illustrating principles such as unsharpness, contrast, distortion and noise, with applications to ultrasound and computed tomography. Characteristics of imaging systems are explored in depth. Hendee, Benavie, Spitzer, and Rossi.

Radiol. 625-C. Radiopharmacology and Human Physiology. Summer. Human anatomy and physiology with emphasis on radiologic imaging. Radiopharmacological selection and production, properties of routine and investigational radiopharmaceuticals, and quality assurance. Fritts and staff.

Radiol. 625-C. Health Physics. Spring. Radiation units, radiation protection standards and their development, radiation dose from external sources in various configurations, shielding calculations and room design, internal radiation dosimetry, physiologic models for dose estimates, tracer kinetics and their application to dose estimates, maximum permissible exposures, health physics instrumentation, radiation safety operations, decontamination procedures. Hendee.

Radiol. 631-C. Special Topics in Radiology I. Fall. Current research topics in radiology, experimental design, recent advances in imaging methodology and therapeutic equipment; new techniques in dosimetry, quality assurance, and treatment planning; federal, state, and local regulations and guidelines; professional ethics; business practices in medical physics. Hendee, Casak, Benavie, Spitzer, and Rossi.


Radiol. 650-credit to be arranged. Research in Radiology. All semesters. Available as an elective to a limited number of students. Students must have an acceptable protocol or qualifications appropriate for participation in ongoing graduate level studies. Hendee, Casak, Rossi, Spitzer, and Benavie.

Radiol. 700-credit to be arranged. Master's Thesis. All semesters. Peer-completion of master's course work. Hendee, Carson, Casak, and Rossi.

The following course on the quarter system is being offered to nonmedical physics majors.

Radiol. 612-C. Radiosotopes in Biological Research. Spring. Radiosotope safety; dose units; dose rates from radioactive sources, working levels; regulatory and advisory agencies, federal, state, and institutional regulations, licensing procedures, properties of the atom and nucleus, radioactive decay, radioactive decay and equilibrium, production of radioactive nuclides, synthesis of radioisotopes for the production of radioactive compounds analysis, purity, stability, and availability of radioisotope compounds; counting statistics and error analysis, experimental design, quantitative counting; interactions of radiation; radiation detectors, counting systems, gamma spectroscopy, sample preparation, nonuniform and external counting, medical isotope data, aspects of radio and scintillation counting, tracer kinetics, biological distribution of radionuclides, internal absorbed dose, health physics. Hendee.
School of Journalism
Russell E. Shain, Dean

INFORMATION ABOUT THE SCHOOL
Office in Macky 229

History and Purpose

Formal instruction in journalism began at the University of Colorado, Boulder, in 1909. Journalism was made a department of the College of Arts and Sciences in 1922 and became a College of Journalism within the College of Arts and Sciences in 1937. The Board of Regents authorized a separate School of Journalism effective with the fall semester of 1962.

The School of Journalism provides a sound academic foundation for the student who plans a career in some phase of journalism or mass communication. The school offers its majors superior professional instruction with a broad education in the liberal arts. It conducts research into mass communications and provides service to the mass media, other state educational institutions (including high schools), and the public at large. The School of Journalism makes courses available to nonjournalism majors within the limits of space and equipment upon which journalism majors properly have first claim.

Career Opportunities

The school offers news-editorial, advertising, and radio-television sequences. Students in the newspapers-editorial sequence choose to major in either news or public relations. Students in radio-television elect an option in either radio-TV news or broadcast production management. Graduates find careers in newspapers, magazines, radio, television, advertising and public relations firms, science, industry and government, and in secondary and higher education. The School of Journalism assists students in career planning and job placement.

Accreditation

The School of Journalism is accredited by the American Council on Education for Journalism, specifically for the news-editorial and advertising sequences. It is a fundamental principle of the ACEJ that education for journalism be broadly based. Accordingly, undergraduate journalism students at the University of Colorado take approximately three-fourths of their college work in the arts and sciences and approximately one-fourth in journalism courses.

Accredited journalism programs, as described by the American Council on Education for Journalism, are distinguished by the following characteristics:

1. They maintain a professional curriculum with one or more special sequences, 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 services, the profession, and research.

3. They strive to serve national media as well as media of their own states.

4. They are committed to a philosophy of professional training that places strong emphasis on liberal arts studies.

5. They provide close relationships between students and teachers.

Facilities

Laboratories. Journalism students work in laboratories for reporting, editing, advertising, radio, television, and photojournalism. They have opportunities for using the Associated Press wire service, videotape cameras and recorders, video display terminals, and radio studios.

Reading Room. A reading room for journalism students contains daily and weekly newspapers for Colorado and elsewhere, professional and general magazines, and other material.

Internships. Majors in journalism are encouraged to seek internships, and the school assists in internship placement. In addition to working for the school's newspaper, the Campus Press, students intern with weekly and daily newspapers, advertising and public relations agencies, social service agencies, and radio and television stations. Students also work for the Colorado Daily and KAII, the University of Colorado radio station.

Honors

Journalism students may graduate with General Honors and/or School of Journalism Honors. Students interested in General Honors must consult the Honors Program office. The School of Journalism may award the bachelor's degree with honors to students who have a 3.25 cumulative grade-point average and a 3.5 grade-point average in journalism courses, complete an independent study in journalism involving scholar.
research effort, and demonstrate a high degree of professional skill. Application for School of Journalism honors must be made to the dean at the beginning of the student's final semester.

Scholarships and Awards

The following scholarships, loan funds, and awards are available annually to officially admitted journalism majors.

Applications must be submitted to the dean of the School of Journalism by February 15 of the year in which the scholarship is to become effective.

**Christopher Michael Burns Memorial Scholarship** ($300) to a man or woman in the advertising sequence.

**Cervi Memorial Scholarship** ($400) to a senior man or woman.

**Colorado Advertising Education Foundation Scholarship** ($300) to a man or woman student.

**Colorado Daily Scholarships** (tuition and fees). Two scholarships given to men or women students who are journalism or pre-journalism majors but not yet seniors.

**Colorado Press Women Scholarship** ($150) to a woman student.

**Denver Press Club Scholarship** (tuition and fees) to a senior man or woman from the Denver metropolitan area.

**Denver Press Club-Mile High Kennel Club** (tuition and fees) to a senior man or woman from the Denver metropolitan area.

**Denver Woman's Press Club, Frances Belford Wayne Merit Award** ($250) to a woman student.

**Dominic F. Manzanares Memorial Scholarship** ($100) to a minority and/or Colorado resident journalism major.

**Raymond B. Johnson Award** ($150) to an outstanding student.

**Journalism Faculty Scholarship** ($400).

**Michael James Edwards Memorial Scholarship—Denver Newspaper Guild** ($300).

**L. C. Paddock Memorial Scholarship** (tuition and fees) to a man or woman student.

**Raymond B. Johnson Memorial Fund** for loans to needy students.

**Blumberg Prize** ($200). Award given to outstanding graduating senior in the broadcast sequence.

**KMGH-TV Special Merit Award** ($100). Award given to outstanding broadcast major.

Student Organizations

Through an elected Student Council, students conduct a wide range of activities and assist in formation of policies of the school.

The school has chapters of the Society of Professional Journalists, Sigma Delta Chi; Women in Communication; American Advertising Federation; Public Relations Student Society of America; and Kappa Tau Alpha, honorary scholastic society in journalism.

Study Abroad Programs

The School of Journalism along with the Office of International Education urges journalism students to participate in the University's study abroad programs. Since the year of study abroad usually is undertaken during the junior year, prospective journalism majors are advised to plan early and seek counseling from the journalism faculty. Programs are offered in Costa Rica, Egypt, France, Germany, Great Britain, Israel, Italy, Mexico, Peru, Spain, and Taiwan. In addition to a journalism degree, students can earn an area studies degree in the College of Arts and Sciences during a five-year period including study abroad semesters. Information and application forms are available at the Boulder Campus Office of International Education, in the basement of the College of Environmental Design, Campus Box 123.

UNDERGRADUATE DEGREE PROGRAMS

Requirements for Admission

The undergraduate degree offered is the Bachelor of Science degree in journalism.

Students planning to major in journalism at the University of Colorado normally enroll as prejournalism freshmen in the College of Arts and Sciences or complete their freshman and sophomore years in some other collegiate institution.

University of Colorado students wishing to transfer into the School of Journalism should file an application for intramural transfer with the school early in the second semester of their sophomore year.

Students may be admitted to the school if they:

1. Complete a minimum of 60 semester hours with a grade-point average of at least 2.25.

2. Fulfill the requirements in the College of Arts and Sciences as outlined below:

   - Humanities ........................................... two 2-semester courses
   - Natural sciences ....................................... two 2-semester courses
   - Social sciences ........................................ two 2-semester courses

   These courses may or may not be sequential, according to the college list.

3. Complete both Jour. 100 and Jour. 250.

4. Establish a grade-point average of at least 2.5 in all journalism courses attempted prior to applying for transfer.

Meeting the minimum requirements, however, does not guarantee a student admission to the School of Journalism.

Prejournalism

1. Prejournalism students are enrolled in the College of Arts and Sciences until eligible to transfer into the School of Journalism, normally at the end of the sophomore year. These students must consult with advisers in the School of Journalism.

2. Prejournalism majors normally take courses that meet area requirements in the College of Arts and Sciences, listed below under Requirements for Graduation. They should also take English composition.

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. The transfer of credits in journalism is
limited to 12 semester units and is subject to approval of the dean of the School of Journalism. A proficiency examination in journalistic writing and language skills will be required of those who wish to transfer credit equivalent to Jour. 250.

Requirements for Graduation

A total of 124 semester hours with a grade-point average of not less than 2.25 overall and 2.5 in journalism courses is required for the B.S. degree in journalism. Of these 124, at least 40 must be upper division credits, 24 must be in the social sciences, and 28-34 must be in journalism. No student may take more than 34 hours of journalism in the 124 hours required for graduation. The upper limit is imposed to ensure wide exposure of journalism majors to liberal arts courses. Students who wish to develop expertise in a particular journalistic specialty are advised to take courses in science, business, political science, or the relevant area.

DOUBLE-DEGREE AND COMBINED-DEGREE PROGRAMS

Some students complete requirements in two fields and in some cases receive two degrees from the University. Such a combined program is available combining journalism and business. The student must make application for the combined program in both the School of Journalism and the College of Business and Administration. Any other such combined programs must be arranged by consulting both schools or colleges involved.

RESIDENCE REQUIREMENTS

A candidate for a degree from the School of Journalism must earn the last 30 hours in residence in the school. This may include courses taken on the campuses at Boulder, Denver, and Colorado Springs.

SENIOR REQUIREMENTS

Seniors should file a diploma card with the School of Journalism by October 1 of the academic year in which they expect to graduate. Diploma cards are available at the office of the School of Journalism.

Journalism and prejournalism majors are required to consult an adviser at each registration period. However, the student alone is ultimately responsible for the fulfillment of all degree requirements.

Journalism Sequences

Three sequences of professional study are available in the School of Journalism.

ADVERTISING SEQUENCE

The advertising sequence is designed to prepare students for careers with newspapers, magazines, radio, television, and advertising and public relations firms.

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Jour. 100, Contemporary Mass Media</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 250, Reporting</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 340, Principles of Advertising</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 345, Advertising Copy and Layout</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 346, Advertising Media</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 377, History of Journalism</td>
<td>3</td>
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</tbody>
</table>

Jour. 440, Advertising Media and Campaigns .................. 3
Jour. 443, Retail Advertising or Jour. 497, Advertising Practicum .................. 3
Jour. 490, Journalism and Public Opinion ................. 3
Journalism electives ........................................ 1-7
Mk. 300, Principles of Marketing .................. 3
Econ. 231, Principles of Economics I .................. 3
Econ. 232, Principles of Economics II .................. 3

NEWS-EDITORIAL SEQUENCE

The news-editorial sequence is designed to prepare students for positions as reporters, editors, and writers for newspapers, news services, magazines, trade and technical publications, company publications, government, and public relations.

<table>
<thead>
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<tr>
<td>Jour. 100, Contemporary Mass Media</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 250, Reporting</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 350, Reporting of Public Affairs</td>
<td>4</td>
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<tr>
<td>Jour. 355, News Editing</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 377, History of Journalism</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 450, Advanced Reporting</td>
<td>3</td>
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<tr>
<td>Jour. 465, Journalism and the Law</td>
<td>3</td>
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<tr>
<td>Jour. 490, Journalism and Public Opinion</td>
<td>3</td>
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<tr>
<td>Journalism electives ................ 3-9</td>
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Public Relations Option

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</tr>
<tr>
<td>Jour. 250, Reporting</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 350, Reporting of Public Affairs</td>
<td>4</td>
</tr>
<tr>
<td>Jour. 355, News Editing</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 377, History of Journalism</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 427, Principles of Public Relations</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 428, Public Relations Programs</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 429, Public Relations Practices</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 488, Internship</td>
<td>3</td>
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<tr>
<td>Jour. 465, Journalism and the Law</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 490, Journalism and Public Opinion</td>
<td>3</td>
</tr>
<tr>
<td>Journalism elective ................ 3</td>
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RADIO-TELEVISION SEQUENCE

Students may choose either of two options within the radio-television sequence. The news option is designed to prepare students as news directors, reporters, editors, and writers for radio or television stations. The broadcast production management option is designed to prepare students for other careers in radio-television, including positions in programming, advertising, promotion, and management.

Radio-TV News Option

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Jour. 100, Contemporary Mass Media</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 250, Reporting</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 350, Reporting of Public Affairs</td>
<td>4</td>
</tr>
<tr>
<td>Jour. 360, Radio and TV News</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 364, Principles of Broadcast Production</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 377, History of Journalism</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 462, Radio and TV News Editing</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 465, Journalism and the Law</td>
<td>3</td>
</tr>
<tr>
<td>Jour. 490, Journalism and Public Opinion</td>
<td>3</td>
</tr>
<tr>
<td>Journalism electives ................ 3-9</td>
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</tbody>
</table>

Recommended Courses

Jour. 463, Broadcast News Projects 3

School of Journalism / 187
Broadcast Production Management Option

Required Courses               Semester Hours
Jour. 100. Contemporary Mass Media              3
Jour. 250. Reporting                          3
Jour. 340. Principles of Advertising          3
Jour. 350. Radio and TV News                  3
Jour. 354. Principles of Broadcast Production  3
Jour. 377. History of Journalism              3
Jour. 484. Radio, TV Station Organization, Operation 3
Jour. 387. TV Production II or
Jour. 481. Advanced Radio Production        2-3
Jour. 490. Journalism and Public Opinion        3
Journalism electives                                         3-8

MASTER’S DEGREE PROGRAM

A Master of Arts degree in journalism is awarded after the student has demonstrated an advanced understanding of the role of the mass media in society as well as competence or potential as a journalist. Students may come into the graduate program with or without a foundation of educational or practical experience in journalism. Upon completion of the program, students may enter or return to journalism, teach, or continue graduate studies in a doctoral program.

Graduate students should read carefully Requirements for Advanced Degrees in the Graduate School section of the catalog.

Journalism courses are available as a minor in other fields of advanced study to which journalism is a logically related subject.

Requirements

Graduate students without adequate educational or practical experience in the profession may be required to take basic courses in journalism without graduate credit as prerequisites for advanced courses, or they may be asked to pass a proficiency exam in journalistic writing and language skills. Such requirements will be determined individually.

Candidates for the master’s degree in journalism pursue either of two plans, depending upon the journalistic background of the student at the time of admission. In either case, the student must present a minor of at least three courses in a supporting field. A minimum of 24 to 30 semester hours of graduate-level work is required.

Every effort is made to suit the course work, both within the journalism curriculum itself and in supporting fields, to the interests and goals of each candidate. For details about the program write the Graduate Director, School of Journalism, Campus Box 287, University of Colorado, Boulder, Colorado 80309.

ACADEMIC POLICIES

Attendance Regulations

Students are expected to attend classes regularly and to comply with the attendance regulations specified by their instructors. At the beginning of each semester, students will be informed by instructors of policies governing attendance in their classes. A student who does not attend any of the first week’s sessions of a class during a term may be dropped from the class.

Uniform Grading and Pass/Fail, Drop/Add, and Withdrawal Procedures

The University has adopted a standard policy concerning grades and pass/fail, drop/add, and withdrawal procedures. These policies are outlined in the General Information section of this catalog.

School of Journalism majors may not take any journalism course pass/fail, but nonjournalism courses required for the major may be taken pass/fail.

Students may be administratively dropped from courses for failure to attend, especially during the first two weeks of each semester.

Scholastic Suspension

Majors (students who have transferred into the School of Journalism) are subject to suspension if they do not maintain a cumulative University grade-point average of 2.25 and a cumulative journalism grade-point average of 2.5.

Scholastic records of students will be reviewed as soon as possible after the close of spring semester, and the student will be informed in writing if he is to be suspended.

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.
INFORMATION ABOUT THE LAW SCHOOL

History and Purpose

The School of Law was established in 1892. It is a charter member of the Association of American Law Schools, organized in 1901, and has been on the list of approved law schools of the American Bar Association since the first publication of such a list in 1923. Such approval is based upon high scholastic standards, a three-year program of full-time resident study, a well-qualified faculty, good library facilities, and high admission qualifications. At the University of Colorado School of Law, a relatively small student body of 450 and a favorable faculty-student ratio produce classes of a size that encourages discussion. Classes normally consist of no more than 75 students, and many are much smaller. In addition, faculty are readily available for informal conferences with individual students.

Courses are offered in a wide range of law-related subject matter (see course descriptions). Students are free to take almost all second- and third-year courses as electives after a required first-year curriculum. Special emphasis in areas of particular curricular strength at the Law School such as commercial law, natural resources, and criminal law and procedure is possible. Graduates are academically qualified to take the bar examination in all 50 states provided they, in choosing their curricula, comply with any individual requirements of states in which they intend to practice.

Affirmative Action

It is the policy of the University of Colorado School of Law not to discriminate on the basis of sex, handicap, race, color, religion, or national or ethnic origin in its educational programs, admissions policies, employment policies, financial aid, or other school-administered programs, except as provided for under affirmative action programs. See Admission Procedures. This policy is supported by federal law under Title IX of the Education Amendments of 1972, Title VI and VII of the Civil Rights Act of 1964, and section 503 and 504 of the Rehabilitation Act of 1974. Inquiries regarding compliance with these statutes may be directed to the Dean’s Office, School of Law, University of Colorado, Boulder, Colorado 80309, telephone (303) 492-8047, or to the Office of Affirmative Action, Regent Hall 207, telephone (303) 492-6706.

Law Building and Law Library

The School of Law is housed in the Fleming Law Building, located in the southeastern part of the campus. Teaching facilities include an excellent library, classrooms, seminar rooms, a complete trial and appellate courtroom, and videotape equipment. The building also contains suites for the Legal Aid and Defender Clinical Program, Natural Resources Litigation Clinic, offices for various student organizations, faculty and administrative offices, and a student lounge. The building has ample space to accommodate the student body of 450 now enrolled.

The law library contains one of the best legal reference collections in the western United States. The collection consists of approximately 140,000 volumes, including a comprehensive collection of American case law from all jurisdictions, statutes of all of the states (in annotated form when available), and the major digests, encyclopedias, periodicals, and texts dealing with American law. The English and Canadian materials are almost as complete, and there are substantial holdings in other Commonwealth materials and in international law. A collection of books in German, Japanese, and French legal materials provides a basis for comparative law studies.

Methods of Instruction

Law school classes are conducted primarily as discussions rather than by lecture. 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 the relevant materials, to speak and write effectively, and to evaluate arguments. Significant changes in the law occur frequently and knowledge of specific laws may become obsolete, but the skills to analyze, argue, and evaluate endure.

Career Opportunities and Placement

The School of Law has an active placement service. Liaison is maintained with law firms, government
agencies, courts, and businesses that seek the services of students and young lawyers.

The graduating class for the academic year 1979-80 included 154 graduates. Of the 145 who reported their employment status, 83 percent were employed and, of these, 83 percent were working in law-related areas. The largest group (53 percent) is in private practice, 19 percent are employed by government on local, state, and federal levels, 12 percent are clerking for judges, and 5 percent are in legal services programs. The remaining 11 percent are working in business, the military services, and academic areas. A beginning average salary of $18,513 was reported from the 49 law-employed graduates who submitted salary figures.

Graduates of this class have located in Alaska, California, Colorado, Florida, Idaho, Illinois, Missouri, New Mexico, New York, Oklahoma, Washington, D.C., West Virginia, and Texas.

Prelegal Preparation

The School of Law of the University of Colorado prescribes no specific prelaw curriculum. Students should pursue their interests, the offerings of their particular colleges, and their personal objectives in studying law. In general, the prelaw student should place primary emphasis on the acquisition of excellent methods of study, thought, and communication, especially writing. Obviously, these skills can be acquired in a number of different areas, and successful law students and lawyers have college majors in almost every field. College courses should be chosen with care to produce a balanced pattern of skills and insights. An undergraduate major field should be one which requires rigorous application of one's abilities.

Part-Time Employment

The study of law is essentially a full-time task. Most students devote from 60 to 70 hours a week to classroom attendance, preparation for class, and other activities directly related to their legal education, such as participation in appellate briefing and argument competition, and work in the school's Clinical Program. As a consequence, the opportunity for self-support through employment while attending law school is limited. Students are strongly advised against outside employment during the first year; however law-related employment for a limited number of hours may actually enhance the educational experience of second- and third-year students. Students should avoid committing themselves to employment of more than 15 hours per week, or to any schedule of employment which will interfere with class attendance. The Law Placement Office assists students who wish to secure law-related part-time employment. The University's Career Development and Placement Services and the Office of Student Employment Services aid those who wish to find conventional employment or work-study placement.

Special Lectures and Professorships

The Charles Inglis Thomson Trust Fund, created in 1913, enables the School of Law to bring to Colorado once a year a leading authority in a selected field of law. Recent Thomson professors have been Edward W. Cleary, professor of law, Arizona State University; Herbert Wechsler of Columbia University; David Daube, Paul J. Mishkin, and Stefan Riesenfeld, professors of law, of the University of California, Berkeley; Rudolf B. Schlesinger, formerly of Cornell University; and S.F.C. Milsom, professor of law and fellow, St. John's College, Cambridge University, England.

In 1956 the late Adrian S. Coen established a trust fund in memory of her husband, the late John R. Coen, to bring to the School of Law once each year a prominent jurist or statesman to deliver a lecture to the students and faculty of the School of Law. Lecturers in this series have included A. Leon Higginbotham Jr., United States Circuit Judge for the Third Circuit; Walter V. Schaefer, retired Supreme Court Justice, Illinois Supreme Court; Guido Calabresi, professor of law, Yale University; Richard A. Posner, professor of law, University of Chicago; Brigitte M. Bodenheimer, professor of law, University of California at Davis; Leonard Boudin, senior partner, Robinowitz, Boudin, and Standard, New York City; Rex E. Lee, dean, Brigham Young University School of Law, and former U.S. Assistant Attorney General; James B. White, professor of law, University of Chicago Law School; and Irving Younger, professor of law, Cornell University.

Numerous other leading American and international scholars, jurists, and practitioners visit the law school each year to speak to gatherings of students and faculty. This provides rich opportunities for expanding legal inquiry beyond the classroom.

Special Programs

The Legal Aid and Defender Program allows students supervised by full-time clinical faculty who are experienced trial attorneys to represent low income clients in civil and criminal cases in Colorado courts. These attorneys also supervise students working with nearby legal services and public defender programs. In addition, students enrolled in the program may represent clients through the Institute of Law and Aging which focuses upon the particular problems of the elderly.

The National Wildlife Federation's Natural Resources Clinic involves students in administrative and judicial proceedings concerning environmental problems. Students in this program work closely with clinical faculty on a range of issues, e.g., water resource and mineral development, land use, air pollution, and energy development. Although some clinic group meetings are held to discuss issues and strategy of general interest, instruction is primarily conducted on a one-to-one (faculty-to-student) basis.

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 offers students an opportunity to refine their research skills, as well as develop skills in appellate brief writing and oral argument. Students thoroughly prepare and brief
ADMISSION PROCEDURES

Requirements and Standards

The School of Law grants admission to qualified applicants who have received a baccalaureate degree from a properly accredited institution, based on at least 90 semester hours or 135 quarter hours of credit (exclusive of credit earned in nontheory courses such as hygiene, domestic arts, physical education, vocal or instrumental music, studio art and ROTC, and exclusive of work taken by correspondence).

The applicant must also show substantial intellectual promise and give evidence of high moral and ethical standards. For the fall 1980 entering class, the average grade-point was 3.4 on a 4.0 scale and the average Law School Admission Test score was 659.

While admission standards are based heavily on undergraduate grade-point average and the Law School Admission Test score, other factors are also important because they may indicate ability and motivation, and because diversity in the student body contributes to the educational process. Other factors that are considered include variation in economic, social, or cultural background; geographic diversity, variation in undergraduate or graduate program or institution; unusual employment or other experience; demonstrated and unusual quality of leadership; special achievement in overcoming personal handicaps or disadvantages; and the ability to contribute the perspectives of racial or ethnic minorities or other distinctive communities. In its efforts to offer equal opportunity for obtaining a legal education, the law school will take race affirmatively into account as an important factor in the competitive weighing of individual applications. Colorado residency is also given special consideration, since the University is a state-supported school.

Personal interviews are neither required nor encouraged. Every applicant is invited to submit a personal statement and to ask people familiar with his or her ability to write letters of recommendation in support of the application.

Beginning students are admitted in the fall semester only. Normally, students are admitted only on a full-time basis. The law school does not have an evening division of study.

The school conducts an introductory summer program for those persons admitted whose qualifications suggest that prior assistance may be particularly helpful for successful law study. In addition, tutorial assistance will be available for first-year students who desire it and whose qualifications suggest that this type of support might be beneficial.

Usually 10 to 15 second-year transfer students are accepted each year. Decisions are based heavily on law school performance, in addition to the factors considered for beginning students.

Because of the large number of applications which must be processed, the deadlines set must be strictly observed.

How and When to Apply

1. Request application blanks and instructions from the School of Law, Fleming Law Building, University of Colorado, Boulder, Colorado 80309.
2. Students must return a completed Application for Admission, an LSAT/LSDAS Law School Application Matching Form, and a nonrefundable $20 application fee by February 1. In addition, the following credentials must be completed and received by March 1 (with each item mailed directly from its source to the School of Law):

   a. An evaluation of all college and nonlaw school postgraduate work undertaken which is provided by the Law School Data Assembly Service. The evaluation must be based on not less than the equivalent of six semesters or nine quarters of regular undergraduate college work. To obtain registration forms, applicants should write directly to Law School Admissions Services, Box 2000, Newton, Pennsylvania, 18940. A registration form to utilize the service must have been received by LSDAS no later than February 1.

   b. Results of the Law School Admission Test. The test is administered by the Law School Admissions Services, Box 2000, Newton, Pennsylvania 18940, four times each year at a number of places. Applicants should take the test no later than December in the year prior to the term they expect to attend law school. For further information and arrangements contact the Law School Admissions Service.

   c. At least one letter of evaluation from a college instructor from whom a course has been taken and, if the applicant has entered into postgraduate employment, from a person having supervision over the applicant’s work. The evaluator should be someone who has had the opportunity to observe and can write about the applicant’s abilities and performance.

The applicant is responsible for arranging for submission of the above supporting documents, including materials from the Law School Data Assembly Service, and for ensuring the materials are received by the School of Law prior to established deadlines.

Because of the large number of applications which must be processed, the deadlines must be met. Late applications will be accepted, but they will be considered only after all of the timely applications. Only the strongest late applicants have any substantial chance of admission.

Transfer Students

Transfer students must meet all standards and requirements set forth above for students who have not previously attended law school.

Applicants must arrange to have sent, in addition to the above items: (1) two copies of transcripts of all law school work undertaken and (2) upon completion of all law school work, a letter from the law school dean stating that the applicant is in good standing and eligible to continue without condition.

Students who have been accepted for admission and who have attended a law school not on the approved list of the American Bar Association will receive no credit for any work completed in that law school.

Students who have previously attended other fully accredited law schools may receive advanced-standing credit for work done in such law schools in an amount and on such conditions as determined by the Office of the Dean. In no event will credit be given toward graduation for any course taken in another law school in which a grade of less than C or its equivalent has been recorded.

Confirmation

As credentials are completed, the Admissions Committee will act upon applications. In most cases notification of an initial decision (admit, hold, or deny) should be received by May 1. A number of applicants will be placed on a waiting list and may be admitted later in the year as vacancies in the entering class occur. Applicants who are accepted for admission must send a nonrefundable deposit, which will be credited toward tuition for the first semester, to the School of Law no later than the time stated (normally within two weeks) in the letter giving notice of admission.

Transcripts—Withdrawal of Admission

At least one week prior to enrolling in the School of Law, all students who have been admitted and have confirmed their admission must submit two official transcripts from each college and law school attended showing all college and postgraduate work completed. Such transcripts must show the student has received a baccalaureate degree from a properly accredited institution. These transcripts must also show any subsequent work which was undertaken whether or not the work was included in the LSDAS evaluation. If such subsequent work is not of substantially similar quality to that included in the LSDAS evaluation, or if the transcripts fail to show the student has received the required baccalaureate degree, the student’s prior admission may be withdrawn.

Summer Session

Any student who has completed at least one year in an accredited law school may register for courses offered during the summer session upon submission of a summer application form together with a letter of good standing from his or her law school. Students may register for a number of courses offered in the summer. The maximum number of credit hours to be earned during the summer session will be determined by the Dean’s Office.

The summer curriculum is designed for students with advanced standing. All courses offered in the Law School will run for the full session unless otherwise announced. A Schedule of Summer Courses with an application form may be obtained by writing to the Assistant Dean for Admissions, School of Law, University of Colorado.

GRADUATION REQUIREMENTS

The right to change the academic performance requirement, and requirements for graduation is expressly reserved to the Dean and faculty.

The Juris Doctor (J.D.) degree will be conferred on students who have satisfactorily completed the six-semester curriculum in accordance with Law School
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 prelaw courses.

The requirements for the J.D. degree are:
1. Completion of 86 semester hours of credit with a numerical average of 72 or better.
2. Completion of all required courses. These are listed under Law School 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 the last two semesters in residence at the University of Colorado School of Law. A semester in residence is earned where the student has been enrolled in and passed a minimum of 10 hours of course work.
5. Half a semester’s time and residence credit may be earned in a summer session. By enrolling in two summer sessions and taking a minimum of five hours of work in each, the student can obtain a full semester of residence credit and earn a degree one semester earlier than normal.
6. Satisfaction of any conditions imposed at the time of admission.

The Juris Doctor degree is the only degree awarded by the School of Law.

ACADEMIC POLICIES

Honor System

On the premise that academic dishonesty is incompatible with the dignity and responsibility of the legal profession, the School of Law operates under an honor code which is subscribed to by all entering students. The honor code is a system of rules administered by student officers and demands high ethical conduct, prohibiting, for example, resorting to unauthorized sources in examinations. The same code also allows students considerable individual freedom and responsibility.

Grading and Point System

Grades are recorded by the University of Colorado as A, B, C, D, or F.

The School of Law also grades on a numerical basis: $A = 90-100; B = 80-89; C = 70-79; D = 60-69; F = 50-59$.

One semester hour of credit represents one 50-minute class period per week through a semester.

In courses designated as pass/fail or pass/graded, the grade of pass is given when in the judgment of the instructor the quality and quantity of work is such that on a graded basis the work would be the equivalent of at least a C (72). If the instructor judges the work not the equivalent of a C (72), the work is assigned that letter and numerical grade between the F (50) and C (71) which the instructor determines is appropriate.

Academic Performance Requirements

Subject to certain qualifications, for which the rules of the Law School should be consulted, students with a cumulative average below 72 at the end of any session or semester are normally excluded at the end of the next semester of attendance, unless by then their cumulative average has been raised to 72.

Normal Course Load; Dropping Courses

The normal course load is about 14 or 15 hours per semester. Students may not register for more than 16 hours or fewer than 10 hours without special permission, and first-year students must obtain permission in order to register for less than a full schedule. A student who discontinues a course at any time without notifying the Office of the Dean and processing the necessary papers will receive an F (50). All first-year students must obtain the permission of the Dean’s Office prior to dropping any course.

No student shall be permitted to drop without discredit any seminar or other course with enrollment limited below the maximum at any time after enrollment for the course has reached capacity, except by approval of the Dean’s Office upon a petition showing good cause. Second- and third-year students may not be permitted to drop any seminar or course with enrollment limited below the maximum which did not reach capacity without discredit after the end of the fifth week, or any other course without discredit after the tenth week of any semester or the fourth week of the summer session, except by approval of the Dean’s Office of a petition showing good cause.

Withdrawals

Students may withdraw from the School of Law at any time up to two days before the beginning of final examinations by obtaining permission of the Dean’s Office.

Transcripts of Credit

Official transcripts of credit should be ordered from the Office of Admissions transcript section, Regent Administrative Center 125. Official transcripts are prepared only at the student’s request submitted in person or in writing. Requests for letters of certification indicating class standing, numerical averages, and attendance dates may be made in person or in writing to the Law School Registrar, Room 141.

Classification of Students

To be ranked in the second-year class, a student must have passed 28 semester hours of work; to be ranked in the third-year class, 56 hours of work.

Attendance

A student who has been absent from more than 20 percent of the total number of classes in a course will be excluded from the final examination and will not receive a passing grade in the course, unless the attendance rule is waived in advance by the instructor.

LAW SCHOOL CURRICULUM

The curriculum of the School of Law is designed to give students a thorough training in fundamental
principles of English and American law, to permit moderate specialization in areas of personal interest, and to prepare them to practice in any state or country where Anglo-American law prevails.

The first-year curriculum of contracts, torts, civil procedure, criminal law, property, legal writing, and appellate advocacy is required of all students. The second and third years are largely elective; the only required courses are constitutional law, professional responsibility, a seminar, and either practice court or trial advocacy or two semesters in the legal aid and defender program.

Students have the responsibility of planning their second- and third-year schedules so as to complete all required courses and obtain a full schedule of work in each semester.

The value of the course in semester hour credits is indicated by the figure following the identifying department number. For example, in Law 510-3, Law 510 is the identifying department number, and the -3 indicates that the course is for 3 hours of credit.

The right to change the schedule of courses and instructors is expressly reserved to the dean and faculty.

Program for the Academic Year

FIRST-YEAR STUDENTS
Law 510-3. Contracts I
Law 511-3. Contracts II
Law 515-1. Legal Writing I
Law 511-1. Appellate Court Advocacy I
Law 520-3. Civil Procedure I
Law 521-3. Civil Procedure II
Law 540-3. Torts I
Law 541-3. Torts II
Law 550-4. Criminal Law I
Law 561-4. Property I

SECOND-AND-THIRD-YEAR STUDENTS
Law 605-2. Future Interests
Law 606-3. Real Property Conveyancing and Security
Law 610-3. Agency-Partnership
Law 618-4. Commercial Transactions
Law 625-4. Corporations
Law 631-3. Water Resources
Law 633-2. Mining Law
Law 635-3. Evidence
Law 640-3. International Law
Law 650-3. Labor Law
Law 651-3. Criminal Procedure
Law 652-3. Legal Process
Law 653-3. Advanced Tax
Law 655-3. Legal Accounting
Law 660-4. Income Tax
Law 661-4. Constitutional Law I

Law 665-1. Professional Responsibility I
Law 666-3. Professional Responsibility II
Law 672-1. Legal Aid
Law 675-2. Legal Aid—Civil Practice
Law 674-2. Legal Aid—Criminal Practice
Law 683-2. Legal Aid—Evidence Presentation
Law 684-2. Legal Aid—Legal Services Project
Law 698-2. Wills and Trusts
Law 700-3. Administrative Law
Law 705-3. Conflict of Laws
Law 710-3. Domestic Relations
Law 712-3. Public Lands
Law 715-3. Federal Estate and Gift Tax
Law 718-3. Advanced Estate Planning
Law 720-4. Due Process and Equal Protection
Law 721-3. Civil and Political Rights
Law 723-3. Land Use Planning
Law 733-3. Oil and Gas
Law 734-2. Employment Discrimination
Law 735-3. Real Estate Planning
Law 737-3. American Indian Law
Law 740-1. Interviewing
Law 745-3. Securities Regulation
Law 747-3. Environmental Law
Law 760-3. Antitrust
Law 765-3. Creditors’ Remedies and Debtors’ Protection
Law 766-2. Bankruptcy
Law 767-3. International Business Transactions
Law 780-3. Local Government
Law 782-2. Trial Advocacy I
Law 786-3. Business Planning
Law 771-1 to 2. Independent Legal Research
Law 775-3. Remedies
Law 787-3. Federal Courts
Law 788-2. Natural Resources/Litigation Clinic
Law 790-1. Practice Court

SEMINARS
Law 704-2. Economic Analysis of Law
Law 708-2. Constitutional Theory
Law 710-2. Products Liability
Law 711-2. Legal History
Law 727-2. Constitutional Litigation
Law 742-2. Professional Responsibility
Law 744-2. Federal Regulations of the Trading of Securities
Law 749-2. Public Choice and Theories of Justice
Law 751-2. Law of Corrections
Law 755-2. Social Science Research and the Law
Law 776-2. Law and Medicine
Law 776-2. Law and Mental Health
Law 777-2. Labor Relations in the Public Sector
Law 779-2. Problems in Education Law
Law 782-2. Labor Arbitration
Law 784-2. Energy Development
Law 785-2. Social Legislation
Law 790-2. Natural Resources/Litigation

*These courses are required; other courses are elective.
INFORMATION ABOUT THE COLLEGE

Mission

The widely varied functions of music in the world today present many challenging and interesting opportunities in the profession as teachers, performers, creative artists, technicians, and commercial personnel. While these different pursuits require specialized emphases, the faculty of the College of Music recognizes the musical and educational experiences that are common to all. Each curriculum of the College of Music is designed, therefore, to present music as an integrated whole. Solo performance and techniques, ensemble performance, historical and theoretical studies, concert and recital opportunities, and elective courses both inside and outside the college are intended to give the student a balanced approach to musical understanding and musicianship. The faculty has assumed the responsibility of making students aware of this unity in the curriculum and will strive to point out the relevance of each part to the whole. It is the student’s responsibility to attempt to develop all the techniques and approaches presented in the curriculum. Only in this way, with the contributions of both faculty and students, can the aim of the curriculum be achieved: the development of well-trained musicians.

The faculty has set up a program of training which in the first year allows students to establish themselves and to resolve in their minds the courses of study to be pursued. After a first year of study and counseling with a principal professor, students may determine the particular area in which they are qualified and in which they may wish to work.

The College of Music was established by the Regents of the University of Colorado in 1920 and is a full institutional member of the National Association of Schools of Music.

Facilities

The Music Building and Macky Auditorium contain studios, classrooms, rehearsal rooms, and practice rooms in which students work. In Macky Auditorium the equipment includes seven practice organs, as well as a large, four-manual Austin concert organ for teaching and performance experience.

The Music Library, located in the Music Building, contains 100,000 books, scores, sound recordings, and periodicals. These include 40,000 scores, 40,000 sound recordings, 20,000 books, and 250 periodicals. Computerized listening facilities are provided for listening to recordings and studying scores. A cathode-ray terminal is available for computer-based reference searching.

The library provides a collection of scores, collected editions and complete works of composers, bibliographies, dictionaries, histories, and treatises. The record collection contains many rare music recordings for research and teaching purposes.

The total facilities of the College of Music include 86 practice rooms; 54 studios and offices, band, choral, opera, and orchestral rehearsal halls; piano and electronic laboratories; and auditoriums with seating capacities of 2,500, 500, and 200.

Concerts and Recitals

Student recitals are an integral part of the student’s life through both listening and participation. All students must attend appropriate class recitals, which are held each week.

Student Activities

The student body of the College of Music has its own organization which is directed by a student council and a faculty adviser. 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.

The College of Music is organized to provide:
1. Specialized training in music to prepare for professional work or advanced study.
2. A background in music education that will prepare the student to teach music in the schools.
3. Training in music as the basis for general cultural attainment.

The preceding pursuits are not determined by interest alone but by qualifications and demonstrated abilities to meet the problems that are concomitant with success in the chosen area of endeavor.
Students concerned with understanding other languages, particularly those in voice, should consider study abroad. The year-abroad program in Regensburg, Germany, open to students at the junior level or above, offers applied music study for all instruments and voice as well as music history and music education. Consult the Office of International Education.

Major Fields and Degrees

Specifically, the following courses of study are available to students in the College of Music:

Instruction in the undergraduate division of the College of Music leads to the Bachelor of Music degree with concentrated areas in voice, piano, harp, guitar, violin, viola, violoncello, string bass, organ, flute, oboe, clarinet, bassoon, saxophone, trumpet, French horn, trombone, baritone, tuba, theory/composition, history and literature of music, or church music.

Instruction that culminates in the Bachelor of Music Education degree leads to a field of concentration in the teaching of either general, choral, or instrumental music, or a combination of these interests.

The areas of study culminating in the degree Bachelor of Arts in Music are widely varied—American folk music, music-broadcasting, music-business, music-dance, music-history, music-journalism, music-theatre, music theory/composition, piano pedagogy, string pedagogy, voice pedagogy, wind/percussion pedagogy, elementary education, and arts management.

Qualified students may receive both the Bachelor of Music and Bachelor of Music Education degrees by taking the required extra work (approximately 30 additional hours). Intent to be admitted to candidacy for both degrees should be indicated as soon as possible, preferably in the sophomore year. Written approval of the dean of the College of Music is required.

Additional information concerning undergraduate degrees is presented in the various undergraduate curricula listed elsewhere in this catalog. Questions regarding particular details of the various curricula may be directed to the associate dean for undergraduate studies, College of Music.

An applicant for the Master of Music or Master of Music Education degree must be a graduate of a university or college of recognized standing where the requirements for graduation are substantially the same as those required by this University for the degrees Bachelor of Music or Music Education. Examinations will be given to entering students so that the student and the adviser may determine a program of future study.

The Doctor of Musical Arts degree, with a field of concentration in composition; literature and performance of choral music; instrumental conducting and literature; organ performance; performance, literature, and pedagogy of piano, voice, strings, winds, and percussion; performance, literature, and pedagogy of piano; or process of group environments is available through the Graduate School to qualified students.

The Doctor of Philosophy degree in music, with music education or musicology as a field of specialization, is available through the Graduate School to qualified students.

Additional information concerning graduate degrees is presented elsewhere in this catalog. Correspondence regarding details not included in this publication should be directed to the associate dean for graduate studies, College of Music.

Scholarships, Grants, Awards

Several scholarships are designed specifically for students in the College of Music:

- Performance Scholarships
- Carroll Maxton Butts Memorial Scholarship
- Clark/Barley Scholarships
- Berton Coffin Singing Scholarship
- Carolyn "Purry" Cook Memorial Scholarship
- Emily Edwards Memorial Scholarship
- Frances Fink Memorial Scholarship
- Wallace F. Fiske Memorial Scholarships
- Graduate Assistantships
- Honors String Quartet Scholarship
- Jessie and Albert Heary Scholarships
- Eugene Hillelges Memorial String Scholarship
- Horace Jones Violin Scholarship
- Kappa Kappa Psi Scholarship
- Shirley Mariner Memorial Scholarship
- Pacey-Roth Memorial Scholarship
- Theodore Prasser Scholarship
- Quafanyak Scholarships
- “Spitfire” Robinson Saxophone Scholarship
- Sigma Alpha Iota Scholarship
- Special Performance Scholarships for Summer
- Frank "Crick" Streeter Memorial Scholarship
- Tau Beta Sigma Scholarship
- Howard Watts Piano Scholarship

ACADEMIC POLICIES

See General Information section.

Normal Course Schedule

The normal academic load for a student in the College of Music is 16 to 19 semester hours. Schedules of fewer than 12 or more than 19 hours must have approval of the associate dean for undergraduate studies of the College of Music. (Maximum is 20 hours.)

Pass/Fail Option

Pass/fail hours are to be selected from nonmusic courses, and are in addition to those that may be taken in honors, physical education, and student teaching. Courses so elected will be taken according to the pass/fail policies of the college or school concerned.

For a College of Music major who transferred into this program of study from another University of Colorado school or college or another university the maximum number of pass/fail hours which may be applied toward graduation requirements is 1 hour in every 8 semester hours completed in this College of Music.

Attendance Regulations

Students are expected to attend classes regularly and to comply with attendance regulations as specified by instructors. Unexplained absence from three consecutive class periods must be reported to the student’s associate dean’s office by the instructor concerned. Attendance at rehearsals, concerts, and concert trips is
also expected under regulations set forth by the conductor of each organization or ensemble.

**Scholastic Requirements**

Any student who has a cumulative grade-point average below 2.0 at the end of any academic year will automatically be placed on probation for the following academic year. If, at the end of the probationary year, the cumulative grade-point average is not 2.0 or above, automatic suspension for the following academic year will result.

Any student who has a cumulative grade-point average of 1.5 or below at the end of any academic year will automatically be suspended for the following academic year. (Cumulative grade-point averages are calculated on grades earned at this University.) However, students who are on probation or who are suspended may attend the summer session to attempt to raise their grade-point averages.

Students under scholastic suspension may petition for readmission and may receive a personal hearing before the associate dean for undergraduate studies.

**Academic Ethics (Dishonesty, Cheating)**

Students are expected to conduct themselves in accordance with the highest standards of honesty and integrity. Cheating, plagiarism, illegitimate possession and disposition of examinations, alteration, forgery, or falsification of official records, and similar acts or the attempt to engage in such acts are grounds for suspension or expulsion from the University.

In particular, students are advised that plagiarism consists of any act involving the offering of the work of someone else as the student’s own. It is recommended that students consult with their instructors as to the proper preparation of reports, papers, etc., in order to avoid this and similar offenses.

**Appeals**

Students are advised that they have the right to appeal decisions of academic dishonesty and to petition for exceptions to the academic policies stated in this catalog. The appeals should be directed to the Office of the Dean.

**Dissertations, Theses, Projects, and Individual Study**

A copy of all scholarly student papers which generate credit (dissertations, theses, projects, lecture recitals, and other document-producing activities), whether undergraduate or graduate, will be placed in the Music Library. More than one copy may be required in individual degree programs. To insure that degree requirements have been met and that 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 four weeks before the graduation date.

Any recital which is required for graduation will be recorded. Arrangements will be made through the College of Music office, and a recording fee will be charged.

The original tape recording will be presented to the appropriate associate dean’s office for placement in the Music Library.

**UNDERGRADUATE DEGREE PROGRAMS**

**Requirements for Admission**

In addition to the entrance requirements of the University outlined in the General Information section, freshmen and transfer students must meet College of Music entrance requirements.

An audition and/or interview is required for all entering undergraduate music majors (Boulder and Denver campuses). Audition dates for students entering summer 1983, fall 1983-84, and spring 1983-84 will be held on the following Saturdays: February 5, February 26, and March 12, 1983. These auditions will be held only on the Boulder campus. Applicants may substitute tape recordings. Write to the College of Music, associate dean for undergraduate studies, for audition-interview applications. (Personal auditions or tape recording auditions should be approximately 10 minutes in length. The tape recording should be made at 7 1/2 ips-monomaural.)

It is expected that all students will have had previous experience in a performance area. Two years of piano training are particularly recommended. In addition, a broad general education background is advantageous. The educational objective is an educated mind and an integrated personality, together with specialized training in the field of music. Careful and intelligent planning on the high school level is an integral part of achieving this goal.

**SPECIAL PROVISIONS FOR APPLICANTS WHO DO NOT MEET SUBJECT REQUIREMENTS**

Students who are unable to meet the specified subject requirements for the College of Music may petition the dean of the college to enter with provisional standing, provided that such students offer at least three units of English and six additional units in academic fields, and provided also that the provisions of paragraphs one and two under the heading Admission Criteria in the General Information section are met by those presenting such petitions. Such factors as rank in high school graduation class, distribution of subjects, and evidences of preparation for the field of study to which admission is requested will be considered. The audition requirement is applicable.

**UNDERGRADUATE TRANSFER STUDENTS**

Undergraduate transfer students must meet the requirements of the University. Further, resident students who have taken course work only through the Center for Lifelong Learning must have a 2.0 (C) grade-point average in such work before being eligible to apply for admission to the College of Music. Nonresident students must have a 2.5 grade-point average. See Audition Requirement.

**SPECIAL STUDENTS**

A special student may not enroll for applied music (private instruction) without permission of the dean.
Permission will not be granted unless a student intends to become a degree student the next semester.

A special student may take any other class with written permission of the instructor concerned. In addition, see Audition Requirement.

Requirements for Graduation

The degrees Bachelor of Music, Bachelor of Music Education, and Bachelor of Arts in Music 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 application form by May 1 in the office of the associate dean for undergraduate studies (Music C-103) if they anticipate completing requirements in December, May, or August of the following academic year.

RESIDENCE REQUIREMENT

Of the hours required for graduation, 56 must be completed in residence in this College of Music. This may be reduced by the faculty because of excellent work done in this University and because of 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 8 hours for the degree Bachelor of Arts in Music.

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.

MUSIC HISTORY MINOR

The music history minor is open to students in Bachelor of Music and Bachelor of Music Education degree programs except the history curriculum. It should be elected by the student, in consultation with the major adviser, by the beginning of his sophomore year. The minimum is as follows:

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Introduction to Music (Mus. 180-181)</td>
<td>6</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>History of Music (Mus. 280-281)</td>
<td>6</td>
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</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>History area courses</td>
<td>4</td>
</tr>
</tbody>
</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>History area courses</td>
<td>3</td>
</tr>
</tbody>
</table>

**Bachelor of Music Degree**

The curriculum leading to the Bachelor of Music degree is a professional training course with concentration upon artistic and/or intellectual performance. One of the following concentration areas may be selected:

- voice, piano, organ or church music, string instruments, wind and percussion instruments, theory/composition, or history and literature. Performance concentration area students will devote a large portion of their time to developing the vocal or instrumental field of their choice. Adequate courses in music theory and electives in academic subjects give an excellent theoretical and cultural background.

It is presumed that the student will have had basic preparation in a principal field of study before entering the University. A singer should be able to sing some standard songs in English, on pitch, with good phrasing and musical intelligence. Knowledge of the rudiments of music and an ability to read simple music at sight are expected. Elementary piano study is recommended. Instrumentalists should possess a well-grounded technique sufficient to play music of moderate difficulty. Students with a major in history and literature, or theory, should have a good working knowledge in a performance field.

Alternative concentration areas are available as follows upon recommendation of the adviser and faculty unit chairman concerned.

In piano and string instruments, pedagogy may be recommended as a concentration area. Public performance must be of an acceptable standard. There must be several appearances in student recitals as well as one solo recital, a comprehensive knowledge of the particular literature, and two semesters of supervised studio teaching.

A concentration area in the field of church music is available for those qualified. No solo recital will be required. A thorough training in the field of service playing and choir training, with some practical experience in various aspects of church music, must be demonstrated.

COURSES AND CURRICULA

The curriculum for the concentration area in performance consists of a four-year program with an emphasis in performance (voice, piano, organ, string instruments, wind, and percussion instruments). A minor area of performance also is required. All students are required to study their principal instrument as long as they are enrolled in the college unless permission for exception is granted by the associate dean for undergraduate studies, the adviser, and the chairman of the faculty unit concerned.

Electives provide enough flexibility to suit individual needs. The student is encouraged to take as many of these hours as possible in liberal arts. A student and adviser may decide together on these areas of study.

A minimum of 244 credit points (with a C overall grade-point average) and 122 semester hours (usually this number is exceeded) must be earned for the Bachelor of Music degree. Of these hours at least 28 must be in the nonmusic academic fields and 32 in the principal field. In the secondary performance field four semesters of study are required.

This degree places a premium upon high musical attainment, scholarship, and either interpretative or creative ability of a high order.

Performance in organizations (orchestra, band, choir) is expected of all undergraduates. Five or six
semester hours of credit in chamber music, as defined by each faculty unit, is a requirement toward this degree. Specific requirements in this regard are controlled as part of the degree plan in each principal field and are further subject to the adviser's judgment in the best interest of the individual student. Undergraduate music students are required to attend a literature-concentric class in their respective areas and are held responsible for checking with their advisers regarding these meetings.

**History and Literature Concentration Area**

Students who wish to have a concentration area in history and literature must have the approval of the chairman of the faculty unit. This area should be declared and approved not later than the junior year, and preferably by the sophomore year.

Students in this area must demonstrate proficiency in at least one facet of performance: voice, keyboard, symphonic, or early instruments. The student should also be able to use the keyboard as a tool in historical study. The history and literature thesis must meet an approved standard of endeavor; two copies must be satisfactorily bound and presented for permanent filing with the College of Music associate dean for undergraduate studies.

The courses outlined below are required at the discretion of the adviser. It is recommended that electives taken during the junior and senior years be distributed as follows: liberal arts, 20 semester hours; music, 8 semester hours.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 162. Private piano instruction (and literature class)</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 100, 101. Theory I</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 102, 103. Theory and Ear Training Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 180. Introduction to Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 181, or 276, or 278, or 277</td>
<td>3</td>
</tr>
<tr>
<td>English elective</td>
<td>1</td>
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<tr>
<td>Foreign language</td>
<td>1</td>
</tr>
<tr>
<td>Ensemble</td>
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</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
<td>3</td>
</tr>
</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 262. Private piano instruction</td>
<td>4</td>
</tr>
<tr>
<td>Hist. 101, 102. History of Western Civilization</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 200. Theory II</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 202. Theory and Ear Training Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 280, 281. History of Music</td>
<td>6</td>
</tr>
<tr>
<td>Foreign language</td>
<td>6</td>
</tr>
<tr>
<td>Elective in theory</td>
<td>2</td>
</tr>
<tr>
<td>Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>Elective in liberal arts and/or music</td>
<td>3</td>
</tr>
</tbody>
</table>

**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 362. Private piano instruction</td>
<td>4</td>
</tr>
<tr>
<td>Period and topical courses in music history (400-level)</td>
<td>8</td>
</tr>
<tr>
<td>Mus. 401, 402. Counterpoint</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 480, Special Studies</td>
<td>2</td>
</tr>
<tr>
<td>Ensemble</td>
<td>2</td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
<td>11</td>
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</table>

**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 462. Private piano instruction</td>
<td>4</td>
</tr>
<tr>
<td>Period and topical courses in music history (400-level)</td>
<td>8</td>
</tr>
<tr>
<td>Mus. 405, 407. Analysis I, II</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 497. History and Literature Thesis</td>
<td>4</td>
</tr>
<tr>
<td>Ensemble</td>
<td>2</td>
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<tr>
<td>Electives in liberal arts and/or music</td>
<td>13</td>
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</tbody>
</table>

**Organ or Church Music Concentration Area**

The following schedule is a basic plan that may be altered to suit individual needs. The organ-performance concentration area may be elected by students of above average ability in performance. Concentration will be mainly on concert literature, and a graduation recital will be accepted in lieu of a thesis. The concentration areas of church music/organ or church music/voices will be awarded to students particularly interested in these fields. The major concentration will be on church music repertoire and the development of an appreciation of the finest in the field of sacred music. Courses such as history of religion, educational psychology, philosophy, and English literature, which are designed to strengthen the knowledge of aesthetic values and develop the ability to work with people, may be taken as electives.

At the beginning of the senior year, all organ students should be able to transpose at least a major second up or down, play from open vocal score, improvise in simple forms, and accompany selected cantatas, e.g., Effinger's *The St. Luke Christmas Story* and Bach's *Christ lag in Todesbanden*. Graduation will not be permitted until such skills have been creditably demonstrated. (Specific yearly requirements may be obtained from the Organ and Church Music Unit.)

All students will be given a minimum reading study list throughout the course, and students in church music will be required to complete a thesis in the senior year. The thesis requirement will be interpreted freely at the discretion of the major professor. It may consist of several minor research projects, choral arrangements, composition projects or the preparation and production of a short cantata.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 160. Private organ instruction (and literature class)</td>
<td>8</td>
</tr>
<tr>
<td>P.Mus. 131. Choir</td>
<td>2</td>
</tr>
<tr>
<td>Class minor in performance</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 100, 101. Theory I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 102, 103. Theory and Ear Training Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 180. Introduction to Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 181, or 276, or 278, or 277</td>
<td>3</td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
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**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>P.Mus. 260. Private organ instruction (and literature class)</td>
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</tr>
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<td>P.Mus. 131. Choir</td>
<td>2</td>
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<tr>
<td>Class minor in performance</td>
<td>2</td>
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<tr>
<td>Mus. 200. Theory II</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 302. Theory and Ear Training Laboratory II</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 307. Instrumentation</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 226. Service Playing Techniques</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 317. Conducting I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 401, 402. Counterpoint</td>
<td>4</td>
</tr>
<tr>
<td>Elective in theory</td>
<td>4</td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 360. Private organ instruction (and literature class)</td>
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<tr>
<td>P.Mus. 331. Choir</td>
<td>2</td>
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<tr>
<td>Mus. 336, 327. Improvisation</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 370, 381. History of Music (see History Minor)</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 332. Senior Recital (performance majors)</td>
<td>0</td>
</tr>
<tr>
<td>Mus. 435, 439. Organ Survey</td>
<td>6</td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
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</table>
### Senior Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 460</td>
<td>Private organ instruction (and literature class)</td>
<td>8</td>
</tr>
<tr>
<td>P.Mus. 331</td>
<td>Choir</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 424</td>
<td>Church Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 496</td>
<td>Thesis (church music majors)</td>
<td>2 or 4</td>
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<tr>
<td>Mus. 499</td>
<td>Recital (performance major)</td>
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<tr>
<td>Electives in liberal arts and/or music</td>
<td>17</td>
<td></td>
</tr>
</tbody>
</table>

### Piano Pedagogy Concentration Area

All pedagogy students will present a half recital during the junior and senior years.

Additional details concerning minimum standards of periodic comprehensive examinations may be received upon request from the College of Music.

The freshman and sophomore requirements are the same as for the performance concentration area in piano.

### Junior Year

<table>
<thead>
<tr>
<th>Semester Hours</th>
<th>Course Code</th>
<th>Course Title</th>
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</thead>
<tbody>
<tr>
<td>8</td>
<td>P.Mus. 362</td>
<td>Private piano instruction (and literature class)</td>
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<tr>
<td>2</td>
<td>Mus. 317</td>
<td>Conducting</td>
</tr>
<tr>
<td>5</td>
<td>Mus. 334, 335</td>
<td>Piano Pedagogy II</td>
</tr>
<tr>
<td>6</td>
<td>Mus. 380, 381</td>
<td>History of Music (see History Minor)</td>
</tr>
<tr>
<td>2</td>
<td>Mus. 399</td>
<td>Recital</td>
</tr>
<tr>
<td>2</td>
<td>Band, orchestra, or choir</td>
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</tr>
<tr>
<td>2</td>
<td>Chamber music</td>
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</tr>
<tr>
<td>8-13</td>
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### Senior Year

<table>
<thead>
<tr>
<th>Semester Hours</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>P.Mus. 462</td>
<td>Private piano instruction (and literature class)</td>
</tr>
<tr>
<td>2</td>
<td>Mus. 406, 407</td>
<td>Analysis I, II</td>
</tr>
<tr>
<td>2</td>
<td>Mus. 422</td>
<td>Piano Literature</td>
</tr>
<tr>
<td>5</td>
<td>Mus. 434, 435</td>
<td>Piano Pedagogy III</td>
</tr>
<tr>
<td>0</td>
<td>Mus. 496</td>
<td>Half recital</td>
</tr>
<tr>
<td>1</td>
<td>Band, orchestra, choir, or ensemble</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Chamber music</td>
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</tr>
<tr>
<td>12-16</td>
<td>Electives in liberal arts and/or music</td>
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</tr>
</tbody>
</table>

### Piano Performance Concentration Area

The student will submit a repertoire list at the end of each year of study. Minimum requirements in content and extent of standard and contemporary piano works will be checked from these lists. In the first two years of study, minimum performance requirements will be examined at the end of the second semester of each year of study. During the junior year, the student's repertoire examination will be a half recital, presented before a faculty committee three weeks in advance of the performance date. A full public recital is required the senior year.

Additional work in piano will be required of the individual student whenever the results of these examinations fall below the minimum standards. Additional details concerning minimum standards may be had upon request from the chairman of the keyboard faculty.

### Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 162</td>
<td>Private piano instruction (and literature class)</td>
<td>8</td>
</tr>
<tr>
<td>Class minor in performance</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Mus. 200</td>
<td>Theory I</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 202, 203</td>
<td>Theory and Ear Training Laboratory I</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 235</td>
<td>Piano Pedagogy I</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 236</td>
<td>Piano Accompanying</td>
<td>2</td>
</tr>
<tr>
<td>Phil. 115</td>
<td>Ethics</td>
<td>3</td>
</tr>
<tr>
<td>Phil. 140</td>
<td>Formal Logic</td>
<td>3</td>
</tr>
<tr>
<td>Elective with adviser's recommendation</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Chamber music</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
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<td></td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
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### Junior Year

<table>
<thead>
<tr>
<th>Semester Hours</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>P.Mus. 362</td>
<td>Private piano instruction (and literature class)</td>
</tr>
<tr>
<td>2</td>
<td>Mus. 317</td>
<td>Conducting</td>
</tr>
<tr>
<td>6</td>
<td>Mus. 380, 381</td>
<td>History of Music (see History Minor)</td>
</tr>
<tr>
<td>0</td>
<td>Mus. 399</td>
<td>Recital</td>
</tr>
<tr>
<td>2</td>
<td>Band, orchestra, or choir</td>
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</tr>
<tr>
<td>2</td>
<td>Chamber music</td>
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<tr>
<td>14-18</td>
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### Senior Year

<table>
<thead>
<tr>
<th>Semester Hours</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>P.Mus. 462</td>
<td>Private piano instruction (and literature class)</td>
</tr>
<tr>
<td>2</td>
<td>Mus. 422</td>
<td>Piano Literature</td>
</tr>
<tr>
<td>2</td>
<td>Mus. 406</td>
<td>Analysis I, II</td>
</tr>
<tr>
<td>1</td>
<td>Band, orchestra, choir, or ensemble</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Chamber music</td>
<td></td>
</tr>
<tr>
<td>1</td>
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</tr>
<tr>
<td>10-20</td>
<td>Electives in liberal arts and/or music</td>
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</tr>
</tbody>
</table>

### String Performance Concentration Area: Guitar, Harp, String Bass, Viola, Violin, and Violoncello

Study in the string instruments is designed to build a secure technical foundation upon which the most artistic accomplishment can be established. To this end progressive proficiency in the scales and standard studies is expected, along with the preparation of such works from the concert repertoire as fall within the ability of the student.

String students, except for guitar, are required to audition for the University Symphony Orchestra and the University Chamber Orchestra. (Membership in the University orchestras will be determined by the conductor concerned.)

A full solo recital must be presented publicly during the senior year.

### Freshman Year

<table>
<thead>
<tr>
<th>Semester Hours</th>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>P.Mus. 162</td>
<td>Private piano instruction (and literature class)</td>
</tr>
<tr>
<td>Class minor in performance</td>
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</tr>
<tr>
<td>Mus. 100, 101</td>
<td>Theory I</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 102, 103</td>
<td>Theory and Ear Training Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 150</td>
<td>Introduction to Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 181, 276, 276, or 277</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>P.Mus. 332</td>
<td>Orchestra</td>
<td>2</td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

### Sophomore Year

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 162</td>
<td>Private piano instruction (and literature class)</td>
<td>8</td>
</tr>
<tr>
<td>Class minor in performance</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Mus. 200</td>
<td>Theory II</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 202, 203</td>
<td>Theory and Ear Training Laboratory II</td>
<td>1</td>
</tr>
</tbody>
</table>

### Notes

1 Chamber music is defined to include participation in activities such as performance or ensemble work on any instrument in an appropriate combination with majors, participants in Ensembles, serving on a committee with University Chamber Orchestras or other appropriate ensemble. Assignment to a one-meet-per-week laboratory is at the instructor's discretion.
Theory/Composition Concentration Area

Approval for the concentration area in theory/composition is based on (1) evidence of aptitude in composition or of exceptional aptitude in practical arrangement, (2) an acceptable level of keyboard proficiency, and (3) probable success in the teaching of theory.

The thesis for theory/composition students is subject to approval by the major advisor and may be in the area of original composition, arranging, research in theory or theory pedagogy, or a combination of these endeavors.

All theory/composition students must register for piano until a requirement of five levels of testing has been passed. These examinations will be given at the end of each semester by the piano and theory/composition faculties. They cover proficiency in technique, repertoire, sight reading, score reading, figured bass, transposition, and harmonic progressions. This requirement presumes some prior keyboard experience.

Proficiency in performance is expected of theory/composition students. Preferably, there should be high attainment in at least one instrument or in voice. Considerable experience in performance areas other than the principal instrument is also expected.

The student's work is reviewed periodically by the theory/composition faculty unit with appropriate recommendations as to continuance in the program.

**Freshman Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus 162</td>
<td>6</td>
</tr>
<tr>
<td>Class minor in performance</td>
<td>2</td>
</tr>
<tr>
<td>Mus 100, 101, Theory</td>
<td>6</td>
</tr>
<tr>
<td>Mus 102, 103, theory and Ear Training Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>Mus 121, Composition Seminar</td>
<td>2</td>
</tr>
<tr>
<td>Mus 153, Composition</td>
<td>6</td>
</tr>
<tr>
<td>Mus 180, Introduction to Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus 181, or 276, or 277</td>
<td>2</td>
</tr>
<tr>
<td>Orchestra, band or choir</td>
<td>2</td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
<td>3</td>
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</tbody>
</table>

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus 262</td>
<td>6</td>
</tr>
<tr>
<td>Theory II</td>
<td>3</td>
</tr>
<tr>
<td>Mus 202, Theory and Ear Training Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>Mus 207, Instrumentation</td>
<td>2</td>
</tr>
<tr>
<td>Mus 221, Composition Seminar</td>
<td>3</td>
</tr>
<tr>
<td>Mus 253, Composition</td>
<td>3</td>
</tr>
<tr>
<td>Mus 401, 402, Counterpoint</td>
<td>2</td>
</tr>
<tr>
<td>Orchestra, band, or choir</td>
<td>2</td>
</tr>
<tr>
<td>Electives in liberal arts and/or music</td>
<td>6</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus 362</td>
<td>6</td>
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<tr>
<td>Private instruction</td>
<td>6</td>
</tr>
<tr>
<td>(and literature class)</td>
<td>6</td>
</tr>
<tr>
<td>Mus 321, Composition Seminar</td>
<td>2</td>
</tr>
<tr>
<td>Mus 352, Composition</td>
<td>6</td>
</tr>
<tr>
<td>Mus 380, 381, History of Music (see History Minor)</td>
<td>6</td>
</tr>
<tr>
<td>Mus 400, Contemporary Theory</td>
<td>3</td>
</tr>
<tr>
<td>Orchestra, band, or choir</td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mus 404, Orchestra</td>
<td>2</td>
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<tr>
<td>Mus 406, 407, Analysis I</td>
<td>4</td>
</tr>
<tr>
<td>Mus 421, Composition Seminar</td>
<td>2</td>
</tr>
<tr>
<td>Mus 452, Composition</td>
<td>6</td>
</tr>
<tr>
<td>Mus 498, Theory Thesis</td>
<td>6</td>
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<tr>
<td>Orchestra, band, or choir</td>
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</tr>
<tr>
<td>Electives in liberal arts</td>
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<tr>
<td>Electives in music</td>
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</tbody>
</table>

Voice Performance Concentration Area

Proficiency in the fundamentals of voice production, i.e., breath, vowel formation, intonation, resonance, and diction, is continually stressed in the four years of study. A repertoire that will eventually include representation in all areas of vocal literature is progressively built. Specific attention is given to the art song, including contemporary composition, the opera, and the oratorio.

The student must meet minimum standards at the end of the freshman year and in the comprehensive examination at the end of the sophomore year. Additional work will be required of the student if the minimum standards are not met. Minimum standards will be judged in performance by the voice faculty; progressive technical proficiency is expected.

A half recital will be required in the junior year and a full public recital in the senior year. Students, in their graduation recitals, must demonstrate ability to perform a program of artistic merit in public. Previews of voice recitals must be given before the voice faculty four to six weeks before the final performance.

Transfer students working toward the Bachelor of Music degree in voice shall audition for a proficiency rating prior to their first registration at this University. The student should present a list of learned repertoire including six songs from which the voice faculty will choose auditioning numbers.

Students pursuing the bachelor's degree in vocal performance are required to take three years of language study. High school language study may be counted toward these three years but must be validated by taking a second semester of that language at the University of Colorado. Languages may not be taken on a pass/fail basis.

The language requirement may be satisfied in one of two ways:
1. One year each of three languages.
2. Two years of one language and one year of a second language.

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1Chamber music is defined to include participation in activities such as performance or study of art song and other appropriate literature with strings, participation in New Music Ensemble, serving as a member of University Chamber Orchestra, or other appropriate ensembles. Assignments to a one-time per-week laboratory is at the instructor's discretion.

2Chamber music is understood to include New Music Ensemble and other vocal chamber and ensemble groups including University Chamber Orchestra. Assignments to a one-time per-week laboratory is at the instructor's discretion, with the advisor.
### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 170, Private voice instruction (and literature class)</td>
<td>8</td>
</tr>
<tr>
<td>P.Mus. 131, Choir</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 100, 101, Theory I</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 102, 103, Theory and Ear Training Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 130, Keyboard Musicianship</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 144, Italian Diction and repertoire</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 145, English Diction and Repertoire</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 180, Introduction to Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 181, or 276, or 276, or 277</td>
<td>3</td>
</tr>
<tr>
<td>Electives in liberal arts</td>
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### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>P.Mus. 270, Private voice instruction (and literature class)</td>
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<td>P.Mus. 131, Choir</td>
<td>2</td>
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<tr>
<td>Mus. 200, Theory II</td>
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</tr>
<tr>
<td>Mus. 202, Theory and Ear Training Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 210, Keyboard Musicianship</td>
<td>2</td>
</tr>
<tr>
<td>Foreign language</td>
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</tr>
<tr>
<td>Elective in theory</td>
<td>2</td>
</tr>
<tr>
<td>Elective in liberal arts or music</td>
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### Junior Year

<table>
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<th>Course</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>P.Mus. 370, Private voice instruction (and literature class)</td>
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</tr>
<tr>
<td>P.Mus. 331, Choir</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 317, Choral Literature and Conducting</td>
<td>2</td>
</tr>
<tr>
<td>Foreign language</td>
<td>10</td>
</tr>
<tr>
<td>Mus. 344, German Diction and Repertoire</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 346, French Diction and Repertoire</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 380, 381, History of Music (see History Minor)</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 395, Junior Recital</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 442, Opera Theatre</td>
<td>4</td>
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</table>

### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>P.Mus. 470, Private voice instruction (and literature class)</td>
<td>8</td>
</tr>
<tr>
<td>P.Mus. 331, Choir</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 444, Opera Practicum</td>
<td>1</td>
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<tr>
<td>Mus. 447, History of the Opera</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 495, Recital</td>
<td>0</td>
</tr>
<tr>
<td>Electives in liberal arts or music</td>
<td>4</td>
</tr>
</tbody>
</table>

### Voice Theatre Concentration Area

Proficiency in the fundamentals of voice production (breath, vowel formation, intonation, resonance, and diction) is stressed in the four years of study. General instruction in basic theatre arts is also provided to enable the student to become a better singing actor. The student must meet minimum standards in voice at the end of the freshman year and in a comprehensive examination at the end of the sophomore year.

Minimum standards in performance will be judged at the end of each semester by the voice faculty; progressive proficiency is expected. The student must demonstrate in the senior year ability to perform in an artistic manner. A senior project (senior recital, major role, direction, or design of a major show) worked out in consultation with the major adviser and approved by the voice and theatre faculties must be presented publicly during the senior year.

### Wind/Percussion Instruments Performance Concentration Area

Progressive technical proficiency is expected; and minimum standards in major and minor scales and chords, studies, and solo repertoire are to be met. The student must meet minimum standards at the end of the freshman year and in the comprehensive examination (including a jury recital) at the end of the sophomore year. Additional work will be required of the student if minimum standards are not met.

A half recital will be required in the junior year and a public full recital in the senior year. The student's graduation recital must demonstrate the ability to perform satisfactorily a program of artistic merit in public. Previews of these recitals must be passed before an instrumental faculty unit committee four to six weeks before the final performance.

All wind and percussion majors in performance are required to participate in an orchestra and/or a band, upon consultation with adviser.

### Freshman Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private wind/percussion instruction (and literature class)</td>
<td>8</td>
</tr>
<tr>
<td>Band or orchestra</td>
<td>2</td>
</tr>
<tr>
<td>Class minor in performance</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 100, 101, Theory I</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 102, 103, Theory and Ear Training Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 110, Keyboard Musicianship</td>
<td>2</td>
</tr>
</tbody>
</table>
Performing organization or chamber ensemble .......................... 2
Mus. 317. Conducting ................................................. 3
Mus. 380, 381. History of Music (see History Minor) ............... 6
Mus. 391. Junior Recital ............................................. 0
Electives in liberal arts and/or music .................................. 11

Senior Year
P.Mus. 457. Private guitar instruction
(and literature class) ............................................. 8
Performing organization or chamber ensemble ......................... 2
Mus. 486. Analysis I .................................................. 2
Mus. 489. Senior Recital ............................................ 0
Electives in liberal arts and/or music .................................. 14

Bachelor of Music Education Degree

The program leading to the Bachelor of Music Education degree is designed to provide superior preparation for the teaching of music in the 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, choral, band, or orchestral work, some may be called upon in their first professional positions to teach in two, or even 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.

Because it is important that the prospective teacher be a competent performer, provision has been made for extensive performance study. Normally, candidates will study their principal instrument (or voice) for seven semesters. Satisfactory proficiency must be demonstrated at the end of each year of study by passing a special examination.

COURSES AND CURRICULA

Three basic curricula are provided for the candidate pursuing the Bachelor of Music Education degree: choral emphasis, general music emphasis, and instrumental emphasis. Within each basic curriculum, options are provided so that students may vary their programs in accordance with their needs and interests.

A minimum of 134 semester hours with an overall grade average of C must be earned for the Bachelor of Music Education degree. Forty semester hours in liberal arts are required.

Performance in organizations (orchestra, band, choir) is required of all music education undergraduates for seven semesters.

Undergraduate music students are required to attend a literature-performance class in their respective applied areas and are held responsible for checking with their private teachers regarding these meetings.

LIBERAL ARTS REQUIREMENTS

All students entering the music education program, whether freshmen, transfers, or those holding a degree, ..
shall meet the following requirements in order to receive a degree and/or a recommendation for teacher certification.

Semester Hours

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>English composition</td>
<td>3</td>
</tr>
<tr>
<td>Humanities</td>
<td>6</td>
</tr>
<tr>
<td>Social sciences</td>
<td>6</td>
</tr>
<tr>
<td>Natural sciences</td>
<td>6</td>
</tr>
<tr>
<td>Electives</td>
<td>19</td>
</tr>
<tr>
<td><strong>Total Required</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

In each of the humanities, social sciences, and sciences, one two-semester course combination shall be required within the prescription of the current College List of the College of Arts and Sciences. If any course combination exceeds the minimum requirement of 6 semester hours, the required hours of electives may be reduced appropriately. An elective may be any course outside of music and education. However, the following courses, which are a part of the required curriculum, may be counted toward meeting the elective requirement as well as fulfilling requirements in music and education.

Semester Hours

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mus. 180, 181. Introduction to Music</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 380, 381. History of Music</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 311. Introduction to the Arts</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 411. Reading and Writing in the Content Areas</td>
<td>3</td>
</tr>
<tr>
<td>Comm. 220. Principles of Communication I</td>
<td>2</td>
</tr>
</tbody>
</table>

**ADMISSION TO TEACHER EDUCATION**

Teacher education is a campus-wide 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 chairman of the music education faculty for admission to this program no later than the second semester of the junior year. **Students may not take courses T.Ed. 412 and student teaching until they are admitted to the Teacher Education Program.**

Requirements for admission to the Teacher Education Program are:

1. A minimum grade-point average of 2.5.
2. Satisfactory completion of the first four semesters of course work as prescribed in a music education curriculum.
3. Satisfactory functional piano ability as demonstrated by passing the proficiency examination or completion of prescribed course work.
4. Satisfactory performance ability as demonstrated by meeting the sophomore proficiency requirements in a private applied area of study.
5. 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 recommendation for admission to the Teacher Education Program.

**STUDENT TEACHING**

Students wishing to receive student teaching assignments must make application to the School of Educa-

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**Choral Music Emphasis**

<table>
<thead>
<tr>
<th>Freshman Year</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private instruction (and literature class)</td>
<td>6</td>
</tr>
<tr>
<td>Class minor in performance¹</td>
<td>6</td>
</tr>
<tr>
<td>Performance organization²</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 100, 101. Theory I</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 102, 103. Theory and Ear Training Laboratory I</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 180, 181. Introduction to Music</td>
<td>12</td>
</tr>
<tr>
<td>Liberal arts³</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sophomore Year</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private instruction (and literature class)</td>
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<tr>
<td>Performance organization²</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 200. Theory I</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 202. Theory and Ear Training Laboratory II</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 210. The Public School Music Curriculum</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 311. Introduction to the Arts</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 380, 381. History of Music</td>
<td>6</td>
</tr>
<tr>
<td>T.Ed. 410. Foundations of American Education</td>
<td>3</td>
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<tr>
<td>Liberal arts³</td>
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<table>
<thead>
<tr>
<th>Junior Year</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>Private instruction (and literature class)</td>
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</tr>
<tr>
<td>Performance organization²</td>
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</tr>
<tr>
<td>Teaching Brass Instruments, Teaching Stringed Instruments, or Teaching Woodwind Instruments</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 217. Laboratory Choir</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 317, 318. Conducting I, II</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 412. Teaching choral Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 416. Introduction to Student Teaching</td>
<td>1</td>
</tr>
<tr>
<td>Instrumental or general music minor</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 411. Educational Psychology and Adolescent Development</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 412. Principles and Methods of Secondary Education</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 441. Reading and Writing in the Content Areas</td>
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</tr>
<tr>
<td>T.Ed. 446. Teaching the Learning Disabled</td>
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<tr>
<td>Comm. 220. Principles of Communication I</td>
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<table>
<thead>
<tr>
<th>Senior Year</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private instruction (and literature class)</td>
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<tr>
<td>Performance organization²</td>
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</tr>
<tr>
<td>Theory elective</td>
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</tbody>
</table>

¹May be used to meet minor or required and/or piano proficiency.
²A maximum of 4 semester hours must be earned in a choir.
³See the requirements in liberal arts.
### Instrumental or general music minor

- Mus. 411, Student Teaching Seminar: 3
- Mus. 417, Student Teaching Practicum-elementary: 3
- Mus. 418, Student Teaching Practicum-secondary: 3
- T.Ed. 470, 471, Student Teaching: 6
- Liberal arts: 4
- Free electives: 4

### General Music Emphasis

#### Freshman Year

<table>
<thead>
<tr>
<th>Course:</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private instruction (and literature class):</td>
<td>6</td>
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<tr>
<td>Class minor in performance:</td>
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</tr>
<tr>
<td>Performance organization:</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 100, 101, Theory I:</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 102, 103, Theory II and Ear Training Laboratory:</td>
<td>8</td>
</tr>
<tr>
<td>Mus. 180, 181, Introduction to Music:</td>
<td>8</td>
</tr>
<tr>
<td>Liberal arts:</td>
<td>12</td>
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</table>

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course:</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private instruction (and literature class):</td>
<td>6</td>
</tr>
<tr>
<td>Performance organization:</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 202, Theory II:</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 210, The Public School Music Curriculum:</td>
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</tr>
<tr>
<td>Mus. 311, Introduction to the Arts:</td>
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<tr>
<td>Mus. 330, 331, History of Music:</td>
<td>6</td>
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<tr>
<td>T.Ed. 410, Foundations of American Education:</td>
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<td>Liberal arts:</td>
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#### Junior Year

<table>
<thead>
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</tr>
<tr>
<td>Performance organization:</td>
<td>2</td>
</tr>
<tr>
<td>Teaching Woodwind Instruments, Teaching Brass Instruments, or Teaching Stringed Instruments:</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 217, Laboratory Choir:</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 313, Classroom Instrument Laboratory:</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 317, 318, Conducting I, II:</td>
<td>4</td>
</tr>
<tr>
<td>Mus. 410, Teaching General Music:</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 415, Percussion Class and Pedagogy:</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 416, Introduction to Student Teaching:</td>
<td>1</td>
</tr>
<tr>
<td>T.Ed. 411, Educational Psychology and Adolescent Development:</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 412, Principles and Methods of Secondary Education:</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 413, Reading and Writing in the Content Areas:</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 414, Teaching the Learning Disabled:</td>
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#### Senior Year

<table>
<thead>
<tr>
<th>Course:</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private instruction (and literature class):</td>
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<tr>
<td>Performance organization:</td>
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</tr>
<tr>
<td>Theory elective:</td>
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</tr>
<tr>
<td>Mus. 411, Student Teaching Seminar:</td>
<td>1</td>
</tr>
<tr>
<td>Mus. 417, Student Teaching Practicum-Elementary:</td>
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<tr>
<td>Mus. 418, Student Teaching Practicum-Secondary:</td>
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<tr>
<td>T.Ed. 470, 471, Student Teaching:</td>
<td>6</td>
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<tr>
<td>Comm. 230, Principles of Communication I:</td>
<td>2</td>
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<tr>
<td>Liberal arts:</td>
<td>1</td>
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<td>Free electives:</td>
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### Instrumental Music Emphasis

#### Freshman Year

<table>
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<tr>
<th>Course:</th>
<th>Semester Hours</th>
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<tr>
<td>Private instruction (and literature class):</td>
<td>6</td>
</tr>
<tr>
<td>Class minor in performance:</td>
<td>2</td>
</tr>
<tr>
<td>Performance organization:</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 100, 101, Theory I:</td>
<td>6</td>
</tr>
<tr>
<td>Mus. 102, 103, Theory II and Ear Training Laboratory I:</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 180, 181, Introduction to Music:</td>
<td>6</td>
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<tr>
<td>Liberal arts:</td>
<td>12</td>
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#### Sophomore Year

<table>
<thead>
<tr>
<th>Course:</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>Private instruction (and literature class):</td>
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<tr>
<td>Class minor in performance:</td>
<td>12</td>
</tr>
<tr>
<td>Performance organization:</td>
<td>2</td>
</tr>
<tr>
<td>Mus. 200, Theory II:</td>
<td>3</td>
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</table>

### Bachelor of Arts in Music Degree

The degree Bachelor of Arts in Music has as its goal a broad education in music within a liberal arts context. The curriculum is designed to give the student competency and knowledge to deal with music within the cultural milieu of present-day society. Although students may elect within their programs special courses which will permit them to pursue graduate study or a profession in such areas as musicology, composition, music librarianship, or music journalism, the major emphasis is on development of basic musicianship, an ability to perform music, and a broad knowledge of principles that will provide an intellectual grasp of art.

A minimum of 124 semester hours with an overall grade average of C must be earned for the Bachelor of Arts in Music degree. Of these hours at least 70 must be in nonmusic courses. Thirty must be at the 300 or 400 level. A minimum of 35 hours and a maximum of 54 hours is required in music courses.

The normal pattern for private instruction in this degree is one half-hour lesson per week for 2 semester hours of credit or one hour lesson for 3 semester hours credit, although some of this study may take place in class instruction. The requirement, except for American folk emphasis, is two academic years of study in one applied area with a minimum proficiency equal to Bachelor of Music (Performance) sophomore level. Not more than 16 semester hours of credit in private instruction may be used toward the degree.

1. May be used to meet minor voice requirement and/or piano proficiency.
2. String players must take a minimum of 4 semester hours in an orchestra. Wind and percussion players must take a minimum of 6 semester hours in a band, two of which must be in Marching Band.
3. See the requirements in Liberal arts.
The student may elect to perform in ensembles, but not more than 4 semester hours of credit may be applied toward the degree.

A recital may be given with permission of the chairman of the faculty concerned and the student's adviser.

Students are required to write a senior thesis in accord with their goals and interests. Preparation and selection of topics are required in a junior research seminar. The thesis is conceived as an academic equivalent to recital, composition, or student teaching requirements in professional music degrees.

The student must complete two semesters of English (composition or literature). One semester of English must be completed in each of the two semesters of the upper-level English sequence.

Basic proficiency in one foreign language equal to three semesters at university level. This must be fulfilled by presentation of three years of study in high school in one language or by passing a University proficiency examination.

Nonmusic electives to fulfill the minimum requirement of 70 semester hours of credit.

Ten semesters of natural sciences, social sciences, humanities: four semesters (two-semester combinations) from each of two of these areas; and two semesters (one two-semester combination) from the third area. (All areas must be represented.)

A Junior Research Seminar and a Senior Thesis.

**CONCENTRATED INTEREST AREAS**

These course listings are for the purpose of advising only. There are no special requirements.

**Music-Broadcasting**

Comm. 530-3. Introduction to Broadcasting.

Comm. 532-3. Television Production.

Comm. 537-2. Television Production II.


Comm. 497-1, 2, 4. Television Production I, II, III.


Th. 373-3. Acting.

Th. 374-3. Directing.

Th. 471-3. History of the Theatre I.


**Music-Business**

Business courses are frequently closed to non-business students. Permission may be obtained from the College of Music associate dean for undergraduate studies for the student to petition the College of Business and Administration dean for permission to enroll in business courses.

Acct. 303-3. Introduction to Accounting.


Econ. 201-3. Introduction to Economics I.

Econ. 202-3. Introduction to Economics II.


**Arts Management**

The following courses in the College of Business and Administration are required in the arts management concentration in the Bachelor of Arts in Music. They are part of the requirement of 70 hours outside of music. Students must inform the associate dean for undergraduate studies in music of specific courses they will be taking by the tenth week of the preceding semester.

Acct. 203-3. Introduction to Accounting.


Fin. 305-3. Basic Finance.

**MINIMUM REQUIREMENTS**

Minimum requirements (no concentrated interest area) are:

1. Two semesters of English (composition or literature).
2. Basic proficiency in one foreign language equal to three semesters at university level. This may be fulfilled by presentation of 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 70 semester hours of credit.
4. Ten semesters of natural sciences, social sciences, humanities: four semesters (two-semester combinations) from each of two of these areas; and two semesters (one two-semester combination) from the third area. (All areas must be represented.)

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Mk. 300-3. Principles of Marketing
Dr. 330-3. Organization and Management.

Other courses in business may be elected in summer on a space available basis. Other courses outside of music required for this degree are:

Eng. 136-3. Introduction to English Studies
Eng. 200-3. Critical Writing

With approval from the associate dean for undergraduate studies, an internship may be substituted for the Senior Paper.

Music-Dance
Th. 270-3. Introduction to the Theatre
Th. 273-2. Stage Movement
Th. 276-3. Stagecraft
Dance techniques course (1 to 6 hours of credit)
Th. 290-3. Beginning Composition and Improvisation
Th. 490-3. Dance Composition
Th. 492-2. Musical Accompaniment for Dance
Th. 493-2. Dance Production

Music-Elementary Education Certification

This concentration of courses allows a student to study music and, at the same time, gain certification for teaching in the elementary classroom. It does not give certification for teaching music. Most courses listed below should be elected in the junior and senior years.

Required Courses

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>T.Ed. 309. Foundations of American Education: Elementary</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 310. Educational Psychology for Elementary School</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 311. Child Growth and Development</td>
<td></td>
</tr>
<tr>
<td>T.Ed. 320. Expressive Arts in the Elementary School</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 400. Educational Media Laboratory</td>
<td>1</td>
</tr>
<tr>
<td>T.Ed. 420. Methods in Elementary Language Arts</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 421. Methods in Elementary Mathematics</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 422. Methods in Elementary Reading</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 422. Methods in Elementary Science</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 446. Teaching the Exceptional Child in the Regular Classroom</td>
<td>2</td>
</tr>
<tr>
<td>T.Ed. 446. Children's Literature</td>
<td>3</td>
</tr>
<tr>
<td>T.Ed. 447. Student Teaching: Elementary School</td>
<td>8</td>
</tr>
<tr>
<td>Mus. 310. Teaching General Music</td>
<td>3</td>
</tr>
<tr>
<td>Mus. 110. Piano Class (two semesters)</td>
<td>4</td>
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Music History

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>Mus. 401-2. Analysis I</td>
<td></td>
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<tr>
<td>Mus. 411-2. Renaissance Music</td>
<td></td>
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<tr>
<td>Mus. 476-2. Twentieth-Century Music</td>
<td></td>
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<tr>
<td>Mus. 422-2. Ancient and Medieval Music</td>
<td></td>
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<tr>
<td>Mus. 486-2. Seventeenth- and Early 18th-Century Music</td>
<td></td>
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<tr>
<td>Mus. 486-2. Late 18th and 19th-Century Music</td>
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Music-Journalism

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<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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</thead>
<tbody>
<tr>
<td>Jour. 100-3. Contemporary Mass Media</td>
<td></td>
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<tr>
<td>Jour. 200-3. Reporting</td>
<td></td>
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<tr>
<td>Jour. 207-3. Public Relations</td>
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<tr>
<td>Jour. 400-3. Editorial Opinion Writing</td>
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<tr>
<td>Jour. 465-3. Journalism and the Law</td>
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<tr>
<td>Jour. 470-3. Critical Writing</td>
<td></td>
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<tr>
<td>Jour. 480-3. Magazine Article Writing</td>
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<tr>
<td>Jour. 490-3. Journalism and Public Opinion Writing</td>
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<tr>
<td>Jour. 552-3. Mass Communication and the Arts</td>
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</tr>
<tr>
<td>Mus. 401-2. Sixteenth-Century Countermark</td>
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<tr>
<td>Mus. 407-2. Analysis II</td>
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<tr>
<td>Mus. 432-2. Piano Literature</td>
<td></td>
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<tr>
<td>Mus. 445-2. Art Song I</td>
<td></td>
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<tr>
<td>Mus. 447-2. Art Song II</td>
<td></td>
</tr>
<tr>
<td>Mus. 466-3. Chamber Music Literature: Winds and Percussion</td>
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Music-Theatre

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Th. 270-3. Introduction to the Theatre</td>
<td></td>
</tr>
<tr>
<td>Th. 273-2. Acting I</td>
<td></td>
</tr>
<tr>
<td>Th. 276-3. Stage Craft</td>
<td></td>
</tr>
<tr>
<td>Th. 351-2.3. Costuming Practice</td>
<td></td>
</tr>
<tr>
<td>Th. 352-1. Techniques in Theatre Practice</td>
<td></td>
</tr>
<tr>
<td>Th. 353-2.3. Management Practice</td>
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</tr>
<tr>
<td>Th. 357-1.2.3. Makeup Practice</td>
<td></td>
</tr>
<tr>
<td>Th. 424-1.2.3. Acting Practice</td>
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<tr>
<td>Th. 471-3. History of the Theatre</td>
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<tr>
<td>Th. 473-3. Advanced Acting</td>
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<tr>
<td>Th. 474-3. Directing</td>
<td></td>
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<tr>
<td>Th. 476-3. Stage Design</td>
<td></td>
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<tr>
<td>Th. 479-0.4. Stage Practice</td>
<td></td>
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<tr>
<td>Th. 488-3. Stage Lighting Design</td>
<td></td>
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<tr>
<td>Mus. 442-2. Opera Theatre</td>
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</table>

Music Theory

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Mus. 305-2. Keyboard Harmony and Improvisation</td>
<td></td>
</tr>
<tr>
<td>Mus. 305-2. Elementary Composition</td>
<td></td>
</tr>
<tr>
<td>Mus. 400-2. Contemporary Theory</td>
<td></td>
</tr>
<tr>
<td>Mus. 401-2. Sixteenth-Century Counterpoint</td>
<td></td>
</tr>
<tr>
<td>Mus. 402-2. Eighteenth-Century Counterpoint</td>
<td></td>
</tr>
<tr>
<td>Mus. 403-2. Scoring and Arranging</td>
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</tr>
<tr>
<td>Mus. 407-2. Analysis II</td>
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Organ Pedagogy

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Mus. 226-2. Service Playing Techniques</td>
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<tr>
<td>Mus. 326-2. Improvisation</td>
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<td>Mus. 327-2. Improvisation</td>
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<tr>
<td>Mus. 401-2. Sixteenth-Century Counterpoint</td>
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<tr>
<td>Mus. 402-2. Eighteenth-Century Counterpoint</td>
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<tr>
<td>Mus. 424-3. Church Music</td>
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<tr>
<td>Mus. 425-3. Church Music</td>
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<tr>
<td>Mus. 428-3. Organ Survey</td>
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<td>Mus. 429-3. Organ Survey</td>
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Piano Pedagogy

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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>Mus. 305-2. Keyboard Harmony and Improvisation</td>
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<tr>
<td>Mus. 305-2. Piano Pedagogy</td>
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</tr>
<tr>
<td>Mus. 402-2. Eighteenth-Century Counterpoint</td>
<td></td>
</tr>
<tr>
<td>Mus. 432-3. Piano Literature</td>
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String Pedagogy

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
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<tbody>
<tr>
<td>Mus. 301-1. Violin Pedagogy</td>
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</tr>
<tr>
<td>Mus. 309-1. Cello Pedagogy</td>
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<tr>
<td>Mus. 468-3. Chamber Music Literature: Strings</td>
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<td>Mus. 481-3. Symphonic Literature</td>
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Voice Pedagogy

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<th>Course</th>
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<tbody>
<tr>
<td>Mus. 144-2. Italian Diction and Repertoire</td>
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<tr>
<td>Mus. 145-2. English Diction and Repertoire</td>
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<tr>
<td>Mus. 344-3. German Diction and Repertoire</td>
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</tr>
<tr>
<td>Mus. 345-3. French Diction and Repertoire</td>
<td></td>
</tr>
<tr>
<td>Mus. 442-2. Opera Theatre</td>
<td></td>
</tr>
<tr>
<td>Mus. 444-2. Vocal Pedagogy</td>
<td></td>
</tr>
<tr>
<td>Mus. 477-3. History of the Opera</td>
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</tbody>
</table>

Wind/Percussion Pedagogy

<table>
<thead>
<tr>
<th>Course</th>
<th>Semester Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mus. 308-1. Woodwind and Percussion Design and Repair</td>
<td></td>
</tr>
<tr>
<td>Mus. 481-3. Symphonic Literature</td>
<td></td>
</tr>
</tbody>
</table>

*Courses fundamental to each interest area and prerequisites to other courses. Choices of courses are subject to student's interests, background, and ability. Classes, especially in the areas of business, dance, journalism, and theatre, should be selected in close consultation with the major advisor and departments and colleges or schools concerned.

It is recommended that students choose 10 to 12 academic hours of credits in history and theory courses in addition to basic music requirements. The courses listed above should be given prime consideration.

College of Music / 207
American Folk Music

Basic requirements in performance: two years of study in voice and/or American folk instruments (30 minutes per week) — banjo, fiddle, guitar, mandolin. Among these five media, the student has one major (two semesters) and two minor areas (one semester each). Continuing Education registrations and fee payment arrangements must be cleared through the College of Music dean's office.

Students also select from the following courses in consultation with their adviser in the American folk music concentration:

BlSt. 240-2. Ethnic Dance.
BlSt. 280-3. Afro-American Music: History and Appreciation I.
BlSt. 281-3. Afro-American Music: History and Appreciation II.
EngL 322-3. Folklore.
EngL 270-3. African-American Art History I.
EngL 271-3. African-American Art History II.
EngL 287-3. American Art II.
Hist. 151-3. American History I.
Hist. 152-3. American History II.
Hist. 263-3. American Society and Thought I.
Hist. 264-3. American Society and Thought II.
Mus. 397-3. Instrumentation.
Mus. 464-2. History of Jazz.
Mus. 480-2, 4. Special Studies.

GRADUATE DEGREE PROGRAMS

The University is approved by the National Association of Schools of Music to offer the Master of Music degree in performance, church music, music literature, composition, conducting, or pedagogy; the Master of Music Education degree with special emphasis in either vocal or instrumental music; the degrees Doctor of Musical Arts in performance, pedagogy, or composition; and Doctor of Philosophy with an emphasis in either musicology or music education.

The student’s program will be directed by the degree program coordinator and the major faculty unit chairman or by the student’s doctoral advisory committee.

In support of the candidate’s application it is recommended that a report of the Graduate Record Examination aptitude test (verbal and quantitative) and the advanced music examination scores be submitted. Arrangements to take these examinations can be made by writing to the Educational Testing Service, Box 696, Princeton, New Jersey 08540; or 1947 Center Street, Berkeley, California 94704. There are no pass or fail grades; the scores achieved will be regarded as supplementary to the academic record shown in the student’s transcript.

Preliminary Examinations. Students who expect to begin work on a master’s or doctoral degree must report to the Music Building as indicated below on the two days prior to the beginning of their first term (see appropriate calendar — fall, spring, or summer). (Areas covered in these examinations include theory, aural perception, history and literature, and the major field.)

The two days of preliminary examinations will consist of the following:

First Day
8:30 a.m. - 12 Music theory, aural perception
1-4 p.m. Music history and literature

Second Day
9 a.m. - 12 Master’s major field (essay examination)
9 a.m. - 12 Doctoral major field
1-4 p.m. Doctoral major field continues if necessary

At least one week before the examinations are scheduled to begin, the student must give written notice to the office of the College of Music associate dean for graduate studies of intent to take the examinations.

Master of Music Degree

Prerequisites. The student is expected to present undergraduate preparation equivalent to that demanded for the corresponding bachelor's degree at this University. See Requirements for Graduation for description of the requirements for the bachelor's degree.

In advance of admission, performance majors must submit a repertoire list and arrange for an audition. All performers should be prepared to demonstrate acquaintance with solo literature of the various historical periods.

Composition majors must submit examples of their work to the College of Music, and music literature majors must submit examples of their research papers or projects.

Preliminary Examination. Examination questions in theory and history will serve as a basis for recommending specific courses and possible further examination in these areas. In addition, the major field written examination for Master of Music degree students in performance will cover musical styles as well as problems of performance and pedagogy. (See the preceding information on Preliminary Examinations.)

Residence. The minimum residence requirement for this degree is two semesters, plus one summer. It is not possible for the student to earn the Master of Music degree during summer sessions only. Prospective students should contact the chairman of the faculty unit concerned for advice.

Degree Requirements. Artistic performance or the competent composition of music or excellence in research are the basis of requirements for the Master of Music degree. (For the music literature major a keyboard proficiency sufficient to play a Bach chorale at sight and some score reading is required. Music literature majors must demonstrate proficiency in at least one foreign language — French or German.) A normal plan of advancement and maturity is expected of those registered as graduate students, this plan being formulated under the advisement of the student’s degree program coordinator and major professor. Only

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those well advanced in technique and in professional maturity will be granted this degree. A minimum of 30 semester hours of credit is required. The actual number of hours to be presented varies with the needs of the individual student and is determined by examinations given during the course of study. All parts of the preliminary examination (or appropriate courses) as required by the major faculty unit — must be passed before the student will be permitted to take the written qualifying examination. An oral comprehensive examination will be given near the close of work toward this degree.

Course Requirements. Normal division of work in this program will include approximately two-thirds of the hours in the major field (i.e., the major faculty unit) and a minimum of 10 hours outside of the major field, 6 of which must constitute a graduate minor in music.

There are four specific areas of study in the master's degree program: music education, music literature, performance, and theory/composition. A student must select a major in one of these four areas and a minor from one of the remaining three. The minor will consist of 6 graduate credit hours.

Major courses for a degree in performance include private instruction, historical research, and recitals. In piano pedagogy, major courses include instruction in piano, research in piano pedagogy and literature, historical research, and recital. In composition, major courses include theory and composition, historical research, and thesis. In church music, courses include church music, historical research, and thesis. In music literature, courses include historical and analytical research, theory, and two research projects (thesis). In wind and percussion pedagogy, major courses include instruction in the major area of woodwind, brass, or percussion (or combination), research in pedagogy and literature of the major area, and recital. In string pedagogy, major courses include instruction in the major areas of viola, violoncello, or string bass; research in pedagogy and literature of the major area; chamber music and/or orchestra participation; and recital. Study in the major instrument, or in composition as a major subject, must continue during all terms of registration for work toward the Master of Music degree.

Choral conducting, percussion, string, and wind majors are required to participate in a music ensemble. These students should consult with the respective chairmen of their faculty units regarding the specific ensemble in which they will participate.

Thesis Requirements. Thesis requirements are as follows (4 hours of credit):

1. For the major in performance: recital(s) and in some cases research papers, or performance preparation from a repertoire list, or a combination of part or all of these, as required by the major faculty unit.

2. For the major in piano pedagogy: research in piano pedagogy and literature and a full-length recital presented before a faculty committee.

3. For the major in composition: the composition, during the period of graduate study, of several works of major proportion, at least one of which must receive public performance.

4. For the major in church music: the preparation and production of a substantive sacred choral work, or recital(s) and in some cases research papers, or a combination of all three, as required by the major faculty unit.

5. For the major in music literature: two written projects for 2 credit hours each, to provide some focus to the candidate's work.

6. For the major in wind or percussion pedagogy: research in pedagogy of the major area and a full-length recital or proficiency examinations in the major area before a faculty committee.

7. For the major in string pedagogy: research in pedagogy of the major area and a full-length recital or proficiency examinations in the major area before a faculty committee.

Master of Music Education Degree

The Master of Music Education program is designed to augment the student's undergraduate preparation in music education with the more advanced training required for service as both a teacher and a supervisor. This advanced study includes, in addition to contemporary methods and materials, attention to aesthetic, philosophical, and psychological theories and principles of teaching music in today's schools. The student may pursue either Plan I, with the approval of the chairman of the music education faculty, or Plan II.

Prerequisites. The applicant is expected to present undergraduate preparation equivalent to that demanded for the corresponding bachelor's degree at this University (see Bachelor of Music Education degree requirements) and the results of the Graduate Record Examination.

During preliminary examinations students will be questioned regarding general knowledge of philosophy and history of music education; organization and supervision of music education; and methods and materials for the individual area (vocal, strings, or winds). Proficiency examinations in the principal and secondary performance instruments (or voice) will be conducted by appointment during the first three weeks of residence.

Course Requirements. Since students entering the graduate program have a variety of backgrounds and needs, the requirements for the degree are flexible, with only minimum requirements in the broad areas of applied music, history and literature of music, theory of music, and music education. A core of five courses is required of all students: Comprehensive Musicianship for Teachers, Foundations of Music Education I and II, Introduction to Graduate Study, and Teaching Music Through Performance. The remaining course work is determined by students in consultation with an adviser in the light of their strengths, weaknesses, and interests. This course work must include a minimum of 6 semester hours concentrated in a graduate minor area other than music education.

The flexibility of the requirements allows the student to select an area of concentration such as keyboard work in the schools; integrated music studies (allied arts, humanities); teaching music to the exceptional, handicapped, or educationally disabled child; theory of
music; history and literature of music; early childhood education; private lessons; and pedagogy, as well as the traditional areas of band, orchestra, choral, or general (classroom) music teaching. The student should be prepared to identify an area of interest (one of the above or another relevant to the degree) so that an appropriate adviser can be assigned.

Plan I. A minimum of 36 credit hours earned in course work plus 4 credit hours for thesis is required. In general the number of credit hours will be in excess of this minimum. Considerable latitude will be allowed in the choice of a thesis subject, but it must involve comprehensive and independent study of some problem relating to music education. The thesis topic and outline must be approved by the chairman of the music education faculty.

Plan II. A minimum of 30 credit hours is required. In general, the number of credit hours will be in excess of the minimum. No formal thesis is required, but the preparation of a substantial professional report in music or music education must be submitted at the time of the qualifying examination. This report may be done in connection with any course or as independent study. It must comply in form and style with Graduate School thesis specifications.

All candidates for the Master of Music Education degree must take the course Introduction to Graduate Study during their first term of residence. In addition, all preliminary examinations must be taken and any deficiencies removed, and all core courses taken before the qualifying examination can be scheduled. This examination normally will be given at the close of the third summer term of study, or during the second semester, and will serve as the basis for determination of the student's status (the actual number of credit hours required for graduation).

Normally the course work for the degree can be completed in one academic year plus one summer or during four summer terms. However, since a wide variety of courses in music education is available during late afternoons, teachers within commuting distance of Boulder can earn a significant portion of credit toward the degree during the academic year without taking a leave from their teaching positions.

Doctor of Musical Arts Degree

The Doctor of Musical Arts degree 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. Areas of study include composition; literature and performance of choral music; instrumental conducting and literature; organ performance; performance, literature, and pedagogy of piano, voice, strings, winds, and percussion; performance, literature, and pedagogy of piano: process of group environments.

ENTRANCE REQUIREMENTS

Entrance requirements include a master's degree in music or demonstrated equivalency comparable to that of this University, submission of performance tapes and tapes of compositions, personal interview and audition when possible, and demonstration of proficiency in the use of the English language. Among the supplementary application materials, a student must submit evidence of written English language proficiency, such as a previously written term paper, a copy of a master's thesis, or a Graduate Record Examination verbal score in the upper 30th percentile.

RESIDENCE REQUIREMENTS

Residence will be three semesters or 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 residence credit may be earned in a summer session. The student must be properly registered to earn residence credit.

A graduate student will be considered to be carrying a full load during a regular semester for purposes of determining residence credit if the student is registered for at least 5 semester hours in work numbered 500 or above or at least 8 semester hours of other graduate work.

A full load for purposes of determining residence credit during the summer session is 3 semester hours of work in courses numbered 500 or above or 6 semester hours of other graduate work.

CONTINUOUS REGISTRATION

After the residence requirement for the Doctor of Musical Arts program has been satisfied, a student must enroll and pay tuition for fall and spring semesters of each year until attaining the degree formally resigning. After a student has enrolled in all required dissertation courses, he or she will enroll in Mus. 801, Pre-Dissertation for Doctor of Musical Arts, until having become a candidate for the degree. After becoming a candidate, the student will enroll in Mus. 802, Candidate for Doctor of Musical Arts, until the degree is attained. This continuing registration is independent of whether the student is in residence at this University. (See also section on Residence Requirements.)

CREDIT REQUIRED

While no specific minimum number of credit hours beyond the master's degree will be required, programs vary. Consult specific dissertation requirements.

PRELIMINARY EXAMINATIONS

While not a requirement for admission to the Doctor of Musical Arts program, the preliminary examinations must be taken before the beginning of the first semester or summer of residence, since they serve as important diagnostic tools. Examinations are given in music history, theory, aural perception, and the major field.

QUALITY OF WORK

Students are expected to complete with distinction all work for which they enroll. A grade below B is unsatisfactory and will not be counted toward fulfilling the minimum requirements for the degree. Upon recommendation by the advisory committee and the
executive officer of the department and with the approval of the dean, a student may be required to withdraw at any time for failure to maintain satisfactory progress toward the degree.

PROGRAM COORDINATION

The dean of the College of Music has appointed a member of the faculty of each program in the College of Music to act as Doctor of Musical Arts program coordinator. The coordinator’s duties involve specifically (1) advising, on the basis of the preliminary examinations, which course work and independent study will lead the student to the comprehensive examination; (2) assisting the student directly in setting up a total degree plan (including preliminary planning of dissertation recitals and repertoire list where required) for presentation to the permanent advisory committee for approval; and (3) generally facilitating and expediting the student’s program and activities.

PERMANENT ADVISORY AND EXAMINATION COMMITTEES

In consultation with the program coordinator, the student will request the dean of the College of Music to appoint a permanent advisory committee, normally by the second semester of residence. This committee will consist of the student’s major professor, who will act as chairman, and two other members of the music faculty; one of the three will assume major responsibility for the student’s research documents. The permanent advisory committee will review the program of study as recommended by the program coordinator and will recommend any adjustments that seem necessary. It will approve the student’s degree plan and recital dates, be the nucleus of the examination committee, and in general guide the student’s efforts in accomplishing his objectives. The student’s degree plan will be considered a contract between him and his permanent advisory committee. The contract will be drawn as soon as possible after the establishment of the permanent advisory committee but not later than the second semester of residence.

The examination committee will consist of the permanent advisory committee and at least two additional members of the graduate faculty. This committee will be appointed before the completion of the first dissertation project and will give final approval to all dissertation projects.

LANGUAGE REQUIREMENT

Each student must be able to read material related to his special field of study in one foreign language. The choice of the foreign language must be approved by the student’s advisory committee. A communication knowledge of the language must be demonstrated by one of four options which the Graduate School allows. (See Doctor of Philosophy, Language Requirement.) Students in voice have additional language requirements.

COMPREHENSIVE EXAMINATIONS

A student is eligible to take the comprehensive examinations when all deficiencies (including the foreign language requirement) have been removed, when the degree residence requirement has been satisfied, and with permission of the student’s permanent advisory committee. This examination is in two phases, written and oral, and must be passed as a unit. The oral examination ordinarily follows the written examination by a period of not less than two weeks. A successful candidate must receive the affirmative votes of a majority of the members of the examination committee. In case of failure, the examination may be attempted once more after a period of time determined by the examining committee.

The comprehensive examination must be taken at least one semester before completion of degree requirements, including the dissertation. Students must be registered at the time they take the examination. Students must file their application for candidacy with the Graduate School two weeks before taking the examination. Comprehensive examinations, final oral examination, and presentation of dissertation projects will normally not take place during the summer session.

TIME LIMIT

Students are expected to complete all requirements for the degree within seven years of their first registrations.

THESIS REQUIREMENTS

All dissertation projects must be submitted in a professionally acceptable format and quality and will be kept on file in the library. Two copies of each must be submitted to the University after final approval. The permanent advisory committee will furnish additional guidelines concerning content and format.

DISSERTATION

Normally, if students show only minor weaknesses on their preliminary examinations, they may be advised to begin work on the dissertation concurrent with preparation for the comprehensive examinations.

The dissertation consists of a specified number of performances (or compositions) and documents. Students’ permanent advisory committees will assist them in meeting dissertation 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.

Students must consult with the appropriate program coordinator to determine their specific requirements.

Area Dissertation Requirements

*Literature and Performance of Choral Music*

Mus. 831-3. Repertoire Project.

Composition
Mus. 833-4 to 6. Major Composition Project.

Performance: Organ, Piano, Strings
Mus. 831-1. Repertoire Project.

Performance, Literature, and Pedagogy: Piano, Strings, Winds, and Percussion
Mus. 826-3. Dissertation Project. Research Lecture-Recital II.
Mus. 831-3. Repertoire Project (not required in Winds and Percussion).
(Pedagogy students may elect, upon advisement, Mus. 824-3, Chamber Music or Solo Recital, and Mus. 830-1. Document, in place of Mus. 826-3, Pedagogy Lecture II.)

Performance, Literature, and Pedagogy: Piano: Process of Group Environments
Mus. 827-1. Document. May be combined with Mus. 828 for a lecture-recital.
Mus. 828-1. Document. May be combined with Mus. 827 for a lecture-recital.

Performance, Literature and Pedagogy: Voice
Mus. 828-3. Dissertation Project. A project on vocal literature or performance.
Mus. 831-3. Repertoire Project.

Upon the recommendation of the student's permanent advisory committee, independent study (Mus. 960) may be substituted for up to a total of 4 hours of performance-related documents (Mus. 827, 828, 829, 830, 1 hour each).

FINAL ORAL EXAMINATION

After all dissertation requirements have been met, an oral examination in defense of the dissertation documents and upon related topics shall be conducted by the examination committee.
Candidates must be registered at the time they take the final examination.

Doctor of Philosophy Degree (Music Education)

The Doctor of Philosophy degree in music, with music education as a field of specialization, is offered through the Graduate School for the student who demonstrates maturity, a strong interest in the music education profession, and musical and scholarly promise. The requirements for the degree have been established for the purpose of acquainting the student with practical and philosophical problems confronting contemporary music education, while at the same time providing a solid background in the history, philosophy, and theory of music. A significant portion of the degree work will emphasize research and research techniques. The program may be expected to prepare the student for a career as a teacher of music education at the college level or for a supervisory or administrative position in the elementary or secondary schools.

Educational preparation similar to the Bachelor of Music Education and Master of Music Education degrees awarded by the University of Colorado and two years of successful teaching experience are prerequisite for admission to the Ph.D. program in music education. Although the primary emphasis in the Ph.D. program is on scholarship and research, the candidate is expected to have attained an acceptable level of musical performance.

Since students entering the Ph.D. program have a variety of backgrounds and needs, the requirements for the program are flexible and cannot be stated in terms of credit hours: the degree is awarded on the basis of proficiency in a broad field of knowledge. Although the rules of the Graduate School require a minimum of 30 semester hours of graduate credit, most students, in order to meet the expected scholarly and musical standards, find it necessary to plan a program of approximately 45-50 semester hours of course work plus the Graduate School requirement of 16 semester hours for the dissertation.

The course work for the Ph.D. degree shall include up to 15 hours in background courses as needed, 14 hours in music education, 8 hours in a primary minor field of history or theory of music, 6 hours in a secondary minor field and electives. Any course work needed to meet the language requirement will be in addition to the above.

The required course work in music education shall include: (1) Contemporary Issues in College Teaching, (2) Research Literature and Techniques I (Historical and Philosophical), (3) Research Literature and Techniques II (Survey and Experimental), and (4) Research Practicum in Music Education. All other
course work shall be determined by the candidate in consultation with the advisory committee.

Course work designed to satisfy the secondary and elective requirements may be selected from such areas as history and literature of music and music theory (if not selected as a primary minor), private applied music and pedagogy, composition, administration, supervision, curriculum, psychology of education, sociology of education, group keyboard pedagogy, integrated music studies (allied arts, humanities), handicapped or educationally disabled children, early childhood education as well as the traditional areas of band, orchestra, choral or general (classroom) music teaching.

Minimum requirements for all Doctor of Philosophy programs at the University of Colorado are outlined in the Graduate School section of this catalog. Further requirements for the Ph.D. degree in music education are as follows:

1. The language proficiency must be demonstrated in either French or German.
2. A minimum of two semesters of resident credit must be earned after the language requirement has been met. The semester in which the language test is passed cannot constitute one of these semesters.
3. A minimum of 6 semester hours in courses taken in residence, numbered 500 or above, in which a grade of B or above was earned and which are applicable toward the degree shall earn one semester of resident credit.

For information regarding preliminary examinations see that section.

Further information may be obtained by writing to the associate dean for graduate studies, College of Music.

Doctor of Philosophy Degree (Musicology)

The program leading to the Doctor of Philosophy degree in music, with musicology as a field of specialization, is offered as a concept-oriented course of study embracing areas of musical scholarship from creative theory to historical research. At present, programs in the various historical periods, historical theory, aesthetics, and American music are available.

The basis of the program is the exposure of students to various concepts of and techniques for looking at music. The object of the program is directed, not at the preparation of the performer, researcher, or classroom teacher, but rather toward the background that well-rounded musical scholars will require to direct their attention to any of these, or other, goals upon completion of their courses of study. Since the basis of all musicology is the stylistic history and theory of music, it is assumed all entrants into the program will have a strong grasp of these areas. Finally, they must show evidence of superior individual work in music theory and history, this condition to be established by the submission of one or more papers or other research projects to the chairman of the faculty unit.

Prerequisites. Before beginning the graduate program in musicology applicants are expected to comply with entrance requirements for the Graduate School, including submission of an application for admission and all supporting credentials as requested thereon. In addition, they are expected to attain acceptable scores on the Graduate Record Examinations (verbal and quantitative, and the advanced music examination). Finally, they must show evidence of superior individual work in music theory and/or history, this condition to be established by the submission of one or more papers, research projects, or compositions to the chairman of the faculty unit.

Preliminary Examinations. Before the beginning of the first semester of residence, the candidate must take the preliminary examinations, and the musicology examination, which includes analysis of a composition; solution of a compositional problem (such as writing a fugal exposition or an invention); score reading; essay questions on historical and theoretical problems; a library research project; and a demonstration of reading ability with or without the aid of a dictionary in at least one foreign language, the passages to be chosen from current periodical literature. All requirements listed under Preliminary Examination must be satisfactorily completed not later than one year after the candidate has begun the program.

Course of Study. Students are responsible for selecting their own course of study with the assistance of their advisers. Because of the basic methodology and techniques involved, Introduction to Music Research (Mus. 570) should be elected as soon as possible in the program. The epoch or period courses constitute general preparation for the comprehensive examination. In addition, the student should have established an area of specialization by the time of the comprehensive examination and have a thorough knowledge of the history and bibliography of the particular area. Therefore, the area of specialization should be determined as soon as practicable in the student's residence, and will involve the selection of an advisory committee as outlined in this catalog, the chairman of this committee to serve as the student's major adviser.

It is the responsibility of the student to convince the faculty that he or she is qualified to be a candidate for the degree Doctor of Philosophy by demonstrating a basic knowledge of philosophical, historical, and theoretical problems; of styles and performance practices in music; and an ability for oral communication and expository writing about music. Normally, the means to such a demonstration will be active participation in colloquia, courses, seminars, and the advisory examination (to be taken at the end of two semesters' study) as well as the comprehensive examination.

Requirements for the Degree. For information regarding hours, residence, thesis, and final examination requirements, see the general requirements for the Doctor of Philosophy degree as outlined in the Graduate School section of this catalog.

1. Entrance requirements are discussed under the topics Prerequisites and Preliminary Examinations.
2. In addition to the Graduate School foreign language requirement, students must demonstrate reading proficiency of musical materials in both French and German as tested by the musicology faculty. Additional language requirements may be made,
depending upon the student's area of specialization. These requirements must be fulfilled before the comprehensive examination.

3. Near the completion of the second semester in the musicology program, the student will meet with the musicology committee in the advisory examination. This examination will be conducted orally and will be concerned primarily with the progress the student has demonstrated, particularly with regard to determining a major area of specialization. Such an area of specialization is not to be conceived narrowly as a thesis topic, but rather as a broader segment in which the student plans to spend an appreciable amount of his or her scholarly career. Advisory examinations may be repeated until such time as the student has satisfactorily defined the area of specialization.

4. Two formal presentations in the Musicology Colloquium are required. Preparation for these presentations may be taken for credit as Seminar in Musicology (Mus. 782-783). Other informal presentations are also expected.

5. The musicology student normally will take both the lecture and seminar sessions of those epoch and topical courses which the adviser and the student consider necessary for the student's program. Lecture sessions may be omitted and seminar sessions only may be taken if in the opinions of the adviser and instructor the student has sufficient proficiency in the area. Students are required to take Musicology Seminar (Mus. 782) each semester until completion of the comprehensive examination.

6. The comprehensive examination will be given upon request after completion of a minimum of 30 hours of course credit, three semesters of residence, and fulfillment of the language requirements. Written notice of intent to take the comprehensive must be presented to the musicology faculty through the student's advisory committee at least three months in advance. The written and oral examinations constituting the comprehensive examination will cover both the general areas of music and musicology, and the candidate's special area.

7. Three copies of the thesis must be submitted: one to the Graduate School, one to the musicology faculty for the music library, and one to be returned to the candidate.

Further information may be obtained by writing to the associate dean for graduate studies, College of Music.

NONDEGREE STUDENTS

All nondegree students must secure consent from the instructor and adviser concerned before registering for any course offered in the College of Music.
DEGREES

Bachelor of Science in Pharmacy

The five-year course of study in the School of Pharmacy leads to the Bachelor of Science (Pharmacy) degree.

The School of Pharmacy is a member of the American Association of Colleges of Pharmacy and is accredited by the American Council on Pharmaceutical Education.

Graduate Degrees

The faculty of the School of Pharmacy, through the Graduate School, offers the Master of Science and Doctor of Philosophy in the pharmaceutical sciences.

PHARMACEUTICAL SCIENCES

The Master of Science and the Doctor of Philosophy degrees in the pharmaceutical sciences are offered with the following fields of specialization: pharmacy and biopharmaceutics, pharmaceutical chemistry, pharmacology, and behavioral pharmacogenetics.

Although an undergraduate degree in pharmacy is desirable, it is not a necessary requirement for pursuing graduate work in the pharmaceutical sciences. Students wishing to pursue graduate work in the pharmaceutical sciences leading to an advanced degree should read carefully the Graduate School section for minimum requirements, quality of work, residence, application for admission to candidacy, thesis requirements, etc.

MASTER OF BUSINESS ADMINISTRATION

Undergraduates in the School of Pharmacy with career interests in business administration may satisfy the prerequisites for the Master of Business Administration program by completing the undergraduate courses or the graduate fundamental courses offered by the College of Business and Administration during their undergraduate programs. Performance in the undergraduate program and on the Admission Test for Graduate Study in Business are important considerations in regard to acceptance into the M.B.A. program of the Graduate School of Business Administration. Students who intend to pursue this combination should consult with the graduate student adviser in the Office of Graduate Studies, College of Business and Administration, early in their program. This program will require an additional year of study beyond the course of study in the School of Pharmacy.

HONORS AT GRADUATION

Qualified students are provided the opportunity to participate in the School of Pharmacy Honors Program. Successful completion of the program entitles participants to graduate with honors or special honors. Students interested in the program should contact the faculty member responsible.

SCHOLARSHIPS AND LOANS

Students needing financial assistance for their education should contact the Office of Financial Aid, Campus Box 106, University of Colorado, Boulder, Colorado 80309. In addition, several scholarships and loans are designed specifically for students in the School of Pharmacy. These are awarded upon recommendation of the Financial Aid Committee of the School of Pharmacy. Information may be obtained from the assistant dean for student affairs of the School of Pharmacy.

UNDERGRADUATE DEGREE PROGRAM

Requirements for Admission

Since the School of Pharmacy is located on the Boulder Campus, admission to the School of Pharmacy is restricted to matriculation on the Boulder Campus only and is not valid for enrollment at the other campuses of the University.

To be admitted to the School of Pharmacy, the applicant must satisfy the requirements of the University as well as specific requirements of the School of Pharmacy. Two academic years of preprofessional study are required to qualify for admission to the School of Pharmacy. Preprofessional courses or their equivalent as indicated in the first two years of the course of study must be completed satisfactorily with a grade of C or better prior to enrollment in the School of Pharmacy and may not be taken under a pass/fail option.

To be eligible for admission, an applicant must have attained a cumulative grade-point average of at least 2.0. However, a 2.0 average is a minimal requirement only and does not assure admission to the School of
Pharmacy. Each year the Committee on Pharmacy Admissions will establish the grade-point average to be used in the selection of applicants.

Selection of applicants for admission will be made according to policies established by the faculty of the School of Pharmacy. Applicants who qualify for admission will be placed in categories according to their status at the time of making application. Selection will be made according to the following categories in a descending order:

1. Qualified Colorado residents.
2. Qualified nonresidents enrolled at Colorado institutions.
3. Qualified nonresidents enrolled at out-of-state institutions.

Applications for admission to the School of Pharmacy are considered only for the fall semester and must be submitted to the Office of Admissions by March 1 (or until the enrollment limit is reached) of the year for which admission is desired. Students will be notified of their status after their credentials have been evaluated. Provisional admission is granted when course work is still in progress. The student has the responsibility to make certain that a supplementary transcript is mailed to the School of Pharmacy when the course work is completed. Failure to submit this transcript may result in refusal of admission. Former students who were enrolled in the School of Pharmacy must meet the admission requirements of the University and be accepted by the School of Pharmacy.

Students who desire to transfer to the School of Pharmacy from other schools or colleges within the University must submit an intra-university transfer application to the School of Pharmacy. The application deadline is March 1 or until the enrollment limit is reached. Intrauniversity transfers that are approved to the School of Pharmacy are effective for the Boulder Campus only and are not valid at the University’s other campuses.

The Pharmacy College Admission Test is optional and is recommended for students whose overall grade-point average is below 3.0.

Requirements for Graduation

To be awarded the Bachelor of Science (Pharmacy) degree, candidates must complete the required courses indicated in the curriculum, and a sufficient number of additional acceptable electives to make a minimum of 166 semester hours, with credit points equal to twice the number of hours attempted.

RESIDENCE REQUIREMENTS

To be eligible to receive the degree in pharmacy, students who bring advanced credit from other schools or colleges of pharmacy will be required to complete a minimum of two academic years or four semesters of residence work at this University.

The American Association of Colleges of Pharmacy requires that a minimum of three academic years of residence work must be completed in an approved school or college of pharmacy regardless of the amount of college credit that may be accepted from other types of institutions. It further provides that none of the professional courses in pharmacy may be taken through correspondence.

To qualify for a semester of pharmacy residency, a student must be registered for at least 12 hours for credit in the School of Pharmacy on the Boulder Campus. If a student takes a reduced schedule of less than 12 hours for the semester or attends the summer session, pharmacy residency will be granted in proportion to the number of hours completed and the duration of the term. Pharmacy residency will not be granted for enrollment at the other campuses or through the Division of Continuing Education of the University.

ORDER OF STUDIES FOR BACHELOR OF SCIENCE (PHARMACY) DEGREE

FIRST AND SECOND YEARS (PREPROFESSIONAL)

Semester Hours
Chemistry, general (with laboratory) (Chem. 101-106) .................................. 10
Chemistry, organic (with laboratory) (Chem. 331-332) ................................. 8
Biology (one year of general zoology or a combination of general zoology and botany) (with laboratory) .......................... 8
MOLB 106-106 or BFOB 121, 122, 123, and 124 ................................. 8
Mathematics (college algebra and trigonometry, or calculus) ................... 5
Physics, general (with laboratory) (Phys. 301) ........................................ 5
Economics, micro (Econ. 203) ......................................................... 3
English composition ................................................................. 6
Communication, oral ................................................................. 3
General Education (36 semester hours)
Psychology, sociology, or cultural anthropology ................................ 6
Humantes ........................................................................ 6
Natural or social sciences ................................................... 6

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THIRD YEAR (PROFESSIONAL)

Fall Semester
PHAR 305. Pharmacy Orientation .................................................. 2
PHCH 370. Pharmaceutical Chemistry I ....................................... 2
PHAD 361. Laws of Pharmacy ........................................................ 3
BIPH 350. Pathology I ................................................................. 2
BIPB 343. Human Physiology ......................................................... 2
CHEM 481. General Biochemistry ................................................. 3

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Spring Semester
PHAR 306. Prescription Procedures ................................................. 1
PHCH 371. Pharmaceutical Chemistry II ..................................... 2
PHCH 375. Physiological and Clinical Chemistry ..................... 3
BIPH 308. Drug Action ................................................................. 4
BIPH 309. Pathology II ................................................................. 3
PHAD 383. Financial Management .................................................. 3

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FOURTH YEAR (PROFESSIONAL)

Fall Semester
PHAR 410. Pharmaceutics I ............................................................... 4
PHCL 452. Pharmacology I .............................................................. 3
PHCL 453. Pharmacology II ............................................................. 2
PHCH 472. Medicinal Chemistry I ................................................. 3
BIPH 450. Infectious Disease ......................................................... 3

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Spring Semester
PHAR 411. Pharmaceutics II .............................................................. 4
PHCL 454. Pharmacology III ............................................................ 3
PHCL 455. Pharmacology IV ............................................................ 3
PHCH 473. Medicinal Chemistry II ............................................... 2
PHCL 474. Toxicology ................................................................... 2
PHAD 498. Pharmacy Management ................................................. 3

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### Fifth Year (Professional)

#### Fall Semester
- CNPH 420. Clinical Pharmacy and Therapeutics I .............. 3
- CNPH 425. Drug Literature Evaluation .......................... 1
- CNPH 426. Community Pharmacy Externship I .................. 2
- CNPH 440. Clinical Pharmacy Rotation (elective) .............. 2
- CNPH 449. Clinical Pharmacokinetics ............................ 3

**Total:** 13

#### Spring Semester
- CNPH 421. Clinical Pharmacy-Therapeutics II ................... 3
- CNPH 422. Therapeutic Aspects of Non-Prescription Products 3
- CNPH 423. Institutional Pharmacy Practice Externship I ..... 2
- CNPH 440. Clinical Pharmacy Rotation (elective) ............. 2

**Total:** 12

**Electives ..................................................** 7

**Total Required Hours ...................................** 165

### Academic Policies

#### Academic Ethics

Students are expected to conduct themselves in accordance with the highest standards of honesty and integrity. The act of or the intent to engage in the act of cheating, plagiarism, illegitimate possession and/or disposition of examinations, assignments, forgery or falsification of records, and similar acts are grounds for suspension or expulsion from the University. Students are advised that plagiarism consists of any act involving the offering of the work of someone else as the student’s own.

#### Course of Study

The course of study in the School of Pharmacy is five academic years, leading to the Bachelor of Science (Pharmacy) degree. The course work is organized in a prescribed sequential manner which provides for an excellent general and professional background.

The normal academic load is 16 to 18 semester hours, and the student must be officially registered for each course to receive credit. Permission to take more than 18 or less than 12 hours may be granted only by the dean. A student must be registered for at least 12 hours for credit on the Boulder Campus to qualify for a semester of residency in the School of Pharmacy.

The proper sequence of both the professional and nonprofessional courses in the curriculum must be maintained. A student will not be permitted to advance in either the fourth or fifth year of the course of study sequence until at least a cumulative 2.0 grade-point average has been attained in the School of Pharmacy. A grade of D is not an acceptable passing grade in a professional course and a student will not be permitted to register for fifth-year professional courses unless all third-year and fourth-year professional courses have been completed satisfactorily with a grade of C or better. A student may not register for any third-year or fourth-year professional course unless all prerequisites have been satisfied with an acceptable passing grade.

### Grading System, Dropping and Adding Courses, Withdrawal

The University of Colorado has adopted a standard policy on these procedures which is outlined in the General Information section of this catalog.

In the School of Pharmacy a grade of D is not an acceptable passing grade in a professional course, and if a grade of D is received in a professional course, the course must be repeated until a grade of C or better is received. Professional courses are those listed under Pharmacy-Pharmaceutics, Clinical Pharmacy, Pharmacy Administration, Pharmaceutical Chemistry, Pharmacology and Biopharmacy. The pass/fail option is not permitted for the nonprofessional or professional courses that are required for graduation. After enrollment in the School of Pharmacy, a maximum of 8 hours of nonprofessional electives may be taken to apply toward the degree under the pass/fail option.

#### Scholastic Requirements

A student must maintain a cumulative 2.0 grade-point average for all courses attempted in the School of Pharmacy to remain in good standing. If the cumulative average falls below 2.0, the student’s status is subject to review by the Scholastic Advancement and Appeals Committee.

A student under scholastic suspension may attend summer sessions at the University in order to improve the grade-point average; however, credits received by enrollment at other institutions while under scholastic suspension will not be accepted as transfer credit by the School of Pharmacy. A student under scholastic suspension may apply for readmission after one academic year and if reinstated will be on probation with two semesters to demonstrate satisfactory scholastic improvement. A student suspended a second time will not be reinstated.

A student will not be permitted to advance into either the fourth or fifth year of the course of study sequence until a cumulative grade-point average of at least 2.0 has been attained in the School of Pharmacy.

#### Convocations

All students registered in the School of Pharmacy are required to attend convocations and special lectures scheduled throughout the year. Usually the programs will be scheduled during the day, but occasionally it may be necessary to attend an evening program. The purpose of the convocations and special lectures is to augment regular classroom lectures and to give students the opportunity to meet and hear outstanding visitors.

#### Credits at the Denver and Colorado Springs Campuses

While professional courses are not available at the Denver and Colorado Springs campuses, students may complete the two preprofessional years of study, as well as the nonprofessional and elective courses required in the pharmacy curriculum, at these campuses.
Reserve Officer Training Corps Programs

ALL ROTC PROGRAMS

It is important to note that enrollment in ROTC programs is open to both men and women, and ROTC courses are open to all students whether or not they are enrolled in ROTC programs.

AIR FORCE AEROSPACE STUDIES

U.S. Air Force ROTC offers two programs leading to commission in the U.S. Air Force upon receipt of the baccalaureate degree. Graduate students may be commissioned upon the completion of 12 hours of the Professional Officer Course and an six-week summer training program.

Standard Four-Year Course

This program is in three parts: the General Military Course for lower division (freshmen and sophomores) students, the Professional Officer Course for upper division students, and Leadership Laboratory (attended by all students). Completion of the General Military Course is a prerequisite for entry into the Professional Officer Course. Completion of a four-week Summer Training Course is required prior to commissioning.

Modified Two-Year Program

This program is offered to full-time, regularly enrolled degree students at both undergraduate and graduate levels who will have two years remaining at the University of Colorado at Boulder when they enroll. Selection is on a competitive basis. Applicants should apply directly to the Professor of Aerospace Studies not later than March 15 of the spring semester immediately preceding the academic year in which they desire to enroll in the program. Those selected for this program must complete a six-week field training program during the summer months as a prerequisite for entry into the Professional Officer Course the following fall or spring semester.

Flight Training

Expense-paid ground school and flight training are open to students approved and qualified for future USAF pilot training.

Air Force College Scholarship Program

Students participating in Air Force ROTC may be eligible to compete for Air Force ROTC College Scholarships. Students selected for this program are placed on grants that pay tuition, book costs, nonrefundable educational fees, and subsistence of $100 per month, tax free. All cadets enrolled in the Professional Officer Course receive $100 per month subsistence during the regular academic year. Students are also eligible to compete for two-, three-, or four-year scholarships open to both men and women.

AFROTC credit for graduation varies with each college. Students should contact the appropriate college or the professor of aerospace studies for determination of credit.

NAVAL SCIENCE

All naval science students enroll in N.S. 101, 102, 201, and 202. Those desiring commissions in the U.S. Navy enroll in N.S. 301, 302, 401, and 402 for upper division work. Those desiring commissions in the U.S. Marine Corps enroll in N.S. 307, 308, 407, and 408 for upper division work.

NROTC offers two-year and four-year scholarship programs, and two-year and four-year college (non-scholarship) programs. Navy scholarships may be earned while the student is enrolled in the college program. Scholarship students receive tuition and fees, books, and a $100 per month subsistence allowance. College program students receive a $100 per month subsistence allowance during their last two years in the program.

Naval science scholarship students must complete course work in calculus, physics, computer science, American military affairs, and national security policy. Students should check with their naval science instructor to determine specific course offerings which fulfill the above requirements.

The number of semester hours of credit for NROTC courses toward fulfillment of the requirements for a degree is a matter for determination by the individual colleges. Students should therefore determine their college's policy when formulating their degree plan.

Opportunities for commissioned service are available in surface, subsurface, and aviation specialties in the U.S. Navy. Opportunities in ground and aviation specialties are available in the U.S. Marine Corps. Men
and women students interested in other programs leading to commissions in either the U.S. Navy or U.S. Marine Corps are encouraged to contact the NROTC unit on campus. All commissioned opportunities require that the student be working toward, and receive, a college degree.

U.S. ARMY MILITARY SCIENCE

The Department of Military Science offers two Army ROTC programs leading to a commission in the active Army or Reserve and National Guard programs.

Four-Year Program

The standard four-year program consists of two phases. The Basic Course, normally completed during the freshman and sophomore years, consists of courses in military science, officer career development, leadership theory and management. The Advanced Course coincides with the junior and senior years. Subject areas include leadership, methods of instruction, tactics and unit operations, military law, history, national strategy, and army policies. Completion of a six-week Advanced Camp in the summer is required prior to commissioning.

Two-Year Program

The abbreviated two-year program consists of the same courses offered in the Advanced Course. However, both undergraduate and graduate students may become qualified for this program by successful completion of a six-week summer basic camp, an on-campus summer program, or specially designed compression courses offered during the spring or fall semesters. If selected for the abbreviated program under these options, students may receive an early commission with the Reserve or National Guard while continuing their college education at the undergraduate or graduate level.

Students should contact the professor of military science for specific requirements and options available based on each student’s status at the time of program entry. Students who are veterans of military service or participated in junior ROTC, Civil Air Patrol, or similar organizations may have a portion or all of the basic course requirements waived by the professor of military science.

Scholarships

Students selected for a U.S. Army scholarship receive full tuition, books, laboratory fees, classroom materials, and a monthly allowance of $100 during each academic year. Only high school seniors are eligible to apply for four-year scholarships. ROTC students enrolled on campus as full-time students may compete for the three-, two-, and one-year scholarships. All scholarship benefits are tax free and competition is open to both men and women.

Guaranteed Specialty

Students entering the advanced phase of instruction may be given the opportunity to select a specific specialty in which they will be commissioned. Approximately 40 specialty programs are available.

Simultaneous Membership Program

Nonscholarship students entering the advanced phase of instruction will be given the opportunity to participate with a Reserve or National Guard unit as an officer trainee. Students participating in this program can earn over $100 per month.

Flight Training

Students selected for the advanced course may become qualified as cadets to participate in the Army Aviation Program. These individuals will attend flight school after completion of their Officer’s Basic Course while on active duty.

Course Credit

Army ROTC course credit for graduation varies with each college. Students should contact the professor of military science or dean of their college to clarify the number of credit hours to be awarded.
Course Descriptions

Following are descriptions of courses offered in the colleges and schools on the Boulder Campus. This listing does not constitute a guarantee or contract that any particular course will be offered during a given year.

For degree requirements, students should refer to the departmental listings in the appropriate college or school information section of this catalog. These requirements are subject to change, and students should check with their department for up-to-date information.

For information on scheduling of classes, students should consult the Schedule of Courses issued at the beginning of each semester.

Courses numbered from 100 to 299 are intended for lower division students and those from 300 to 499 for upper division students. Courses numbered from 500 to 599 are primarily for graduate students but in some cases may be open to qualified undergraduates. Courses at the 600, 700, and 800 level are open only to graduate students.

The value of each course in semester hour credits is carried as part of the identifying course prefix and department number. For example, in Anth. 103-3, “Anth. 103” is the identifying department number and “3” indicates semester hours of credit. Abbreviations used in the course descriptions are as follows:

Coreq.—Corequisite
Lab.—Laboratory
Lect.—Lecture
Prer.—Prerequisite
Rec.—Recitation
Wk.—Week

College of Arts and Sciences

ANTHROPOLOGY


Anth. 104-3. Principles of Anthropology II. Fall, Spring. Survey of the world’s major culture areas; culture and its major components, such as subsistence, social organization, religion, and language. Coreq., Anth. 201.

Anth. 200-3. Evolution of Human Sexuality. Offered irregularly. Current literature on male and female supremacy is evaluated. The issue of human sexuality is placed in the context of human evolution, is related to human life cycle stages, and is examined in terms of cultural influences on its expansion.

Anth. 201-3. Introduction to Physical Anthropology I. Fall. Detailed consideration of human biology, man’s place in the animal kingdom, and fossil evidence for human evolution.

Anth. 202-3. Introduction to Physical Anthropology II. Spring. Continuation of Anth. 201. Quantitative analysis, genetics, and race are emphasized.

Anth. 203-1. Laboratory in Physical Anthropology I. Fall. Lab. in human osteology and the skeletal-muscular system with an emphasis on comparative primate morphology and adaptation. Coreq., Anth. 201.


Anth. 220-3. Introduction to Archaeology. Fall. History, basic concepts, techniques, and theoretical construction of archaeological field and laboratory investigations.

Anth. 221-2. Laboratory Course in Archaeological Methods. Fall. Study of analytical methods in archaeological research including those employed both in the field and in the laboratory. Instruction will deal with practical exercises illustrating many of the theoretical principles covered in Anth. 220. Coreq., Anth. 220.

Anth. 222-3. The Neolithic Revolution. Alternate years. Analysis of the cultural processes involved with man’s adjustment to an agricultural-based lifestyle in both the Old and New Worlds, and the importance in terms of the subsequent growth of modern societies. Coreq., Anth. 223-3. Man in the Pleistocene. Offered irregularly. Review of evidence pertaining to man’s early cultural development. Specific concerns are the interaction of man’s physical evolution with the development of culture and man’s interaction with his environment.

Anth. 224-3. Urban Revolution. Spring, alternate years. The archaeological evidence available and the theories and methods by which urban civilizations arose in the Old and New Worlds.


Anth. 227-3. New World Archaeology. Spring. Prehistory of North, Middle, and South America, emphasizing peopling of the New World, earliest American Indian cultures, and later regional developments.

Anth. 230-3. America: An Anthropological Perspective. Alternate years. Historical and contemporary aspects of American life are considered from an anthropological perspective including such topics as slavery, immigrants to the United States, the development of cities, American popular culture, and American character.

Anth. 280-3. Nature of Language. Fall, alternate years. Survey of the languages of the world. Study of theories of the origin of language, its relationship to other forms of communication, and to systems of writing.

#Also available through correspondence study.

Course Descriptions / 221
Anh. 300-3. Primate Behavior. Fall. Survey of naturistic primate behavior. Social behavior, behavioral ecology, and evolution emphasized as they lead to an understanding of human behavior.

Anh. 301-3. Man and Culture. Offered irregularly. Deals with the implications of basic anthropological knowledge and understanding as these apply to contemporary problems confronting mankind.


Anh. 342-3. Peoples of Latin America. (Ch. St. 342.) Alternate years. The diversity of Latin American cultures: (1) tribal, primitive, or relatively unaculturated peoples; (2) agrarian-rural peoples along a spectrum from traditional to rural proletarianism; (3) peoples of complex societies, urban settings, squatter settlements, ghettos, and slums.


Anh. 380-3. Languages and People. Alternate years. Investigation of the role which languages play in the building of new nations, in the spread of ideas and religions, in migration, and in the diffusion of writing systems and other customs throughout the world.

Anh. 390-3. Seminar: Physical Anthropology. Offered irregularly. Intended to offer the student an opportunity to probe more deeply the topics presented in Anh. 201-202. Prer., Anh. 201-202 or equivalent, and consent of instructor.

Anh. 391-3. Seminar: Archaeology. Offered irregularly. Designed to develop a student's knowledge of theoretical and methodological advances in anthropological archaeology. Prer., Anh. 200 or equivalent, and consent of instructor.

Anh. 399-3. Undergraduate Seminar: Anthropology. Alternate years. Directed investigation of a specific topic of current importance. The topic may be within the subfields of physical anthropology, archaeology, cultural anthropology, or anthropological linguistics. Preranged topics will be announced each semester. Prer., consent of instructor.

Anh. 401/501-1 to 3. Teaching Anthropology. Fall, Spring. Practicum by special arrangement only in which students learn to teach anthroopology by serving as education leaders or tutors in introductory courses or as small group leaders in advanced courses. Prer., consent of instructor.

Anh. 403/503-3. Primate Anatomy. Offered irregularly. Anatomical correlates of the primate pattern will be investigated through lecture and laboratory dissection of nonhuman primates. Prer., Anh. 201-202 or equivalent.


Anh. 405/505-3. Quantitative Methods in Anthropology. Fall. A survey of the ways of deriving meaning from anthropological data by numerical means, including, but not confined to, basic statistical procedures. Prer., Anh. 201-202 or equivalent.

Anh. 406/506-3. Nutrition and Anthropology. Alternate years. The nutritional requirements of man and how they have been met by different populations: taking into account differences in soils, climate, natural resources, technology, and cultural practices. Prer., Anh. 201-202 or equivalent.

Anh. 407-3. Nonverbal Communication. Offered irregularly. An examination of nonverbal signals which convey information and are believed to be part of the total communication system in human cultures. Biological signals compared with nonhuman primate behavior, culturally derived signals related to cultural variation, and evolution.

Anh. 410-3. Human Races. Fall. The biological variability of man as shown in geographic races and individual differences, the ways in which races may be formed, maintained, and mixed; survey of the living peoples of the world. Prer., Anh. 201-202 or equivalent.

Anh. 411/511-3. Human Paleontology. Spring. A detailed consideration of the fossil evidence for human evolution. Subjects covered are a history of discovery of important fossils and interpretations, descriptive information about the fossils, and data and theory from Pleistocene studies relating to ecology. Prer., Anh. 201-202 or equivalent.


Anh. 415/515-3. Human Ecology I. Offered irregularly. A study of demographic and ecological variables as they relate to man. Aspects of natural selection, overpopulation, and environmental determination will be considered.

Anh. 416/516-3. Human Ecology II. Offered irregularly. A descriptive and analytical study of change in demographic and ecological variables within one or more specific cultures undergoing rapid assimilation. Aspects of breeding isolates, population structures, settlement patterns, and family and community institutions will be compared.

Anh. 417-3. Forensic Anthropology. Fall, alternate years. Anthropological techniques for identifying individuals and for use in legal proceedings. Techniques, which include anthropometry, the analysis of blood and other body fluids, fingerprints, and genetic identification, are introduced in terms of historical use in specific crimes.


Anh. 421/521-3. Southwestern Archaeology. Alternate years. Prehistoric cultures of the American Southwest, their origins, characteristics, and relationships.

Anh. 422/522-3. Archaeology of Mexico and Central America. Fall. Prehistoric and protohistoric cultures and areas of Mexico and Central America, including the Aztecs and Maya.

Anh. 423/523-3. Settlement Archaeology. Offered irregularly. Study of the areas in which primitive man adapts his residence to the physical environment and his social needs. Consideration of prehistoric settlement data as well as inferences to be derived - population, community organization, architecture, and land use.

Anh. 424/524-3. Archaeology of South America. Offered irregularly. Prehistoric and protohistoric cultures of South America, their origins, characteristics, and relationships, including the high civilization of the Andean area.


Anh. 430/530-3. Cultural Evolution. Offered irregularly. Review of various theories explaining the evolution of culture with particular attention to the Neolithic and Urban Revolutions.

Anh. 431/531-3. Archaeology of Ancient Near East. (General Classics 436/536.) Offered irregularly. Emphasis is placed on the similarities and differences between the archaeological material of the nations of the Middle East and the archaeological influences which were exchanged between such nations.

Anh. 432/532-3. Archaeology of Ancient Egypt. (General Classics 432/532.) Fall. The archaeology of Ancient Egypt in the light of recent excavations; the link between the history and archaeology of the nations of the Bible in the North, Egypt, Nubia, Ethiopia, and Yemen in the South.

Anh. 435/535-3. Environmental Archaeology. Offered irregularly. A survey of the methods of culture ecology as it can be applied to archaeological investigations.


Anh. 435-2 to 8. Archaeological Field and Laboratory Research. Summer session only. Students will participate in archaeological field research and conduct laboratory analysis of archaeological materials and data. Open only to University of Colorado anthropology majors. Prer., consent of instructor.

are used, including fracture mechanics, lithic technology, materials, heat treatment, and functional analysis. Percussion and pressure flaking experiments are performed. Prer., Anth. 105 or 230 or equivalent.


Anth. 452-3. Symbolic Anthropology. Spring, alternate years. An exploration of anthropological approaches to the study of symbolic systems, including patterns of belief, ritual, art, and myth. Theoretical issues involve the nature of symbols, the impact of modes of communication, and the interpretation of meaning cross-culturally. Prer., Anth. 104 or consent of instructor.

Anth. 463/563-3. History of Anthropology. Fall. History of the growth of anthropology from the earliest times, various schools of thought, outstanding contributors and their works, to the mid-20th century.

Anth. 454/554-3. Culture, Mind, and Experience. Alternate years. A sampling of contemporary work in the field of psychological anthropology, including culture and personality, culture and cognition, altered states of consciousness, cultural models of diagnosis and cure, the ethnothography of experience, and psychological dimensions of social change.

Anth. 455/555-3. Culture Dynamics. Alternate years. Culture change with emphasis on the role of individual motivation in promoting or inhibiting such change. Survey of the literature and analysis of selected case material, including problems of directed change.

Anth. 458/558-3. American Indian Acculturation. Spring. Domination of Indian areas and cultures by Europeans and resulting modification of Indian cultures.

Anth. 458/558-3. Power: the Anthropology of Politics. Fall, alternate years. Covers the nature and distribution of power in state and stateless societies, the evolution of political stratification, the political economy of colonialism, and selected aspects of power in modern society.


Anth. 468/568-3. Cross-Cultural Aspects of Socioeconomic Development. Offered irregularly. Examines the goals of international agencies which support development in underdeveloped countries. Anthropological perspective is provided for such issues as urban planning, health care and delivery, population control, rural development, and land reform.


Anth. 474/574-3. Cultural and Society in South Asia. Alternate years. An introduction to the cultural anthropology of the South Asian region comprising India, Pakistan, Nepal, Bangladesh, and Sri Lanka. Topics include cultural geography, family and kinship, caste hierarchy, ritual and religion, economic and political patterns, tribal groups and minorities, and modern trends in social change.

Anth. 475/575-3. Ethnography of Oceania. Fall, alternate years.

Anth. 480/580-3. Languages of Primitive Peoples. Alternate years. The methods used to record and analyze the languages of nonliterate societies. Students will be able to work with languages recorded by native speakers from nonwestern languages from around the world.

Anth. 481/581-3. Language and Culture. Alternate years. Relationship of language to human behavior; the typological classification of languages; the study of linguistic universals, and the evolutionary implications of such studies. Prer., Anth. 490 or consent of instructor.

Anth. 483/583-3. Egyptian Hieroglyphics I. (General Classics 483/583). Fall. A study of the culture of the ancient Middle East to c. 3000 B.C. and the history of its languages. Reading and translating hieroglyphic inscriptions into modern languages.

Anth. 484/584-3. Egyptian Hieroglyphics II. (General Classics 484/584). Offered irregularly. Reading and translating hieroglyphics into modern languages.

Anth. 485/585-3. Hieratic, Demotic, and Coptic. (General Classics 485/585). Offered irregularly. Study of these three languages of Ancient Egypt in different periods of history to aid in understanding the culture of the area, its history, and its archaeology.

Anth. 487/587-3. Semitic Studies and Inscriptions. Offered irregularly. A study of the Semitic languages of the Ancient Middle East from their original sources: the papyri, inscriptions, and different texts.

Anth. 488/588-3. Etruscan Art and Archaeology. (General Classics 431/531, F.A. Hist. 431/531.)

Anth. 489/589-3. Roman Art and Archaeology. (General Classics 432/532, F.A. Hist. 432/532.)

Anth. 491-3. Departmental Honors in Anthropology I. Fall. The course work is built around a theme of research design as a means of integrating previous training in the field of archaeology as well as providing an opportunity to perform creative scientific investigations.

Anth. 492-3. Departmental Honors in Anthropology II. Spring. Conclusion of Anth. 491.


Anth. 498/598-3 to 6. Archaeological Ruins Stabilization. Summer session only. Practical and administrative aspects of ruins stabilization. Includes "on-the-job" training in this specialty and review of the policies and legal bases which govern ruins stabilization. Prer., consent of instructor.

Anth. 508-3. Anthropological Genetics. Offered irregularly. A consideration of the data and theory of human genetics. Emphasis will be placed upon analytical techniques relating to a genetic analysis of the individual, family, and populations. Prer., Anth. 201-202 and consent of instructor.


Anth. 512-3. Advanced Osteology. Alternate years. 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. Prer., Anth. 201 and 302.


Anth. 526-2 to 6. Anthropological Field Work. Summer Session. Students will assist in the supervision of archaeological field research and conduct laboratory analysis of archaeological materials and data. Open only to University of Colorado advanced anthropology students enrolled in a regular degree program.

Anth. 537-3. Topics in Roman and Etruscan Art and Archaeology. (General Classics 536, F.A. Hist. 542.) Consideration of various aspects of Roman and/or Etruscan art and archaeology. Topics to be explored may vary and will be announced in advance.

Anth. 599-3. Research Methods in Archaeology I. Offered irregularly. Methods and theory of archaeology; emphasizing the interpretation of materials and data and the relationships of archaeology to other disciplines.


Anth. 578-3. The Anthropology of Language Acquisition. Offered irregularly. Consideration of various cultural and psycholinguistic factors that may determine group behavior or personality.

Anth. 586-3. Biocultural Foundations of Language. Alternate years. An investigation of species-specific language behavior as it relates to the hominid fossil record, primate communication, and physiology. Evidence will be drawn from archaeological data and from cultural anthropology.

Anth. 592-3. Hellenistic Art and Archaeology. (General Classics 515, F.A. Hist. 515.) Topics of emphasis are architecture, domestic decoration, sculpture, terra-cotta, jewelry, and coins of the period following the death of Alexander the Great until the Roman conquest of Greece. Prer., Anth. 426 or consent of instructor.

Anth. 593-3. Classical Greek Art. (General Classics 521, F.A. Hist. 508.) Seminar in Greek art. Topics to be selected from the following: architecture, vase painting, sculpture. Prer., Anth. 426 or consent of instructor.
Anth. 594-3. Archaic Greek Art. (General Classics 523, F.A. Hist. 509.) Prereq., Anth. 428 or consent of instructor.

Anth. 595-3. Prehistoric Greek Art and Archaeology. (General Classics 524, F.A. Hist. 510.) Examination of Neolithic, Cycladic, Minoan, and Mycenaean periods. Prereq., Anth. 427 or consent of instructor.


Anth. 613-3. Interdisciplinary Seminar. Alternate years. A consideration of interdisciplinary problems that involve anthropology and related fields such as history, the behavioral disciplines, and the natural sciences.

Anth. 614-3. Seminar: Archaeology of Selected Areas. (General Classics 614.) Alternate years. Consideration of the archaeology of a specialized area, either geographical or topological. Areas to be selected in terms of current research interests.


Anth. 800-30. Doctor's Dissertation. All doctoral students must register for no fewer than thirty 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 under Change in Requirements for Doctoral Degree.

Anth. 920-1 to 3. Independent Study (Undergraduate, Lower Division). Consent of instructor required.

Anth. 940-1 to 3. Independent Study (Undergraduate, Upper Division). Consent of instructor required.

Anth. 950-1 to 3. Guided Study. Directed individual research based on a specific area of specialization. For graduate students only. Consent of instructor required.

Anth. 960-1 to 3. Independent Research. For graduate students only. Consent of instructor required.

Anth. 999-000. Candidate for Degree.

ARTS AND SCIENCES


A.S. 101-3. Expository Writing in the Humanities. Basic expository writing with emphasis on readings and topics in the humanities.

A.S. 102-3. Expository Writing in the Social Sciences. Basic expository writing with emphasis on readings and topics in the social sciences.

A.S. 103-3. Expository Writing in the Natural Sciences. Basic expository writing with emphasis on readings and topics in the natural sciences.

A.S. 104-3. Freshman Seminar (Farrand Hall). Basic communication skills stressing both effective writing and speaking; Subjects for writing and speaking will be drawn from the humanities, natural sciences and social sciences. Mastery of library skills and a term paper will be required.

A.S. 110-3. Advanced Expository Writing. Develops rhetorical skills and the techniques of research writing. Prereq., A.S. 100, 101, 102, 103, or 104.

A.S. 221-3. Human Sexuality. (Formerly Psych. 221.) Covers in substantive form the interdisciplinary field of human sexuality. Anatomical, physiological, anthropological, sociological, legal, and artistic aspects of the subject are included.


A.S. 313-2. Practicum: German. May be repeated once.


ASTRO-GEOPHYSICS

A.G. 111-3. General Astronomy. Fall, Spring. Principles of modern astronomy for non-science majors, summarizing our present knowledge about the earth, moon, planets, the sun, and the origin of life. In both A.G. 111 and A.G. 112 (which may be taken in either order) emphasis is placed on how our knowledge is obtained, on concepts rather than details, and what problems remain to be solved. In both courses there is considerable use of the Planetarium, but only limited use of telescopes. Students desiring more extensive laboratory and observing experience should also register for A.G. 121.

A.G. 112-3. General Astronomy. Fall, Spring. Principles of modern astronomy for non-science majors summarizing our present knowledge about the sun, stars, birth and death of stars, galaxies, and the structure and origins of the universe. A.G. 111 and A.G. 112 can be taken in either order. Students desiring more extensive laboratory and observing experience should also register for A.G. 122.


A.G. 114-3. Dynamic Earth II — The Solid Earth. (Geol. 114.) Spring. Basic concepts of the physics of the solid earth, earthquakes, their causes and prediction. Earth structure, earth's gravity and magnetic fields, paleomagnetism.


A.G. 121-1. General Astronomy Laboratory. Fall, Spring. Optional lab for A.G. 111, centered around the solar laboratory but involving other telescope, laboratory, and planetarium experience, emphasizing the solar system. One three-hour period per week. Coreq., A.G. 111.

A.G. 122-1. General Astronomy Laboratory. Fall, Spring. Optional lab for A.G. 112 involving observatory, planetarium, and laboratory experience, emphasizing sun, stars, and galaxies. One scheduled hour per week plus additional day- and night-time hours to be arranged. Coreq., A.G. 112.


A.G. 320-3. Topics in Meteorology. (Geog. 220.) Fall, Spring. Emphasizes developments of topical interest in meteorology. Topics vary from year to year and may include some of the following: weather map analysis and prediction, climatic change, air pollution, weather modification, and severe storms. Nonmathematical. Prereq., A.G. 115 (formerly A.G. 114, Planet Earth), Geog. 100, or instructor consent.

A.G. 321-3. Topics in Modern Astronomy. Fall, Spring. Designed as a supplement to A.G. 111/112. Emphasizes modern developments in astronomy. Topics change from year to year and may include some of the following: nature and evolution of the sun, stellar evolution, quasars and exploding galaxies; cosmology: life in the universe; origin and nature of the planets; space science; pulsars and black holes. Nonmathematical. Prereq., A.G. 111/112 or instructor consent.

A.G. 350, 351, 352-variable credit. Special Topics in Astro-Geophysics. Special topics intended to acquaint undergraduate students with topics of current interest and research in astro-geophysics.

A.G. 391-3. The Earth's Atmosphere and Oceans. Fall. The physical structure and processes occurring in the atmosphere and oceans; radiation and cloud physics; atmospheric winds and ocean currents; general circulation; gulf and jet streams; formation of severe storms. Prereq., general physics and calculus.


and production of the elements in the stars, cosmic electrodynamical processes. Prer., general physics and calculus.

A.G. 394-3. *Cosmology and Relativity*. Spring. Special and general relativity as applied to astrophysics, cosmological models, observational cosmology, experimental relativity, the early universe. Prer., general physics and calculus.


A.G. 511-3. *Internal Processes in Gases*. Fall. Thermal, mechanical, and radiative processes in gases with emphasis on those processes that are of interest in the study of planetary and stellar atmospheres and the interstellar medium.

A.G. 514-4. *Experimental Plasma Physics*. (Phys. 414.) Spring. A combined lect. and lab. course in which fundamentals of plasma physics are demonstrated in student hands-on experiments. Gas-discharge physics, statics and dynamics of plasmas. One lect. and one three-1/2 hr. lab. session weekly. Prer., senior standing in physics or equivalent by consent of instructor.


A.G. 516-3. *Intermediate Plasma Physics* (Phys. 516.) Fall. Continuation of A.G. 515. Topics vary yearly but include nonlinear effects such as wave coupling, quasilinear relaxation, particle trapping, nonlinear Landau damping, collisionless shocks, solfitions, nonneutral plasmas; kinetic theory of waves in a magnetized plasma; anisotropy; inhomogeneity; radiation — ponderomotive force, parameter instabilities, stimulated scattering; plasma optics; kinetic theory and fluctuation phenomena. Prer., A.G. 516 or instructor consent.


A.G. 520-3. *Meteorology of the Upper Atmosphere*. Spring, alternate years. The structure and dominant physical processes that occur in the neutral atmosphere from 20-100 km. Radiation, photochemistry, general circulation, transport phenomena. Also probing techniques, rockets, satellites, etc.


A.G. 540-3. *Fluid Dynamics I*. Fall. Laws of fluid motion relevant to the earth’s atmosphere, the sun, planets, and interplanetary space. Scalar analysis, rotational effects, boundary layer theory, nonlinear compressible waves, shocks.


A.G. 554-3. *Mathematical Methods in Astro-Geophysics*. Fall. A course in applied mathematics designed to provide the necessary analytical background for courses in plasma physics, fluid dynamics, E and M 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 integrandifferential equations. Illustrative examples will be drawn from above areas of physics. Prer., undergraduate or graduate complex variables.

A.G. 555-3. *Radiative Transfer*. Spring. Physical processes involving radiative transfer; radiative equilibrium; mathematical solutions of radiative transfer equation applied to problems such as coherent scattering, line formation, frequency redistribution, gray and non-gray absorption, anisotropic scattering, emission-dominated processes.

A.G. 556-3. *Radiative Processes in Planetary Atmospheres*. Fall, alternate years. Application of radiative transfer theory to problems in planetary atmospheres, with primary emphasis on the earth’s atmosphere: principles of atomic and molecular spectroscopy; infrared band representation; absorption and emission of atmospheric gases; radiation flux and flux divergence computations; radiative transfer and fluid motions; additional applications such as inversion methods for atmospheric models, etc. Prer., A.G. 555 or consent of instructor.

A.G. 560-3. *Introduction to Astrophysics*. Fall. Introduction to basic astronomical data and techniques; stellar classifications; stellar motions; stellar populations, star clusters, HR diagrams, semiempirical approach to stellar evolution; survey of various astrophysical disciplines.


A.G. 583-3. *Solar Physics*. Fall, alternate years. Topics include solar interior; energy source, neutrino deficit, and energy transfer by radiation and convection; structure and energy balance of the photosphere, chromosphere, corona and solar wind; solar activity cycle, including sunspots, flares, and coronal evolution. Prer., or coreq., A.G. 515, 540, and 555 or equivalent.


A.G. 614-3. *Astrophysical Fluid Dynamics*. Spring, alternate years. Varying topics in modern application of nonlinear fluid dynamics in astrophysics. Topics will include compressible convection in stars, including the coupling to rotation and magnetic fields; acoustic-gravity waves and pulsational modes; dynamics of accretion discs and mass exchange in binary systems; steady turbulence; stellar winds. Prer., A.G. 540-541; A.G. 613 recommended.

A.G. 515-3. *Magnetohydrodynamics*. Fall, alternate years. Development of MHD equations, approximations, MHD flows, waves and
shocks, double adiabatic theory, stability theory, boundary layers, convection, and turbulence. Astro-geophysical applications (will vary somewhat according to instructor). Prereq. A.G. 515, 540.
A.G. 624-3. Physics of Planetary Airflows. Fall, alternate years. Theory of the physical processes that lead to the excitation of the airflows. Ground- and space-based observational techniques used to measure the nightglow, twilightglow, and dayglow. The determination of the structure and composition of planetary atmospheres from airflow measurements. Prereq. A.G. 515, 520; Phys. 686.
A.G. 640-3. Radio Astronomy. Fall, alternate years. Observations and interpretation of the radio emissions from the sun, planets, and galactic and extragalactic sources. Topics include a limited amount of antenna and receiver theory, the representation of random noise, polarization, and the theory of the physical processes which produce radio emission. Prereq. A.G. 584.
A.G. 650, 651, 652, 653, 654, 655-variable credit. Special Topics in Astro-Geophysics. Intended to acquaint students with current research in astro-geophysics. (Topics vary each semester.)
A.G. 750-variable credit. Reading and Research in Astro-Geophysics.
A.G. 800-30. Doctor's Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.
A.G. 920-variable credit. Independent Study.

BIBLIOGRAPHY

BIOLOGICAL SCIENCES
Students may not receive credit for both MCDB 105-106 and EPOB 121-123-122-124, or Natural Science 123 and 124.

Biology—Environmental, Population, and Organismic
EPOB 100-3. Background in Biological Sciences. This is a 3-credit course designed to provide a background in biology. The course will serve as a general introduction to biological methods and principles.
EPOB 107-4. Introduction to Biology I. Three lect., two rec. per wk. An introductory survey for students educationally disadvantaged in biology and other sciences (i.e., students with inadequate or no high school science course). Includes molecular, cellular, developmental, and organismic emphasis placed on fundamental principles, concepts, facts, and questions. Fulfills one semester of natural science if followed by EPOB 108.
EPOB 121-3. General Biology I. Fall. A concentrated introduction to modern cellular, genetic and evolutionary biology. Emphasis on fundamental principles, concepts, facts, and questions which underlie more detailed consideration later in the core curriculum. Students with a score of 2 on the Advanced Placement Test in biology consult course office; those with scores of 3, 4, or 5 at 66th percentile or higher on the CLEP test, receive 6 hrs. credit and are exempt from course. Consult Course Office for schedule of the CLEP test. Students who transfer credit in biology must consult departmental adviser. Coreq., EPOB 123 for students taking advanced EPOB courses.
EPOB 122-3. General Biology II. Spring. Lect. A concentrated introduction to organisms, homeostasis, development, behavior, and ecology. Emphasis on fundamental principles, concepts, facts, and questions which underlie later, more detailed consideration in the core curriculum. See description of EPOB 121 for information on proficiency tests. Prereq., EPOB 121; Coreq., EPOB 123 for students taking advanced EPOB courses.
EPOB 123-1. General Biology Laboratory I. One 3-hr lab per week. Designed to introduce the beginning student to the process of biological thought and investigation in the laboratory setting. Consists of experiments and exercises which provide an extension of basic concepts presented in four of the main subject areas presented concurrently in the general biology lecture course (EPOB 121): structure, function, genetics, and development of both plant and animal materials. Lab sessions vary from familiarization with biological materials to detailed experimental analyses extending over two lab periods. Living materials will be employed where possible. Coreq., EPOB 121. R. Eaton.
EPOB 201-2. Ecology for Man. Introduction to principles and methods of ecology for students in disciplines other than biology. Lect., discussion, and field or library individual or group projects. Prereq., consent of instructor.
EPOB 203-3. Introduction to Biological Statistics. Lect. and discussion. Introduction to statistical methods for the design and analysis of biological research. Includes such topics as development and testing of hypotheses, field research vs. the controlled experiment, and when to use parametric vs. distribution-free statistics. Prereq., EPOB 121-124 and Math. 110 or equivalent. S. Bernstein.
EPOB 305-3. Heredity and Society. Relevance of heredity and evolution to contemporary problems in medicine, behavior, agriculture, and other societal concerns. For freshmen and sophomores. Not for biology majors.
EPOB 310-3. Plants and People. Spring. Lect., demonstrations. Introduces botanical studies and emphasizes the role of plants in human affairs. Covers the major uses of plants for foods, fibers, shelter, fuels, medicines, and industrial raw materials as well as some less fundamental uses such as flavorings, perfumes, poisons, dyes, stimulants and ornamentals. Prereq., EPOB 121-122, 123-124, or equivalent. R. Byg.
EPOB 316-3. History of Biological Communities. 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; ecolonal instability in North America; extinction of large mammals; why environmental planning ignores historical perspective. H. Schach.
EPOB 317-3. Arctic and Alpine Ecology. Spring. Deals with the biology of arctic and alpine environments, the limiting physical factors (such as geomorphology and climatic history), and the human

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interaction with cold stressed environments, especially the arctic. Field trips are required. Prereq., introductory biology, geology, or geography. H. Nichols.

EPOB 318-2. Principles of Taxonomy. Fall, alternate years. Lect., practical exercises. Biological principles, logic, classification, identification, and nomenclature are introduced. Course is intended for all biology majors as a necessary element for a well-trained student. Prereq., EPOB 105 or equivalent. H. Smith


EPOB 323-2. Introduction to Evolution. Designed to introduce both science and non-scientific students to modern evolution. Traces the historical development of evolutionary thought, which is central to modern life science, and surveys the kinds of substantiating evidence. Prereq., EPOB 121-124. J. Bock.

EPOB 340-4. Microbiology. Lect., lab. Survey of microbiology. Emphasis on prokaryotes with general consideration of viruses as well as eukaryotic microorganisms. Includes microbial concepts and methodology, and a survey of distinguishing characteristics of microorganisms based on structural-functional relationships. Nutritional-biochemical prototypes, and ecological roles. Consideration is given to taxonomy, growth, physical-chemical agents of control including antibiotics, metabolism, genetics, and evolution of microorganisms. Introduction to various aspects of applied microbiology is presented with emphasis on infectious diseases, basic concepts of immunology and microbial ecology. Prereq., EPOB 121-124 and college chemistry. Organic chemistry recommended. W. Shull and W. Segal.


EPOB 343-5. Human Physiology. Three lect., one 3-hr. lab. and rec. per wk. An introduction to human physiology primarily for students in pharmacy and allied health programs. May be counted towards EPOB major. Prereq., EPOB 121-124, and one year of college chemistry.


EPOB 348-3. The Biology of Nutrition. A functional approach to human nutrition with emphasis on the roles of nutrients under normal conditions in the biochemistry and activities of the body and its constituent cells, on the physiology of digestion, and on the chemistry, sources, and functions of macro- and micro-nutrients. Nutritional balance, interactions, and the problems and control of obesity are studied. In nutrition of experimental animals, the principles of nutrition are explored. Prereq., general biology (one year), college chemistry (one year). P. Winston.

EPOB 350-4. Plant Kingdom. Provides an introduction to the structure, function, diversity, and evolution of plants. Essential to students anticipating further botanical studies. Provides a survey of plant types with an emphasis on the diagnostic features of plants in general and major taxa in specific. Each taxon will be treated from the following points of view: identity, morphology, anatomy, reproduction, ecology, geography, evolution, fossil record, and economic uses. A general survey of elementary plant physiology, plant genetics, and laboratory ecosystem studies is included, enabling students to prepare for more advanced study. Prereq., EPOB 121-124. S. Shushan and P. Weber.

EPOB 351-4. Plant Anatomy and Development. An introduction to the structures of seed plants, especially angiosperms, and the developmental history of these structures. Cell types will be learned, and their location and function in plant tissues and organs will be studied. The laboratory will provide an opportunity to examine plant tissues and to prepare tissues for examination by the light microscope. The role of plant structures in the living plant will be stressed. Prereq., EPOB 121-124 or equivalent. J. Bock.


EPOB 381-4. Insect Biology. An introduction to evolution, ecology, physiology, and behavior of insects. Emphasis on how insects have solved problems, such as maintaining water balance or finding food that are shared by all animals but for which there may be unique solutions among the insects. Agricultural and human health problems related to entomology are discussed. Prereq., EPOB 121-124, or equivalent zoology course. M. Breed.


EPOB 374-5. Developmental Biology. (Same as MCDIS 465.) See MCDIS for course description.

EPOB 385-5. Comparative Animal Physiology. Lect., lab. Introduction to principles of animal physiology, emphasizing physiological control systems and responses to environmental changes. Prereq., one year of college chemistry and EPOB 121-122 and 123-124. Comparative vertebrate anatomy (EPOB 372) is recommended.

EPOB 385-4. Introduction to Animal Behavior. Topics of behavior considered include basic concepts and history of ethology, methods of study, the central nervous system and behavior, motivational systems, the development of behavior, social organization, predator-prey relations, eliminative behavior and chemically mediated communication, aggressive behavior, sexual behavior, parental behavior, play, and communication. Behavioral ecology and the evolution of behavior also are stressed. Prereq., EPOB 121-124 or equivalent, or consent of instructor. M. Bekoff.

EPOB 400/500-3. Teaching of Modern High School Biology. Lect., 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. Closed to freshmen and sophomores. Prereq., EPOB 121-122 and 123-124, or equivalent, and consent of instructor.

EPOB 401-2. Teaching Biology. Offers students a one-term opportunity to assist in teaching of specific laboratory section in EPOB biology under direct faculty supervision. The student must make arrangements with the faculty concerned, the department, and the instructor for the course in which he plans to assist. A student may take this course for credit only once. No credit can be received independent study credit through this program. Prereq., consent of instructor.


EPOB 403/503-3. Limnology. 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, survey of biotic composition of freshwater environments important to modern freshwater ecology are considered, including energy flow, trophic structure, eutrophication, and management of freshwater ecosystems. Prereq., EPOB 121-124. W. Lewis.


EPOB 409/509-4. Biometry. A demanding, problems-oriented methods course in statistical procedures, assumptions, limitations, and applications with emphasis on techniques appropriate to realistic biological problems; 509 includes data file management using interactive computing techniques. Prereq., general biology and Math. 110 or equivalent. M. Grant.

EPOB 410/414/510/514 (2-4). Advanced Ecology. Specific aspects of ecology. Emphasis is on principles of ecology. The course is non-semester course. Topics which have been taught are listed.
here and others may be given: dynamics of mountain ecosystems, tundra ecology, ethnoregion, population dynamics, tropical and in-
sular biology, ecology of furbie, quantitative plant ecology, arctic and
alpine environments. Prereq., EPOB 502. Some courses have additional
pre-requisites. See Schedule of Courses.

EPOB 415/419/515-519 (1-2). Techniques in Ecology. Courses
emphasizing application of modern ecological techniques. One course
offered each semester in topics such as stream biology, aquatic
biology, environmental management and control, techniques in
genealogy. Prereq., EPOB 303. Some courses have additional prereq-
requisites. Staff See Schedule of Courses.

EPOB 425-4. Laboratory Genetics. (MCDB 483.) Laboratory ex-
periments with animal, plant, and fungal species to elucidate principles
of Mendelian genetics, cytogenetics, behavior genetics, and popula-
tion genetics. Part II involves laboratory experiments with bacteria
and viruses to elucidate principles of molecular and microbial
research. Prereq., EPOB 520 or MCDB 384 and/or consent of instructor.
Milton and Soll.

tion of plant populations: Population dynamics, geographic variation,
adaptive strategies and plant-animal co-evolution. Prereq., genetics,
evolution. Y. Linhart.

of population genetics, presenting botanical, zoological, or anthrop-
ological examples. Subjects considered: stochastic and deter-
mind factors which influence changes in frequency of genotypes and
phenotypes. Prereq., genetics. Prereq., EPOB 320 or equivalent.

EPOB 428, 429/528, 532-2 to 4. Advanced Topics in Evolution.
Specialized aspects of organic evolution. Courses offered on an ir-
regular basis include origin and dispersal of flowering plants, repro-
ductive biology of flowering plants, evolution, and speciation.
Prereq., EPOB 320 or equivalent.

EPOB 430, 431/530, 531-2 to 4. Advanced Genetics. Courses of-
fered at irregular intervals dealing with specialized topics in genetics.
Prereq., EPOB 320.

EPOB 432, 433/532, 533-1 to 2. Techniques in Genetics. Courses
offered occasionally involving specific procedures and their applica-
tions in solving genetic research problems. Prereq., See Schedule of
Courses.

EPOB 435, 435/535, 536-2 to 4. Biological Field Studies. Courses
offered during the summer session and occasionally during the
academic year, stressing broad areas of biology and employing field

EPOB 437 to 439-2. Biological Seminar. Designed primarily for
seniors seeking Honors in EPOB Biology. Separate sections may be
available for others. Especially designed for graduates students. Sample
topics include historical biology concepts, impact of biology on modern
times, ecology and the crises of the modern world. Prereq., consent of instructor. See Schedule of Courses.

EPOB 440-4. Pathogenic Microbiology. Lect., lab. Discussions of
infectious diseases selected on basis of various classes of etiologic
agents: bacteria, rickettsia, and viruses. Emphasis on characteristics
do disease agents in relation to mechanisms of disease production,
clinical symptoms and pathology, immunology and serological re-
actions, laboratory diagnosis, and epidemiology. Special consideration
to basic concepts of immunology, including antigen-antibody in-
teractions, structure and function of antibodies correlated with specificity,
and structure of antigen in relation to immunological ac-
tivity. Prereq., EPOB 340 or equivalent. W. Snow.

EPOB 442-3. Microbial Approaches to Environmental Problems.
Principles of microbial ecology, emphasizing the microbial com-
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munity and its microenvironment; colonization, succession and
climax communities; interspecific relationships; interactions of
microorganisms with plants and animals; biochemical roles;
microbial approaches to the solution of various environmental

EPOB 448, 447/548, 547-2 to 4. Advanced Microbiology. Courses
offered each year dealing with specialized topics related to microbial
biological or immunology, microbial physiology, and applied
microbiology. Prereq., See Schedule of Courses.

EPOB 448, 449/548, 549-1 to 2. Advanced Microbiology Lab-
ory. Special techniques related to specific areas of microbial
research or diagnostic work. Examples: immunology laboratory,
microbial physiology laboratory. Prereq., See Schedule of Courses.

EPOB 451/551-4. Plant Ecology. Lect., lab, and field work. Dis-
cussion of the ecosystem concept. Survey of the characteristics of
Colorado ecosystems with special attention to plants of North America in general; adap-
tation; ecological classification of plants. Prereq., EPOB 121-122 or
consent of instructor. J. Marr.

EPOB 453-4. Morphology of Nonvascular Plants. Lect., lab. Algae,
fungi, and bryophytes. Prereq., EPOB 121-124 or college botany.
S. Shuhman.

Prereq., EPOB 121-124 or college botany. S. Shuhman.

EPOB 455, 456/556, 556-2 to 4. Advanced Botany. Special areas of
botany offered each year including courses in algae, myology, my-
lithology, palaeontology, evolution and ecology of domesticated
plants, advanced classification of flowering plants, plants of
Colorado, developmental plant anatomy, Cenozoic paleobotany.
Prereq., See Schedule of Courses.

Functional aspects of botany including advanced general plant
physiology, ecological plant physiology, plant growth and develop-
ment in sterile culture. Prereq., See Schedule of Courses.

courses offered at irregular intervals or during summer sessions. Ex-
amines field botany, plants of Colorado. Prereq., See Schedule of
Courses. Staff.

EPOB 465/565-5. Invertebrate Zoology. Lect., lab. Morphology,
physiology, ecology and systematics of invertebrates; emphasis on
recent additions to class. Modern classification. Prereq., EPOB 361 or 363. Prereq., EPOB 121-124 or college
botany. J. Bushnell.

EPOB 467, 468/567, 568-2 to 4. Advanced Invertebrate Biology.
Courses dealing with specific taxa and/or special aspects of
invertebrate biology. Topics include insect taxonomy, aquatic
invertebrate zoology, biology of social insects, benthic aquatic

EPOB 469, 470/569, 570-1 to 2. Advanced Invertebrate Biology
Laboratory. Laboratory courses dealing with special taxa and/or
special aspects of invertebrate biology. Prereq., See Schedule of
Courses.

EPOB 472/572-4. Vertebrate Micronatomy. Lect., lab. Analysis of
vertebrate histology and preparation of vertebrate tissues for light
microscopic examination. Especially useful to students of vertebrate
anatomy, development, and physiology. Prereq., EPOB 121-124 and
one of the following: comparative vertebrate anatomy, comparative
animal physiology, or vertebrate embryology.

EPOB 474/574-3. Biology of Amphibians and Reptiles. Com-
parative morphology, taxonomy, ecology, and geographic distribu-
tion of amphibians and reptiles. For lab. See RBP 479, 480/580.
Prereq., EPOB 121-124 or equivalent.

EPOB 475/575-3. Ornithology. Lect., lab., discussion. Origin, evolu-
tion, distribution, physical and behavioral characteristics, and tax-
onomy of orders and families of birds of North America; field work
with local species emphasizing avian ecology. Prereq., EPOB 121-122,
302, or consent of instructor.

Origin, evolution and adaptation, geographic distribution, ecology,
and taxonomy of mammals; field and laboratory study of Colorado
species. Prereq., EPOB 302, or consent of instructor.

Special aspects of vertebrate biology such as ichthyology, experi-
mental embryology, biology of freshwater fishes, vertebrate natural
history. Prereq., See Schedule of Courses.

EPOB 479, 480/579, 580-1 to 2. Advanced Vertebrate Biology
Laboratory. Laboratory courses dealing with special taxa and/or
special aspects of vertebrate biology. Prereq., See Schedule of
Courses.

EPOB 481, 482/581, 582-2 to 4. Animal Field Studies. Field-
oriented course in animal biology. Courses are typically taught at
locations other than the Boulder campus. Prereq., See Schedule of
Courses.

EPOB 485/585-3. Vertebrate Physiology. Lect. Physiology of verte-
brate organ systems with special emphasis on regulatory processes
providing for adaptation to environmental pressures. Prereq., EPOB
385. C. Snyder.

EPOB 488/588-3. Environmental Animal Physiology. A broad con-
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EPOB 489, 490/589, 590-2 to 4. Advanced Animal Physiology. Specialized areas of physiology including invertebrate physiology, cell physiology, vertebrate reproduction, and others. Prer., see Schedule of Courses.

EPOB 491, 492/591, 592-1 to 2. Techniques in Animal Physiology. Laboratory courses dealing with special techniques employed in various aspects of physiological research. Examples: techniques in endocrinology, instrumentation, vertebrate physiology laboratory. Prer., see Schedule of Courses.

EPOB 495/595-1 or 2. Animal Behavior Laboratory. Exposes student to methods of data collection and analysis in behavioral studies. Students conduct original research projects. Prer., consent of instructor. M. Bekoff.


EPOB 497/597-3. Neurobiological Bases of Behavior. Introduction to structure and physiology of neurons followed by neuroethological analysis of how neurons are organized into assemblies which generate behavior. Emphasis on simple systems in both vertebrates and invertebrates. Prer., one upper division course in physiology or behavior. E. Footer.

EPOB 498, 499/598, 599-1 to 4. Advanced Ethology. Special areas of ethology such as sociobiology, animal communication. Prer., see Schedule of Courses. M. Bekoff.

EPOB 501-1. Seminar: Introduction to Biological Research. In-depth discussions on areas of biological research presented in EPOB biology. Required of all first year graduate students in EPOB biology. Prer., see Schedule of Courses.


EPOB 512-2. Advanced Primate Ecology and Behavior Seminar. A seminar course for seniors and graduate students with lectures, discussions, and student presentations on current topics in primate distribution and abundance, population ecology, group dynamics, social behavior, and behavioral ecology. Prer., Anth. 300, EPOB 395, or consent of instructor. Southwick.

EPOB 610 to 619-2. Seminar in Environmental Biology. Open only to graduate students.

EPOB 620 to 629-2. Seminar in Population Biology. Open only to graduate students.

EPOB 630 to 639-2. Seminar in Organismic Biology. Open only to graduate students.

Note: No student may receive independent study credit for assisting in the operation and/or teaching of any laboratory section.

EPOB 940-1 to 3. Independent Research (Undergraduate). Consent of instructor required.

EPOB 941-1 to 3. Independent Study (Undergraduate). Consent of instructor required.

EPOB 950-1 to 3. Independent Study. Consent of instructor required.

EPOB 960-1 to 3. Independent Research in Environmental Biology. Consent of instructor required.


EPOB 962-1 to 3. Independent Research in Organismic Biology. Consent of instructor required.

Biography—Molecular, Cellular, and Developmental

MCDB 105-4. 106-4. Introduction to Molecular, Cellular, and Developmental Biology. Fall, Spring. Three lect., one 2-hr. lab, per wk. Designed to prepare MCDB majors and other science majors for upper division MCDB courses. Nonscience majors who seek to understand modern biology and its implications for the future of humankind are encouraged to enroll. Origin and evolution of life; structure of biological macromolecules and molecular associations; structure and function of cells; sources of energy and materials for life; reproduction; molecular and Mendelian genetics; growth, development and death; multicellularity; organismal physiology; communities of organisms. Lab, sections stress carrying out actual experiments, and provide time for questions and discussion of lect. material. Prer., high school chemistry and algebra. MCDB 105 prer. for 106. Bever, Dubin, Prescott.

MCDB 311-3. Cell and Tissue Biology. Fall. Same as MCDB 312 except no lab., three lect./wk. This course does not carry credit toward the MCDB major or the distributed studies major with MCDB as the primary subject. Such majors must take MCDB 312. Prer., MCDB 106 or EPOB 123. Bonneville, McIntosh, Staehelin.

MCDB 312-4. Cell and Tissue Biology. Fall. Three lect., one lab. per wk. Major emphasis on correlation of cell and tissue fine structure and function. Laboratory provides opportunity for first-hand experience with modern techniques. Required for MCDB and distributed studies majors with MCDB as the primary subject. Recommended for students planning careers in health sciences. Prer., MCDB 106 or EPOB 122-124. Bonneville, McIntosh, Staehelin, Birc. 

MCDB 313-4. Histophysiology; Structure and Function of Vertebrate Organ Systems. Spring. Three lect., and one lab. per wk. Function and microscopic anatomy of major vertebrate organ systems with emphasis on correlations between structure and function, particularly at cellular and tissue levels. Topics presented include integumentary, digestive, urinary, respiratory, circulatory, endocrine, reproductive, and immune systems. Prer., MCDB 312 or consent of instructor. Bonneville, Porter.


MCDB 346-2. Biology of Early Mammalian Development. Fall. Knowledge gained from domestic and laboratory mammals will be related to known events in human reproduction. The focus will be on the period between final maturation of germ cells through initiation of intrauterine pregnancy. Topics include: early embryo development, early embryogenesis, embryo viability, and implantation. Prer., MCB 106-108, or consent of instructor.


MCDB 401-V, 402-V. Teaching MCDB Biology. Fall, Spring. Practice teaching in college-level courses in MCDB. Students will experience laboratory teaching; participate in holding discussion sections, review sessions, and office hours; and carry out special projects. Prer., instructor consent.


membranes and action potential, synaptic transmission and integration, organization of CNS, visual system, and developmental topics. Pre., two sem. credits, biology, chemistry and physics, one of calculus. Credit for concurrent. Instructor: Dubin.

**MCDB 420/520-2. Topics in Plant Cell Biology, Ultrastructure, and Morphogenesis. Spring.** Instructor and possibly students present lectures, seminars, and papers on selected contemporary problems in morphogenesis, sexuality, physiology, and cell division among higher and lower plants. Instructor consent for nonbiology majors. Pickett-Heaps.

**MCDB 422/522-3. The Plant Cell—Diversity of Form and Function. Fall.** Three lect. per wk. Structure and ultrastructure of a wide variety of plant cells including algae and lower plants examined and compared. The correlation of structure with possible function always emphasized; the variation and diversity in both form and role of cell organelles and their control mechanisms demonstrated. Instructor consent for nonbiology majors. Pickett-Heaps.

**MCDB 423/523-1. The Plant Cell Laboratory.** One meeting per week; time and place to be arranged to avoid conflicts. Limited to those taking (or who have taken) MCDB 422/522. Various algae and lower plants will be studied in conjunction with the detailed work covered in MCDB 422/522. Pickett-Heaps.


**MCDB 460/560-2. Cell and Tissue Interactions in Development. Spring. Two lect., two labs, per wk. Theoretical and practical aspects of investigating current problems in regulatory controls for developmental events. Emphasis will be on the evaluation of hypothesis, design of experiments, and applied laboratory techniques for study of embryonic changes. Pre.: embryology or developmental biology. Runner.

**MCDB 485-3. Developmental Biology. (Same as EPOB 374.) Spring.** Analysis of development with emphasis on cellular and molecular mechanisms. Topics covered include descriptive embryology, control of gene expression in eukaryotic cells, mechanisms of differentiation, and morphogenesis. Primary attention is given to vertebrate development, but other systems are also discussed where appropriate. Pre.: MCDB 312, 384; MCDB 466 must be taken concurrently. Ham, Hirsh.


**MCDB 488/588-3. Mechanisms of Aging. Fall.** Aging studied as a developmental process with emphasis on the cellular and molecular mechanisms involved. Pre.: MCDB 312, 384, and 461 or 462. Ham.

**MCDB 472/572-3. Molecular Biology of Cellular Organelles. Fall.** Examines the functional, biosynthetic, and metabolic interactions between cellular organelles. Topics will include organelle biochemistry, intracellular energy flow, bioenergetics, and cell evolution. Pre.: MCDB 312, 312, 412, Chem. 481, 482. Peyton.

**MCDB 475-2. Animal Virology. Spring. One 2-hr. lect./wk.** Encompasses the structure, replication, and interactions with the host for both lytic and transforming animal viruses. The diversity of naturally occurring genomic structures and the resulting strategies of infection emphasized. Pre.: MCDB 384, Chem. 482, or instructor consent. Dann.

**MCDB 480-2. Microtechniques. (Same as EPOB 480.) Spring.** Training in preparation of specimens for light microscopy; designed for students needing this skill to carry out future research or as job training. Bonneville, Winston.

**MCDB 481-2. Developmental Genetics. Spring.** Genetic investigations of mechanisms that control gene expression in developing organisms. Results from genetic studies correlated with current knowledge of control processes at the level of DNA replication, RNA synthesis, and protein synthesis. Pre.: MCDB 384, McConkey.

**MCDB 488-3. Human Biochemical Genetics. Fall.** The human organism as a genetic system. Effect of mutation on protein structure and function; biochemical basis of human genetic diseases; immunogenetics; polymorphic gene loci; gene mapping; impact of human genetics on medicine and society. Pre.: MCDB 384, McConkey, Kueppel.

**MCDB 480/580-3. Workshop in Electron Microscopy. Spring. Lab. experience in operation of electron microscope and techniques for preparation of specimens including fixation, thin sectioning, freeze-etch, positive and negative staining; and limited experience with histochemical procedures and electron opaque tracer techniques. Pre.: MCDB 312 and consent of instructor. MCDB 501 must be taken concurrently. Bonneville, Porter.

**MCDB 481-1. Techniques in Molecular Microscopy. Spring.** Two lect., two dem. per wk. for first five weeks of semester. Introduction to the electron microscope and techniques for preparation of specimens including fixation, thin sectioning, freeze-etch, positive and negative staining, histochemical procedures, and electron opaque tracer techniques. Pre.: MCDB 312 and consent of instructor. Bonneville.

**MCDB 505-3, 508-3, 507-3, 508-3. Core Courses in Molecular, Cellular, and Developmental Biology 14V. Fall.** Covers classes most six hrs. per wk. throughout fall and spring semesters. One course is six weeks. The four courses are tightly integrated to provide an advanced overview of life processes at the molecular, cellular, and developmental level, as well as an introduction to current research in these areas of biology. Emphasis is placed on correlating information derived from pro- and eukaryotic cells. The course is divided into segments, team-taught by two to four faculty. Topics include structural and functional organization of bacteria, animal, and plant cells; energy metabolism; enzymes; structure, function, and assembly of membranes, microtubules, microfilaments; photosynthesis; nucleic acids; units of molecular memory; DNA replication, recombination, transcription, replication, mutation, and genetic mapping; translation and posttranslational control; host-virus interactions; evolution of patterns of gene expression; hormones; morphogenesis of complex viruses and subcellular structures; inheritance of cytoplasmic and cortical structures; developmental fields in morphogenesis and regeneration; cell lineage patterns in development; cytoplasmic determinants versus morphogenetic gradients. A detailed outline of each course can be obtained from the department. Students interested in taking only one course segment can do so by signing up for MCDB 581, Special Topics, with consent of instructor.

**MCDB 513-2. Advanced Topics in Electron Microscopy.** Spring, even-numbered years. Two lect. per wk. with occasional demonstrations or lab. sessions. Topics beyond introductory stage and recent developments of current interest in advanced biological research. Elements of electron optics, image optimization, image formation and magnification, resolution, various modes of ultramicroscopy (including CTEM, STEM, HREM), stereoscopy of cells and tissues, image processing, specimen quantitation, visibility of atoms, autodistribution, applications to molecular biology, elements of electron diffraction. Specimen preparation stressed only incidentally. Some familiarity with electron microscopy desirable. Pre.: introductory biology or MCDB 480-580 or Phys. 112, 301, 302 or instructor consent. Fetino.


**MCDB 573-1. Current Topics in Neurobiology. (Same as EPOB 589.) Spring.** One two-hr. lecture-discussion every two weeks. Invited speakers will discuss new research findings. Intended for students with at least one prior course in neurobiology. A. Beloff, M. Dubin, R. Eaton.

**MCDB 573-3. Animal Virology. Spring.** Same as MCDB 475, with one additional meeting per week for the purpose of further discussion and a critical review of the literature. Pre.: MCDB 384, Chem. 482, or consent of instructor. Dann.

**MCDB 576-2. Bacteriophage T4 Genetics and Development.** Discussion of classic and modern T4 genetics. The regulation of gene expression at all possible levels will be studied as well as the biochemistry of recognition of May 1982. Pre.: MCDB equivalent and MCDB 384. Instructor consent. Gold.
MCB 577-1. Fine Structure of Chromosomes. Review and analysis of the current research on the organization of genes within chromosomes, including new techniques in recombinant DNA and DNA cloning. Must be repeated. Pre.: biochemistry and molecular genetics. Instructor consent. Present.


MCB 580-2. Aspects of Prokaryotic and Eukaryotic Development. Consists of seminar presentations on current research and research literature in bacteriology and molecular genetics, with emphasis on the embryonic development, with emphasis on macromolecular processes, and in nematode development. May be repeated. Instructor consent. St. Paul.

MCB 591, 592, variable credit. Special Topics. Special courses are offered for special courses such as those offered to present visiting lecturers or for courses offered on an intermittent basis.

MCB 685-2, 687-2, 698-2. Current Literature Seminar: Molecular Biology, Cellular Biology, Developmental Biology. This series of courses is designed to prepare graduate students in oral presentation and critical reading of the literature. Each section meets 2 hrs. per wk. Students select a number of current topics from the literature. Seminar section is offered in MCB 690-2, Seminar Practicum. Designed for graduate students to practice oral presentation of their own research, fielding questions and responding to critical. Staff.

MCB 801-variable, 802-variable. Graduate Seminar. Fall, Spring. MCB 700-variable credit. Master's Thesis. Students seeking a master's degree should consult a departmental advisor. Plan II only.

MCB 900-30. Doctor's Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the catalog under Change in requirements for Doctoral Degree.

MCB 930-1 to 6, 935-1 to 5, 940-1 to 6. Undergraduate Independent Study in Molecular Biology, Cellular Biology, Developmental Biology. Instructor consent required. MCB 960-1 to 6, 965-1 to 6, 970-1 to 6. Graduate Independent Study in Molecular Biology, Cellular Biology, Developmental Biology. Instructor consent required.

BLACK STUDIES

BlSt. 203-3. Behavior Analysis I. Fall. A psychology course which deals with the interrelationships between the black individual and his social environment. Social influence upon motivation, perception and behavior. Development and change of attitudes and opinions in the ghetto.

BlSt. 204-3. Behavior Analysis II. Spring. Psychological analysis of small groups, social stratification, and mass phenomena, e.g. riots. Continuation of BlSt. 203.

BlSt. 210-3. Politics of Contemporary Africa I. Fall. An examination of the historical and socioeconomic factors that have influenced the process of politics in post independence Africa.

BlSt. 211-3. Politics of Contemporary Africa II. Spring. Continuation of BlSt. 210 but with emphasis on Africa in the context of world politics and a more in-depth comparative analysis of selected African countries.


BlSt. 216-3. Afro-American History II. (Hist. 216.) Spring. Continuation of BlSt. 215.


BlSt. 221-3. Black Social and Political Thought. Spring. General introductory course designed to acquaint the student with the thinking, writings, and speeches of black people, historical and contemporary. May be repeated. Pre.: biochemistry and molecular genetics. Instructor consent. Present.

BlSt. 222-3. The Black West. Fall. An introduction to the history and sociology of blacks in the Trans-Mississippi West. King.

BlSt. 223-3. Survey of Afro-American Literature I. (Engl. 272.) Fall. Chronological study of Afro-American literature beginning with the 18th century. The Harlem Renaissance, the depression writers, and the writers from the 1960s to the present.


BlSt. 231-1, 236-1, 237-1. Mini Courses in Black Studies. Fall. Three five-week courses in black studies with each meeting 3 hrs. of credit. Topics will vary in accordance with student/faculty interest and availability. One, two, or three of the courses may be taken.

BlSt. 240-2. Afro-American Dance I. Fall. An exploration of various Caribbean and African dance forms, both traditional and choreographed works. Other cultural arts will be studied to accompany and enhance the dance as a total cultural experience. This will include some rituals, musical accompaniment, singing and chanting, and descriptive background data of a particular dance.

BlSt. 241-2. Afro-American Dance II. Spring. A continuation of Afro-American Dance I, but may be taken separately by permission of instructor. Emphasizes the growth of American black dance from the roots of African dance. Technique, movement exploration, and improvisation includes plantation dance, Afro-American heritage dances, blues, and jazz.

BlSt. 255-3. The Black Woman in American Society. Fall. A sociological and psychological examination of the black woman in American society, as revealed in the stereotypes, of sexism and racism, in relationships in the family and with black men, in a historical and contemporary context.

BlSt. 260-3. Introduction to African Literature. (Engl. 270.) Fall, Spring. Survey of African literature from its beginnings to the present; oral tradition, the pioneer writers, market literature, the Nihilist movement, and some major contemporary writers like Achebe, L. Serafina, and others. Also, some theoretical questions concerning second-language literatures.


BlSt. 270-3. African-American Art History I. (F.A. Hist. 270.) Fall. Survey of selected traditional West African culture. Specific cosmological beliefs will be illustrated with visual manifestations. These manifestations are symbols of tradition for the African and art objects for the Western collector.


BlSt. 280-3. Afro-American Music History and Appreciation I. Fall. A history of black music. The African background studied as well as the influences of Europe and the Caribbean. Afro-American folk music studied in detail.

BlSt. 281-3. Afro-American Music History and Appreciation II. Spring. Music since 1900, religious and secular. The development of jazz and modern rhythm and blues today. Black musicians and their technical development also studied. Continuation of BlSt. 280.

BlSt. 285-3. Development of Caribbean Literature. Fall. (Engl. 271.) An examination of some important literary works of the 20th century Afro-Caribbean writers. Emphasis will be placed on the cultural, historical, and social traditions which this writer represents.

BlSt. 300-3. Sex and Racism. This course will examine the current black-white psychosexual syndrome which has resulted from the peculiar historical-sexual interaction between the two groups in America from the time of the Negro importation.

BlSt. 302-3. Selected Topics in Black Studies. Spring. Intensive examination of a particular topic, theme, issue, or problem concerning the black presence as chosen by the instructor. Sample offerings could include the black family institution.

BlSt. 310-3. Black Religious Life in America. Fall. The intent of this course is to explore and assess the religious aspect of the black experience. Topics covered include the origins development and mul-

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tiple functions of the church; certain religious attitudes, beliefs, and practices; and some discussion of the black theology question.


B.L.S.t. 370-3. Culture, Racism, and Alienation. Fall, Spring. Investigates the effects of racism on the individual personality of the recipient and the donor of practices evolving from participation in a racist culture.


B.L.S.t. 415-3. Pre-Colonial History of West Africa I. (Hist. 417.) Fall. Survey of West African history from earliest times through the state systems up to the European beginnings and the slave trade.

B.L.S.t. 416-3. Pre-Colonial History of West Africa II. (Hist. 418.) Spring.

B.L.S.t. 450-3. Research Methods in Black Studies I. Fall. Preparations for empirical inquiry in black studies. Emphasis on philosophy of science concerns and skill acquisition. Students submit rigorous, executable research design for the investigation of a specific problem, topic, or issue germane to black people for credit.

B.L.S.t. 451-3. Research Practice in Black Studies. Spring. Research apprenticeship with emphasis on skill development. Students execute in library, field, or laboratory the research design developed in B.L.S.t. 450. Prer., B.L.S.t. 450 or consent of instructor.

B.L.S.t. 476-3. Contemporary Afro-American Literature I. (Engl. 472.) Fall. An advanced in-depth study of the works of prominent Afro-American novelists and poets of the traditional school, e.g., Wright, Gaine, Ellison, and Morrison. Their works will be studied in terms of their literary, intellectual, and political values.

B.L.S.t. 477-3. Contemporary Afro-American Literature II. (Engl. 473.) Spring. A nontraditional and experimental examination of the literature of the black arts movement of the 1960s and 1970s. Students will examine the works of such authors as Baraka (LeRoi Jones), Don L. Lee, William Melvin Kelby, and Ishmael Reed.

B.L.S.t. 480-3. The African Novel. (Engl. 470.) Fall. In addition to a detailed study of works by distinguished African novelists, examines such areas as the indigenous and foreign antecedents of African fiction and possibilities of the novel as a reflector of changing minds and attitudes.

B.L.S.t. 480-3. Critical Approaches to African Literature. (Engl. 471.) Spring. Since the emergence of modern African literature in European languages, the issue of authentic critical standards has become crucial. Course explores various dimensions of the argument while trying to determine the possibility of a distinctly African critical theory.

B.L.S.t. 910-variable credit. Independent Study. Arranged with consent of instructor.

B.L.S.t. 940-variable credit. Independent Study. Arranged with consent of instructor.

B.L.S.t. 949-variable credit. Independent Study. Arranged with consent of instructor.

CHEMISTRY

Chem. 100-2. Preparatory Chemistry. Fall, Spring. Lect. and rec. For students with no high school chemistry or a very poor chemistry background; designed especially to prepare students for entrance to Chem. 103. Students whose academic plans require Chem. 101-102 should not take this course. Chem. 100 does not count toward fulfilling natural science requirement.) Prer., one year of high school algebra or concurrent registration in Math 110. Students must perform satisfactorily in this course to go on to Chem. 103.

Chem. 101-4. Elements of Analytical, Inorganic, and Physical Chemistry. Fall, Lect. and lab. First course in principles of chemistry. Chem. 101-104 satisfies half the natural science requirement of the College of Arts and Sciences and meets the chemistry requirement for nursing, physical therapy and physical education. Prer., high school algebra.

Chem. 103-5. General Chemistry. Fall, Spring. Lect., rec., and lab. A first college chemistry course for students with adequate high school chemistry whose academic plans require advanced work in chemistry or who wish to satisfy the natural science requirement at a more advanced level than Chem. 101-102. Prer., one year of high school chemistry or satisfactory performance in Chem. 100.

Chem. 104-4. Introduction to Organic and Biochemistry. Fall, Spring. Lect., rec., and lab. Essential topics in organic and biochemistry. Chem. 101-104 or Chem. 103-104 completes the chemistry requirement for nursing majors and constitutes a general physical education requirement; satisfies one year of the natural science requirement. Prer., Chem. 101, 103, or 107. Chem. 104 does not replace Chem. 106 or 108 as a prer for Chem. 331 or 335.

Chem. 106-5. General Chemistry. Fall, Spring. Lect., rec., and lab. A continuation of Chem. 103 for students going on to advanced chemistry. Includes structure, types of bonding, transition metal chemistry, and quantitative analytical techniques. Prer., Chem. 103 or equivalent, with a grade of C or higher.

Chem. 107-5. General Chemistry. Fall, Lect., rec., and lab. A higher level, low enrollment freshman course for well-prepared students who expect to major in chemistry, chemical engineering, physics, or molecular biology. Prer., one year each of high school chemistry and physics and high scores on SAT or ACT mathematics placement examination; four years of high school mathematics recommended.

Chem. 108-5. General Chemistry. Spring, Lect., rec., and lab. Continuation of Chem. 107. Prer., Chem. 107 or permission of instructor.

Chem. 331-4. Organic Chemistry. Fall, Spring. Three lect., one lab. per wk. For nonchemistry majors. Topics include structure and reactions of alkanes, alkenes, alkynes, aromatic molecules, and alkyl halides; nomenclature of organic compounds; stereochemistry; reaction mechanisms; and chemical and spectroscopic methods of structure determination. Prer., Chem. 106 (or 108) with a grade of C or higher.

Chem. 332-4. Organic Chemistry I. Fall, Spring. Three lect., one lab. per wk. For nonchemistry majors. Topics include structure and reactions of alcohols, ethers, carboxylic acids, aldehydes, ketones, and amines; introduction to the chemistry of heterocycles, carbohydrates, and amino acids; nomenclature of organic compounds; synthesis; and reaction mechanisms. Prer., Chem. 331 with a grade of C or higher.

Chem. 335-5. Organic Chemistry. Fall, Spring. Three lect., two lab. per wk. Required course for chemistry majors. Topics include structure and reactions of alkanes, alkenes, alkynes, aromatic molecules, and alkyl halides; nomenclature of organic compounds; stereochemistry; reaction mechanisms; and chemical and spectroscopic methods of structure determination. Prer., Chem. 106 (or 108) with a grade of C or higher.

Chem. 336-5. Organic Chemistry. Fall, Spring. Three lect., two lab. per wk. Required course for chemistry majors. Topics include structure and reactions of alcohols, ethers, carboxylic acids, aldehydes, ketones, and amines; introduction to the chemistry of heterocycles, carbohydrates, and amino acids; nomenclature of organic compounds; synthesis; and reaction mechanisms. Prer., Chem. 335 with a grade of C or higher.

Chem. 338-1 or 2. Organic Laboratory I. Fall, Spring. Open only to students who have completed organic lecture at the Chem. 300 level and need beginning organic lab. Controlled enrollment. Lab. sections assigned on a space-available basis. Prer., organic chemistry lecture at the Chem. 300 level.

Chem. 339-1 or 2. Organic Laboratory II. Fall, Spring. Open only to students who have two semesters of organic lect. and one semester of organic lab. at the Chem. 300 level. Controlled enrollment. Students assigned to lab. sections on a space-available basis. Prer., two semesters of organic lecture.


Chem. 418-4. Advanced Quantitative Analysis. Spring. Lect. and lab. Instrumental analysis, including separations and measurements by gas, liquid, and thin layer chromatography, potentiometry and other electrochemical methods; visible, ultraviolet, infrared, and atomic absorption spectroscopy; titrimetry and other analytically important applications of equilibrium theory. Prer., Chem. 451.

Chem. 440-1. Scientific Glassblowing. Fall, Spring. Lab. An introductory course in scientific glassblowing which allows the student an opportunity to develop sufficient skills in glass manipulation to design, fabricate, and repair glass apparatus.

Chem. 450-3. Physical Chemistry. Thermodynamics and related topics with emphasis on macromolecules and biological applications.
Includes thermodynamics, chemical and physical equilibria, solution chemistry, transport properties, and multiple-site binding phenomena. Alternative to Chem. 451, designed for biochemistry option and biology majors. Students may not take both 450 and 451. Chemistry majors are expected to take Chem. 450 prior to or concurrently with Chem. 451. Prereq.: Phys. 111, Math. 130, 200, and 240, two years of chemistry courses, or consent of instructor. Coreq.: Phys. 112.


Chem. 452-3. Physical Chemistry. Fall, Spring. Lect. Introduction to quantum chemistry with applications to molecular spectroscopy, the nature of chemical bonding, the electronic structure of conjugated hydrocarbons, and magnetic resonance spectroscopy. Prereq.: Chem. 335, Phys. 112, 114, and Math. 240 or equivalent courses. Chem. 451 and 452 may be taken in any order.


Chem. 454-2. Physical Chemistry Laboratory. Fall, Spring. One lect. and one 3 hr. lab. per wk. Instruction in the experimental techniques of modern physical chemistry. Emphasis on experiments illustrating the fundamental principles of chemical thermodynamics, quantum chemistry, statistical mechanics, and chemical kinetics. Prereq.: Chem. 450 or 451 or equivalent course in thermodynamics; coreq.: Chem. 452 or 453.

Chem. 455-3. Experimental Physical Chemistry. Fall, Spring. One lect. and two 3 hr. labs. per wk. Instruction in the experimental techniques of modern physical chemistry with emphasis on experiments illustrating the fundamental principles of chemical thermodynamics, quantum chemistry, statistical mechanics, and chemical kinetics. For chemistry majors. Prereq.: Chem. 450 or 451 or equivalent course in thermodynamics; coreq.: Chem. 452 or 453.

Chem. 481-3. General Biochemistry. Fall, Spring. Lect. Topics include structure, conformation, and properties of proteins; enzymes; mechanisms and kinetics; intermediary metabolism; Krebs cycle, carbohydrates, lipids; energetic and metabolic control; electron transport and oxidative phosphorylation. Prereq.: one year of organic chemistry.

Chem. 482-3. General Biochemistry. Fall, Spring. Lect. Continuation of Chem. 481. Metabolism of lipids, amino acids and nucleic acids; photosynthesis; biosynthesis and function of macromolecules including DNA, RNA, and proteins; biochemistry of subcellular systems; and special topics. Prereq.: Chem. 481.


Chem. 484/584-3. Biochemistry of Complex Carbohydrates. Lect. Detailed consideration at the current research level of the chemistry, biosynthesis, and biological functions of the glycoproteins, glycolipids, and polysaccharides of micro-organisms, plants, and animals. Prereq.: Chem. 481 or equivalent.

Chem. 486-4. Biochemistry Laboratory. Fall, Spring. Introduction to modern biochemical techniques. Topics include enzymology, spectrophotometry, electrophoresis, affinity chromatography, radioisotopes, membrane structure, immunochemistry, and nucleic acid chemistry. Prereq.: Coreq.: Chem. 481 or 453.


Chem. 511-1. Instructional Methods in Chemistry. Fall. Lecture, discussion, and practicum in teaching strategies for undergraduate chemistry courses. Includes applications of Piaget's theories to instruction in chemistry, application of Bloom's taxonomy to questioning skills, ways to tutor, reinforcement theory and writing instructional objectives, exam and quiz questions. Required of all chemistry teaching assistants. This course will not count toward a graduate degree.

Chem. 516-2. Survey of Methods of Analysis. Fall, Lect. Special topics in chemical analysis, such as electron spectroscopy, thermal methods, fluorescence spectroscopy, atomic absorption spectroscopy, biophysical chemistry, and environmental analytical chemistry. Emphasis on analytical applications. Prereq.: Undergraduate physical chemistry or consent of the instructor.

Chem. 517-3. Advanced Analytical Chemistry. Fall, Lect. Electrochemical methods of analysis, analytical instrumentation. Topics will include basic theory, instrumentation, analytical and research applications, fuel-cells and photovoltaic devices. Prereq., Undergraduate physical chemistry or consent of the instructor.


Chem. 550-3. Chemical Dynamics. Fall. Lect. Discussion of mechanism and rate of chemical reactions from a fundamental point of view. The nature of collision is discussed and the concepts of cross section and rate constant developed. Theory of elementary bimolecular and decay processes are critically examined.


Chem. 552-3. Survey of Chemical Kinetics and Quantum Mechanics. An introduction to chemical kinetics, including the phenomenological discussion of rate laws, an outline of the theories of rate constants and a survey of experimental techniques. An introduction to quantum mechanics with applications to problems in chemistry. Prereq., A basic knowledge of undergraduate physical chemistry.


Chem. 556-3. Physical Chemistry of Macromolecules. Spring, Lect. Structure and conformation of macromolecules; interaction between macromolecules; binding and cooperative phenomena; transport in solution; light scattering; spectroscopic probes of structure and motion.


Chem. 581-3. General Biochemistry. Fall, Spring, Same lectures as Chem. 481. Course work includes library studies and preparation of special reports. Not open to undergraduates. Prereq.: one year organic chemistry;


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Chem. 587-3. Advanced General Biochemistry II. Fall, Lect. In-depth analysis of several of the following subjects: proteins, enzymes, metabolic regulation, biocomponents, photosynthesis, lipids, nitrogen metabolism, transcription, protein biosynthesis; topics in molecular biochemistry. Prer.: Chem. 482 or comprehensive biochemistry.
Chem. 588-3. Advanced General Biochemistry III. Spring, Lect. In-depth analysis of selected topics listed under Chem. 587. For the same academic year different topics will be covered in Chem. 587 and 588. Prer.: Chem. 482 or comprehensive biochemistry.
Chem. 600-3. Departmental Research Seminar. Fall, Spring, 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. Credit for course is 3 hours. 
Chem. 602-1 to 3. Special Topics in Inorganic Chemistry, Lect. on subjects of current interest in inorganic chemistry. Primarily used for graduate level presentations of special topics by visiting and resident faculty, Variable class schedule.
Chem. 613-2. Seminar: Synthetic Chemistry of Transition Metal Compounds.
Chem. 625-1. Seminar: Analytical Chemistry. Fall, Spring, Student, faculty, and guest presentations and discussions of current research in analytical chemistry. Required of all analytical chemistry graduate students. Credit is deferred until presentation of satisfactory seminar.
Chem. 650-1 to 3. Special Topics in Analytical Chemistry, Lect. course on subjects of current interest in analytical chemistry. Used for graduate level presentations of special topics by visiting and resident faculty, Variable class schedule.
Chem. 651-1 to 3. Special Topics in Physical Organic Chemistry. Spring. A course devoted to various topics of current interest in physical organic chemistry. Among the subjects covered in recent years are photochemistry, carbonyl chemistry, molecular orbital methods, gas phase ion chemistry.
Chem. 682-1 to 3. Advanced Topics in Physical Chemistry. Prer., consent of instructor.
Chem. 653-3. Nuclear and Electron Magnetic Resonance Spectroscopy. Spring, alternate years, Theory and application of magnetic resonance techniques to modern chemical problems. Includes a study of Fourier transform NMR, spin labeling and its biochemical applications, spectral analysis, relaxation times and their applications, magnetic resonance and kinetics and other topics, according to the interest of the class. Combines the classical lecture format with a student tutorial approach that allows the individual student wide choices in the selection of study topics. Prer.: Chem. 552 or consent of the instructor.
Chem. 688-3 to 6, 689-3 to 6. Advanced Topics in Biochemistry. Fall, Spring. A detailed study of the current literature relative to one major topic is undertaken each semester. Topics covered on a rotating basis include enzyme kinetics and mechanism; lipids and lipopo-teins; 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 course is 3 hours. The course(s) may be taken for a maximum of 12 hours credit. Prer., one year of biochemistry courses and consent of instructor.
Chem. 689-1. Biochemistry Seminar. Fall, Spring. Required of all biochemistry graduate students. Credit is deferred until presentation of satisfactory seminars. Prer., consent of instructor.
Chem. 692-2. Seminar: Regulation of Transcription.
Chem. 800-30. Doctor's Dissertation. All doctoral students must register for no fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.
Chem. 943-1 to 3. Independent Study in Chemistry. Fall, Spring. For undergraduate study. May be repeated; no limit on total credit. Consent of instructor required.
Chem. 963-1 to 3. Special Topics in Chemistry. Fall, Spring. Prer., consent of instructor. May be repeated; no limit on total credit.

Denver Campus Offering

For details regarding the graduate program offerings on the Denver Campus, please consult the bulletin for the University of Colorado at Denver or contact the associate dean of the Graduate School on the Denver Campus.

CHICANO STUDIES

Ch-St. 101-3. Introduction to Chicano Studies. The following three areas are studied: how social science theory and methodology produce stereotypes, how social problems are attributed to Chicano, and how Chicano create culture.
Ch-St. 102-3. Chicano Fine Arts and Humanities. Provides a foundation for further study of Chicano literature, music, the plastic arts, theatre, and film. Also introduces aesthetic, artistic, and critical concepts and terminology and their applications in Chicano Studies.
Ch-St. 104-3. Introduction to Chicano Literature. Examines contemporary Mexican-American literature from its early concerns with political protest to its present expression of a variety of subjects, themes, and styles.
Ch-St. 127-3. The Contemporary Mexican American. Special attention is given to the following areas of Mexican American life: family life cycle, migration, economic change, social mobility, discrimination (race and sex), issues in education, and political status. Prer., Ch-St. 101 or sophomore standing.
Ch-St. 181-3. History of Latin America. (Hist. 181.) See History for course description.
Ch-St. 201-3. Chicano History to 1848. An introduction to the historical developments of Chicano society and thought from the pre-Columbian period to 1848.
Ch-St. 202-3. Chicano History 1848 to Present. This is an introduction to the historical development of Chicano society and thought from 1848 to the present.
Ch-St. 221-3. Barrio Issues and Problems. The focus in this course is on such problems as abortions, drugs, discrimination, health care, housing, police, religion, sexual identity, and welfare. Students will
be encouraged to analyze these problem areas, choosing one for analysis and problem solving in their term papers. Prec., Ch.St. 101 or 127.

Ch.St. 270. American Indian Religions. (R.St. 270.) See Religious Studies for course description.

Ch.St. 302-3. Field Experience. The objective is to acquaint students with major ethnographic studies on ethnic communities and to teach the qualitative methods as participant observation and depth interviews. Students will be required to do a field study. Prec., Ch.St. 101 or 127.

Ch.St. 312-3. Bilingual Skills—Usage. This course is designed to help students who wish to teach in bilingual, multicultural settings and who seek to develop their understanding of bilingualism.

Ch.St. 313. Study of Chicanoa. Through an interdisciplinary study of history, sociology, literature, images, and folk portraits, this course will provide insight into the present socioeconomic condition of Chicana/o women and the concept of feminismo en el pueblo.

Ch.St. 315-3. Folklore, Mysticism, and Power. Different cultural conceptions of folk healing, mysticism and power are examined. Special attention is given to the practice of folk healing and mysticism in ancient and contemporary society.

Ch.St. 320-4. Research Methods for Bardo Studies. (Sec. 320.) See Sociology for course description.

Ch.St. 321. Chicano Family Structures. Conflict theory, ethnomethodology, structural functionalism, and symbolic interaction are used to discuss the social production of Chicano family structure. Special attention is given to the common sense knowledge that family members use to construct roles within the family and outside the family.


Ch.St. 360. Chicanos and the Mass Media. The psychological, social, and organizational dynamics of the media industry (i.e., TV, radio, newspapers, public broadcasting, and news programming) are examined. Special attention is given to the ways media programs and presentations influence images of Chicanos.

Ch.St. 381. Chicano Poetry. Beginning with an examination of indigenous pre-Columbian roots and later Mexican influences, the course will move to an exploration of contemporary Chicano poetry. The poetry's expression of political protest, history, and such cultural concepts as mestizaje and Aztlán will be analyzed from a variety of critical perspectives.

Ch.St. 382. Survey in Chicano Prose Fiction. Of particular interest to the student investigating literature from an ethnic minority perspective, this course covers the most important Chicano writers of prose fiction of the last three decades. The progression of Chicano fiction from naturalism, realism, and romanticism to post-Modernism will be considered within a range of critical modes.


Ch.St. 400-3. Mexican American Culture of the Southwest. (Span. 400.) See Spanish for course description.

Ch.St. 405-3. Intergroup Relations. (Sec. 405.) See Sociology for course description.


Ch.St. 420. Hispanic Culture. (Span. 420.) See Spanish for the course description.

Ch.St. 423-3. Community and Human Relations of Second Language Speakers. An analysis is made of the Spanish used in Chicano communities. Special attention is given to the understanding of key aspects of cultural perspectives and the home cultures as they relate to language development generally and to such related phenomena as code-switching, self-concept, and home-school-community relations. Special attention is given to the way of life of the U.S. institutions (i.e., legal, economic, educational, governmental, and social agencies) help or hinder Chicanoa. The legitimacy of the following concepts is discussed: internal colonialism, institutional racism, assimilation and acculturation, and identity.

Ch.St. 432-3. Education in a Multilingual Community. (Soc. 432.) See Sociology for course description.

Ch.St. 435-3. The Mexican Revolution. The Mexican Revolution will be studied through a multiperspective approach: films, literature, photographs, historical documents, and chronicles. This approach allows the student to conceptualize a complex event that changed the history and future of Mexico, affecting immigration, cultural, and political patterns of Chicano communities in the United States.

Ch.St. 445-3. Advanced Chicano Writing Workshop. This seminar-style course is for the upper level student interested in writing either original research papers or say area of Chicano Studies or creative fiction (prose, poetry, drama) from a Chicano perspective. Each student will plan individual course syllabi to include approximately four to seven writing assignments, revisions, and group criticism sessions, and conferences with the instructor.

Ch.St. 455-3. Mexican American in Politics. (P.St. 455.) See Political Science for course description.

Ch.St. 460. History of the Chicano in American Labor Movement. Presents a historical and topical analysis of the American labor movement, particularly its ethnic, sexual, racial, and skill divisions. The objective will be to analyze the historical development of the American working class, specifically, its culture, ideology, ethnicity, and union involvement. A major focus will be the Chicano.

Ch.St. 482-3. Chicano Novel in English. Focuses on the period beginning with Pochos to the novels published in the 1970s. The individual works will be considered within the context of both the Chicano movement and contemporary American fiction.

Ch.St. 483-3. Emergence of Modern Mexico. (Hist. 483.) See History for course description.

Ch.St. 485. Special Topics.

Ch.St. 910-variable credit. Independent Study in Chicano Studies. Consent of instructor required.

Ch.St. 940-variable credit. Independent Study in Chicano Studies. Consent of instructor required.

CLASSICS

General Classics

Cl. 101-3. The Study of Words. A study of English words of Latin and Greek origin, focusing on etymological meaning by analysis of component parts (prefixes, bases, suffixes) and on the main types of semantic change which the words underwent in their development.

Cl. 105-3. The World of Ancient Greeks. (Hist. 105.)

Cl. 106-3. The Rise and Fall of Ancient Rome. (Hist. 106.)

Cl. 110-3. Greek Mythology. The Greek myths are documents of early man's imagination, the source of Greek culture, and part of the fabric of the Western cultural tradition. Of particular interest to students of literature and the arts, psychology, anthropology, and history.

Cl. 112-3. Masterpieces of Greek Literature in Translation. Survey of Greek authors whose works have most influenced Western thought: Homer, Aeschylus, Sophocles, Euripides, Aristophanes, Plato.

Cl. 113-2. Masterpieces of Roman Literature in Translation. (Wm.St. 112.) A study of the literature, ideas, and culture of the Roman era.

Cl. 203-3. Topics in Ancient History. (Hist. 203.)

Cl. 204-3. Topics in Ancient History. (Hist. 204.)

Cl. 210-3. Women in Antiquity. (Wm.St. 210.) The evidence of art, archaeology, and literature is examined from a contemporary point of view in a study of the status of women in Greek and Roman antiquity (their role in works of art and literature, attitudes expressed toward them, their daily lives).

Cl. 330-3. Visiting Scholar's Course. Topic to be announced.

Cl. 332-3. Ancient Athletics. An examination of the role of athletics and recreation in Classical Greece, Rome, and the Roman Empire (especially Constantinople) with special emphasis upon
religious and political significance (Olympic Games, etc.) and the philosophical speculations on ethics by Plato, Aristotle, etc.

Clas. 361-3. The Religions of Greece. (Phil. 361.) A history of Greek and Roman religion from its Bronze Age origins to the rise of Christianity. Recommended prere., Clas. 110.

Clas. 402/502-3. Athens and Greek Democracy. (Hist. 402.) A study of Greek history from 800 B.C. (the rise of the city-state) to 323 B.C. (the death of Alexander the Great). The major emphasis is upon the development of democracy in Athens. The reading is in the primary sources.

Clas. 403/503-3. Alexander and the Hellenistic World. (Hist. 403.) The course focuses first on the careers of Philip of Macedon and his son Alexander and second on the Hellenistic Age, especially its culture, from Alexander's death (323 B.C.) to the defeat of Cleopatra and Antony by Octavian in 31 B.C.

Clas. 405/505-3. Greek Constitutional History. A study primarily of Athenian constitutional and legal history with some consideration given to other Greek states.


Clas. 408/508-3. The Roman Republic. (Hist. 408.) A study of the Roman Republic from its foundation in 753 B.C. to its conclusion with the power of Augustus. The major emphasis is upon the development of Roman Republican government. The reading is in the primary sources.

Clas. 409/509-3. The Roman Empire. (Hist. 409.)

Clas. 411/511-3. Greek and Roman Epic. A careful reading in English of the major epic poets of classical antiquity.


Clas. 413/513-3. Greek and Roman Comedy and Satire. A study of Aristophanes, Plautus, Terence, and Roman satire in English translation.

Clas. 418/518-3. Myth in the Arts. (Prec. Hum 101-102. 6 hours classics, or instructor's consent. (Hum 416; C. Lit. 492/592.)


Clas. 425/525-3. Archaeology of Ancient Egypt. (Anth. 432/532.)


Clas. 427/527-3, Pre-Classical Art and Archaeology. (Anth. 427/527; F. A. Hist. 427/527.) Greece and Crete from the Neolithic period to the end of the Mycenaean world.

Clas. 428/528-3. Classical Art and Archaeology. (Anth. 428/528; F. A. Hist. 428/528.) Greek art and archaeology from the end of the Mycenaean world through the Hellenistic era.

Clas. 431/531-3. Etruscan Art and Archaeology. (Anth. 488/588.)

Clas. 432/532-3. Roman Art and Archaeology. (Anth. 498/598; F. A. Hist. 492/592.)


Clas. 483/583-3. Egyptian Hieroglyphics I. (Anth. 483/583.)

Clas. 484/584-2. Egyptian Hieroglyphics II. (Anth. 494/594.)

Clas. 485/585-3. Archeology of Ancient Near East. (Anth. 492/593.)

Clas. 495/595-3. Latin Backgrounds to English Literature: Selected Readings. (Eng. 595.) Key readings from selected Latin authors influential in English literature will be studied in depth using a bilingual text; emphasis will be placed on structure, word placement, dictionary, and meter in order to cast light on the debts of their successors. Prec., Lat. 595-596 or instructor's consent.

Clas. 515-3. Hellenistic Art and Archaeology. (Anth. 595; F. A. Hist. 515.) Topics selected from architecture, vase painting, and sculpture of the third and second centuries B.C.

Clas. 521-3. Classical Greek Art. (Anth. 595; F. A. Hist. 508.) Topics selected from architecture, vase painting, sculpture, prec., Clas. 528/528 or instructor's consent.

Clas. 524-3. Prehistoric Greek Art and Archaeology. (Anth. 595; F. A. Hist. 510.) Topics selected from architecture, pottery, frescoes, and minor arts of the third millennium B.C. Prec., Clas. 427/527 or instructor's consent.

Clas. 548-3. Topics in Roman and Etruscan Art and Archaeology. (Anth. 597; F. A. Hist. 548.)

Clas. 560-3. The Art of translation. (C. Lit. 560.)

Clas. 580-3. Philosophy of Plato. (Phil. 580.)

Clas. 581-3. Philosophy of Aristotle. (Phil. 581.)

Clas. 614-5. Seminar in Archaeology of Selected Areas. (Anth. 614.) Areas to be selected in terms of current research interests.

Clas. 712-3. Seminar in History of Art. (Hist. 712.)

Clas. 930-1 to 3. Independent Study.

Clas. 950-1 to 3. Graduate Independent Study.

Clas. 995-0. Candidate for Degree.

II. Classical Philology


CIP. 604-3. Greek Paleography.

CIP. 609-3. Seminar. Subject to be announced.

CIP. 610-3. Seminar. Subject to be announced.


CIP. 800-30. Doctor's Dissertation. All doctoral students must register for at least 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 under Changes in Requirements for Doctoral Degree.

III. Greek

Undergraduate students who start the study of Greek in college to satisfy the language requirement must take Greek 101, 102, and 311.

Gr. 101-5. Beginning Classical Greek I.

Gr. 102-5. Beginning Classical Greek II. Continuation of Gr. 101. Pre., Gr. 101 or instructor's consent.

Gr. 311-3. Intermediate Classical Greek I. Readings in Plato.

Gr. 312-3. Intermediate Classical Greek II. The reading of two Attic tragedies generally one Euripidean and one Sophoclean. The major emphasis is upon learning to read the dramas with ease and comprehension. Grammar and syntax receive a good deal of attention.

Prerequisites for the following 400-level courses are Greek 311 and 312, or the equivalent.

Gr. 410/510-3. Homer.

Gr. 411/511-3. Greek Tragedy. Selected plays from Aeschylus, Sophocles, and Euripides.

Gr. 415/515-3. Greek Comedy.

Gr. 421/521-3. Lyric Poetry.

Gr. 440/540-3. Attic Orators.


Gr. 451/551-3. Thucydides.


Gr. 489/589-3. Accelerated Beginning Classical Greek I. Taught every other year. For advanced undergraduates and graduate students. Grammar survey, intensive reading. Both semesters required for credit.

Gr. 494/594-3. Accelerated Beginning Classical Greek II. Continuation of Gr. 493/593. For advanced undergraduates and graduate students. Prec., Gr. 493/593 or equivalent. Successful completion of Gr. 594 meets the Graduate School foreign language requirement.

Gr. 500-3. Graduate Reading. Author or topic to be specified in Schedule of Courses. May be repeated.

Gr. 500-3. Advanced Graduate Reading. Materials to be taken from graduate reading list. May be repeated.


Gr. 930-1 to 3. Independent Study.

Gr. 950-1 to 3. Graduate Independent Study.

IV. Latin

Lat. 101-5. Beginning Latin I.

Lat. 102-5. Beginning Latin II. Continuation of Lat. 101. Prec., Lat. 101 or instructor's consent.

Lat. 103-5. Latin Review. For students who have had two years of high school Latin.

Lat. 211-3. Intermediate Latin. Prec., Lat. 102 and 102, or two years of high school Latin. Students with three years of high school Latin will be placed in accordance with their level of proficiency.
The following two courses are intended for persons with four years of high school Latin or two years of college Latin.

Lat. 311-3. Selections From Latin Prose.

All 400-level courses are intended for those who have completed one 300-level sequence.

Lat. 413/513-3. Seneca's Tragedies.
Lat. 432/532-3. Lucretius. The philosophical background to Lucretius' De Rerum Natura; tradition and originality in Lucretius' thought and poetry.
Lat. 455/555-3. Tacitus.

Lat. 490-3. Teacher Training. Offered fall semester in alternate years, to be taken the semester prior to student teaching. Teaching techniques, preparation of materials, professional orientation. Prereq., proficiency test in the translation of Caesar, Cicero, Vergil, Ovid.


Lat. 494/594-3. Accelerated Beginning Latin II. Continuation of Lat. 493/593. For advanced undergraduates and graduate students. Reading of advanced texts: Caesar, Cicero, Ovid. Prereq., Lat. 493/593 or equivalent. Successful completion of Lat. 594 meets the Graduate School foreign language requirement.

Lat. 500-3. Graduate Reading. Author or topic to be specified in Schedule of Courses. May be repeated.

Lat. 600-1. Advanced Graduate Reading. Materials to be taken from graduate reading list. May be repeated.

Lat. 611-3. Comedy.
Lat. 930-1 to 3. Independent Study.
Lat. 950-1 to 3. Graduate Independent Study.

COMMUNICATION

Comm. 101-3. Introduction to Public Communication. Fall, Spring. Introduces concepts that define communication in a variety of contemporary public and mediated contexts. Topics include symbols, myths, and rituals, and the rhetoric of politics, agitation, control, advertising, and entertainment. For communication education majors; for nonmajors.

Comm. 102-3. Introduction to Interpersonal and Small Group Communication. Fall, Spring. Presents an introduction to concepts and related skills that define communication in a variety of face-to-face contexts. Topics include models of communication, meaning, content/relationships, formal gathering, intimacy, and group problems. For nonmajors.

Comm. 203-3. Interpersonal Communication. Fall, Spring. Emphasizes personal aspects of communication. Choice making, choice attribution, risk taking, personal knowledge, creativity, and alternative kinds of interpersonal relationships are central topics. Increased self-awareness, understanding of interpersonal relationships, and improvement of interpersonal skills are dominant goals. Prereq., major in communication or completion of Comm. 101 or 102. Not open to students who have taken Comm. 103.

Comm. 215-3. Organizational and Small Group Communication. Fall, Spring. An introduction to the processes of communication in groups with emphasis on group decision making in organizational settings. Prereq., major in communication or completion of Comm. 101 or 102.

Comm. 230-2. Communication Principles in Instruction. Fall, Spring. Designed for students who intend to enter the teaching profession. Deals with the application of basic communication concepts to the education process. Fulfills the School of Education's communication proficiency requirements and is open to prospective teachers only. Not open to freshmen.

Comm. 260-3. Introduction to Communication Media. Fall, Spring. Public communication systems (speech, writing, film, television, and radio) are explored in historical and contemporary perspectives, with a particular emphasis on the practical, and poetic impact on culture and technology. Required for majors.

Comm. 320-3. Argumentation. Fall, Spring. This class focuses on principles of argument, the process of critical decision making, the uses and limitations of logic and evidence. Contemporary issues (personal, social, political, or philosophical) are analyzed and debated. Prereq., Comm. 205, 215, and 260 for majors, and 101 or 102 for nonmajors. Required for majors.

Comm. 364-3. Communication of Popular Culture. Through an examination of specific topic areas, the role of public communication as it has an impact on cultural values is explored. The student is expected to develop critical skills in assessing this persuasive impact. Prereq., junior major or two of Comm. 101, 260, 290, 100, 225.

Comm. 369-1 to 6. Problems in Communication: Internship. Fall, Spring. Studies are pursued in community based communication research projects. These research projects are generally investigative in nature and require an internship of 10 hours or more per week in the field. (Six hr. limit for major.) Prereq., consent of supervising instructor.

Comm. 418/518-3. Advanced Interpersonal Communication. Reviews perspectives of interpersonal communication and the key variables and research studies that emerge from each perspective. Special attention is paid to the humanistic and dialogic view of interpersonal communication. Assignments include readings, discussion, and experiential methods. Graduate students will be assigned additional work of a more theoretical nature. Prereq., for majors, any three of Comm. 203, 215, 260, 320; for nonmajors, consent of instructor; junior standing or above for all.

Comm. 419-3. Special Topics. Special interest areas of communication research and practice are analyzed in depth. The course format is lecture, discussion, investigative analysis, and practical application. (Six-hour limit in major.) Prereq., instructor consent.

Comm. 420/520-3. Persuasion. Fall, Spring. Persuasion is the study of all the dimensions of communication with an emphasis on oral performance. Attitudes, values, beliefs, ethics, notions of credibility, criticism of effects, and elements of oral presentation are analyzed. Advanced level registration involves the examination and synthesis of current theory, research findings, and societal applications of both. Advanced students are expected to meet writing standards appropriate for theses projects. Prereq., for majors: any three of Comm. 203, 215, 260, 320; for nonmajors, consent of instructor; junior level or above for all.

Comm. 421/521-3. Psychology of Communication. Fall, Spring. Emphasizes applications to communication of selected areas of psychological theory and research. Topics treated may include person perception, interpersonal attraction, learning, symbolic interaction, attitude change, language and meaning, and information theory. Advanced level registration involves analysis of theoretical implication of class materials. Written efforts at this level are critiques by standards appropriate to thesis writing. Prereq., for majors, any three of Comm. 203, 215, 260, 320; for nonmajors, consent of instructor; junior standing or above for all.

Comm. 423/523-3. Nonverbal Dimensions of Communication. Fall, Spring. The study of nonverbal communication focuses on how people communicate in everyday life without words and with signals which accompany words. Special topics of analysis include proxemics (spatial relations), kinesics (body movement), facial expression, eye contact, vocal qualities, touch, personal adornment, and environmental cues. Advanced level registration involves the examination and synthesis of current theory, research findings, and applications of both. Prereq., for majors, and three of Comm. 203, 215, 260, 320; for nonmajors, consent of instructor; junior standing or above for all.

Comm. 424/524-3. Organizational Communication. Fall. Focuses on relationships among such variables as information processing, network analysis, leadership, morale, productivity, decision-making and conflict, and general communication in the organization. The course format is lecture, discussion, and case studies. Advanced level registration involves the examination and synthesis of current special theories, research findings, and applications of both. Advanced students are expected to meet writing standards appropriate for theses.
projects. Prereq: for majors; any three of Comm. 203, 215, 260, 320; for nonmajors, consent of instructor; junior standing or above for all.

Comm. 426/526-3. Communication and Conflict. (C.P.S. 426.) Conflict management is studied from a communication perspective on the interpersonal, intergroup, and small group levels. Attention is given to managing conflict in informal settings and to the productive management of conflict. Assignments include field observations, analysis of actual conflicts, and experiences in intervention methods. Advanced registration required. Prereq: reading primary theoretical works in conflict resolution and criticism of interpersonal, group, and small group practice. Writing a major paper. Prereq., for majors, any three of Comm. 205, 215, 260; for nonmajors, consent of instructor; junior standing or above, for all.

Comm. 427/527-3. Intercultural Communication. Fall, Spring. The processes, problems, and potential unique to communication across cultural boundaries are the focus of this course. Special topics include comparative studies of communication philosophies and customs in selected countries. Advanced level registration involves the examination and synthesis of current theories, research findings and applications of both. Prereq., for majors, any three of Comm. 205, 215, 293, 330; for nonmajors, consent of instructor; junior standing or above, for all.

Comm. 430-3. Teaching of Communication and Theatre. Fall. The fundamental educational decisions faced by the teacher of communication and theatre are analyzed. Methods of teaching, unit design, teaching aids, and materials are selected. Special topics include case studies. Prereq., consent of instructor.

Comm. 435-3. Creative Dramatics. Fall, Spring. Study of experimental and creative learning techniques. Special focus on the manner in which creative drama assists in the growth and development of the human being. Prereq., junior standing or above.

Comm. 484-3. Mass Media and Society. An investigation of the relationship between public communication systems and the society is undertaken. Methods of cultural study are employed. Prereq., junior standing or above. Prereq., one or more of Comm. 101, 200, Jour. 100, Eng. 225, and junior standing or above.

Comm. 519-3. Special Topics: Special interest areas of communication research and practice are examined in depth. The course format is lecture, discussion, investigatory analysis, and practical applications. Prereq., consent of instructor.

Comm. 522-1 to 6. Field Experience in Communication. Fall, Spring. Master level participation in communication studies through institutes, research centers, Gestalt training centers, and similar off-campus instructional programs. Prereq., graduate standing and consent of instructor.

Comm. 569-1 to 6. Problems in Communication: Internship. Fall, Spring. Studies are pursued in community-based communication research projects. These research projects are generally investigative in nature and require an internship of 10 hours or more per week in the field. Prereq., consent of supervising instructor.

Comm. 601-3. Introduction to Graduate Study in Communication. Fall. Survey, comparison, and critique of current paradigms, issues, and research trends in the field of communication are explored in depth. Student will analyze scholarly works and prepare a research proposal. Prereq., graduate standing.

Comm. 602-3. Methods of Critical Research. Defines and explores a variety of approaches to criticism, examining their suitability for particular research projects, and studies the problems encountered in doing critical research. Prereq., doctoral standing or consent of instructor.

Comm. 603-3. Qualitative Methods of Research in Communication. The theory and skills of qualitative data gathering and analysis are studied in this course. Topics include philosophical assumptions, field entry and relations, roles, ethics, participant observation, naturalistic observation, interviewing and surveys, quality of data, hypothesis generation, and theory building. Students are expected to complete several stages of a research project during the course. Prereq., graduate standing.

Comm. 615-3. Seminar in Group Communication Theory. Critical evaluation of current theory and research in small group communication behavior, with emphasis on small groups in organizational settings. Topics such as leadership, decision-making processes, and cohesion development will be discussed in terms of groups of varying sizes. Prereq., doctoral standing or consent of instructor.

Comm. 619-3. Special Topics: Special interest areas of communication research and practice are examined in depth. The course format is lecture, discussion, investigatory analysis, and practical applications. Prereq., consent of instructor.

Comm. 622-1 to 6. Field Experience in Communication. Fall, Spring. Doctoral level participation in communication studies through institutes, research centers, Gestalt training centers, and similar off-campus instructional programs. Prereq., graduate standing and consent of instructor.

Comm. 623-3. Communication Competence in Organizations. Examines verbal and nonverbal communication codes in face-to-face situations within organizations. The focus is on research and theory in interpersonal communication, and its application to interviewing, supervision, and committee leadership in organizations. Prereq., doctoral standing. Comm. 523 or consent of instructor.

Comm. 624-3. Theory and Research in Organizational Communication. The interdependency of organizations and human communication is studied. Emphasis is placed on current communication special theories, research approaches, and general philosophies. The course format is lecture, discussion, and case studies. Prereq., doctoral standing or consent of instructor.

Comm. 698-3. Thesis Approaches to Rhetorical Criticism. This seminar explores in depth a small number of major theorists who have influenced contemporary rhetorical criticism. Critical works applying these theories will be studied, and students will apply the theories in their own analyses of public messages. Theorists covered may vary from semester to semester. Prereq., doctoral standing or consent of instructor.

Comm. 698-3. Philosophical Perspectives on Communication. The major philosophical schools influencing contemporary research and theory in communication will be examined. Consideration of the presuppositions, influences, and shortcomings of each perspective will be considered. Perspectives include logical positivism, phenomenology, symbolic interaction, and rules/action. Prereq., doctoral standing or consent of instructor.

Comm. 699-3. Standards of Critical Evaluation. Criteria involve a comparison between a critical object and a general standard extrinsic to that object. This seminar examines standards typically used to evaluate public messages as well as critical studies using each standard. Standards include argument, model, genre. Prereq., doctoral standing or consent of instructor.

Comm. 699-1 to 6. Problems in Communication: Internship. Fall, Spring. Studies are pursued in community-based communication research projects. These research projects are generally investigative in nature and require an internship of 10 hours or more per week in the field. Prereq., consent of supervising instructor.


Comm. 710-3. The Role of Myths and Archetypes in Rhetorical Criticism. Focuses on the analysis of universal values as communicated rhetorically in public messages. Classical and contemporary myths will be analyzed. Students will write critical analyses of public messages from a mythic perspective. Prereq., doctoral standing or consent of instructor.

Comm. 720-3. Interrelationships Between Rhetoric and Culture. Examines the interplay among public discourse, the culture from which it springs, and resulting rhetorical ideologies. Various methods of cultural study of media are examined, with students exploring philosophical issues concerning cultural production and ideology. Prereq., doctoral standing or consent of instructor.

Comm. 726-3. Communication and Conflict in Organizations. Examines key variables and processes of communication and conflict in the organizational setting. Topics include the relationship of conflict to management, communication networks, decision making, productivity, and morale in organizations. Special attention is placed on the processes of mediation and arbitration and male-female conflict. Prereq., doctoral standing and Comm. 601, 624, 626, or consent of instructor.

Comm. 728-3. Organizational Communication: Intervention and Change. Involves an examination and critique of methods of organizational development and change from a communication perspective. Change is considered from philosophical, theoretical, and practical perspectives. Includes a practicum for developing diagnostic, intervention, and action research skills in organizational development. Prereq., doctoral standing. Comm. 601, 624, 626, or consent of instructor.
Comm. 730-3. Practicum in Rhetorical Criticism. As the final seminar in the rhetorical analysis emphasis, this course examines specific public messages. Students will participate in team research projects involving analysis, evaluation, and writing potentially publishable essays in criticism. Prereq., four of five seminars in criticism area or instructor consent.

Comm. 800-30. Doctor’s Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portions of the catalog under Change in Requirements for Doctoral Degree.

Comm. 830-1 to 8. Undergraduate Independent Study. Fall, Spring. Prereq., written consent of supervising instructor.

Comm. 990-1 to 8. Master’s Independent Study. Fall, Spring. Prereq., written consent of supervising instructor.

Comm. 999-0. Candidate for Degree (Master's).

COMMUNICATION DISORDERS AND SPEECH SCIENCE

Communication Disorders


CDSS 210-3. Introduction to Communication Disorders. Survey of communication disorders including hearing impairments, learning disabilities, and speech-language disorders as well as introduction to basic speech science.

CDSS 301/401-4. Speech and Language Development in Children. The underlying processes in the development of speech and language, normal and atypical.

CDSS 370-2. Manual Communication I. An introduction to the various systems of manual communication used by the deaf, with emphasis upon developing receptive and expressive skills in the use of the American Sign Language.

CDSS 371-2. Manual Communication II. A continuation of Manual Communication I. This course examines more closely the academic, linguistic, and research aspects of manual communication, and extends the vocabulary and situational uses of sign.


CDSS 520-3. Psycholinguistics and Language Behavior.

CDSS 530-3. Language Disorders of School-Age Children.

CDSS 532-3. Language Disorders of Young Children.


CDSS 552-2. Cleft Palate.


CDSS 554-2. Fluency Disorders.

CDSS 555-210 to 3. Speech and Language of the Mentally Retarded.

CDSS 556-3. Aphasia and Related Language Disorders.

CDSS 557-2. Voice Disorders.


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Phon. 305-4. Physiological Phonetics. A study of structures and functions of those portions of the human body important to the reception of sound and the production of speech.

Phon. 306-1. Experimental Phonetics I. Introduction to instrumentation. The application of instrumentation to the study of the processes involved in speech production and transmission.


Phon. 407/507-2. Articulatory Phonetics. Application of principles of physiological phonetics to speech production. The main emphasis is on the study of "normal" and pathological speech in American English. Practical work in phonetic transcription is included.

Phon. 408-2. Intermediate Phonetics. This course presumes a knowledge of physiological, articulatory, and auditory phonetics. After a short review of the fundamentals in these areas, this course concentrates on fundamental aspects of combinatory phonetics up to the phonetics of syllable juncture. Prereq.: Phon. 304 or the 305, 308 sequence.

Phon. 409-5. Synopses of Phonetic Sciences. Survey of physiological, articulatory, and acoustic phonetics. (For Graduate Students only; to make up UG deficiencies in phonetics), offered only during Summer Term.

Phon. 505-1 to 2. Advanced Phonetics.

Phon. 508-2. Experimental Phonetics II.


Phon. 617-1 to 3. Practicum in Phonetics.

Phon. 619-1 to 2. Independent Study.

Phon. 640-1 to 3. Independent Study.

Phon. 650-1 to 4. Independent Study.

Phon. 960-1 to 4. Independent Study.

COMPARATIVE LITERATURE


C.L. 438/538-3, Studies in the Drama.


C.L. 441/541-3. Literature of Antiquity. (Clas. 418/518.)


C.L. 445/545-3. Literature of the Enlightenment (English, French, German).


C.L. 464/564-3. International Literary Relations. (Span. 464/564.)


C.L. 482/582-3. Literature and the Arts. (Clas. 418/518; Hum. 418.)

C.L. 483/583-3. Literature and History.

C.L. 484/584-3. Philosophy and Literature.


C.L. 500-3. Proseminar I.

C.L. 501-3. Proseminar II.


C.L. 511-3. The Medieval Tradition.

C.L. 580-3. Art of Translation. (Clas. 580.)


C.L. 581-3. General Aesthetics II.


C.L. 800-4. Doctor's Dissertation. All doctoral students must register for at least 20 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 under Change in Requirements for Doctoral Degree.

C.L. 950-1 to 3. Independent Study.

C.L. 999-0. Candidate for Degree.

ECONOMICS

Econ. 151-3. Economic History of Europe. Historical interplay of democratic spirit and "capitalistic" spirit of economic organization. Evolutionary view of modern political economics in Europe.

Econ. 152-3. Economic History of the U.S. Continuation of Econ. 151, with emphasis on the U.S. Course may be taken independently for credit.

Econ. 153-3. Current Economic Problems. An introduction to the major concepts of economics and how they are applied to such problems as population, poverty, urban economic and social choices that face the American people in the light of limited resources.

Econ. 201-4. Principles of Macroeconomics. An overview of the economy by examining the flow of income and GNP, the factors determining the level of employment, income, money, credit, and prices.

Econ. 202-4. Principles of Microeconomics. The operation of the price system as a major organiser of the economy. Elementary theory, problems, and public policy of competition, monopoly, distribution of income, and international economic relations.

Econ. 232, 233, 243, 235, 258, 237. Mini-Courses in Selected Economic Topics. This is a series of mini-courses, each carrying 1 hr. credit. Specific topics to be given each semester will be announced in the course schedule.

Econ. 320-3. Women and Economics. The course explores the historical development of economic thought about women as economic agents, examining competing theories of discrimination against and work roles of women today, presents empirical facts of women's position today. Prereq. Econ. 201 and 202.


Econ. 401-3. Economic Education. Seminar for qualified undergraduate economic majors interested in being teaching assistants. Students must hold two 30-min. recitations per week for an introductory economics course and attend a weekly seminar with the other undergraduate TAs. (Econ. 401 - TA for Macro.) Prereq. Econ. 201-202, 407-408, grade-point average of 3.5 and consent of faculty teaching seminar and professor teaching principles. Also 3.5 grade-point average in economics.

Econ. 402-3. Economic Education. Seminar for qualified undergraduate economic majors interested in being teaching assistants. Students must hold two 30-min. recitations per week for an introductory economics course and attend a weekly seminar with the other undergraduate TAs. (Econ. 402 - TA for Micro.) Prereq. Econ. 201-202, 407-408, grade-point average of 3.5 and consent of faculty teaching seminar and professor teaching principles. Also 3.5 grade-point average in economics.


Econ. 407-3. Intermediate Microeconomic Theory. Production, price, and distribution theory. Study of value and distribution theories under conditions of varying market structures, with special reference to the contributions of modern economic theorists. Econ. 407 and 408 may be taken in any order. There is no recommended sequence.

Econ. 408-3. Intermediate Macroeconomic Theory. National income and employment theory. Primary emphasis placed on determination of the levels of employment and prices. Within the framework of a general equilibrium macroeconomic model theories of consumption, investment, and money are considered. The problems of unemployment and inflation are analyzed and appropriate monetary and fiscal policies considered. Econ. 407 and 408 may be taken in any order. There is no recommended sequence.

Econ. 411/511-3. Monetary and Banking Systems. Survey of major monetary and financial institutions, such as commercial banks.
Federal Reserve System, and savings institutions, and the structure of debt from the standpoint of how their operation affects the money supply and its circulation.

Econ. 412/512-3. Monetary Theory and Policy. Theories of inflation and deflation and their effects upon economic growth and prosperity. Goals of monetary policy, problems involved in trying to achieve these goals, survey of some recent monetary policies in action. Prer., Econ. 411/511.


Econ. 422/522-3. Public Finance II. Continuation of Public Finance I.

Econ. 425/525-3. Urban Economics. Analysis of the level, distribution, stability, and growth of income and employment in urban regions. The topics of urban poverty, housing, land use, transportation, and local public services are examined, with special reference to economic efficiency and social progress.

Econ. 432, 433, 434, 435, 436, 437. Mini-Courses in Selected Economic Topics. A series of mini-courses, each carrying 1 hr. credit. Specific topics to be given each semester will be announced in the course schedule.

Econ. 441/541-3. International Trade. Theories of interregional and international trade, private and public trade, world population and resources, tariffs and commercial policy, international economic organization.

Econ. 442/542-3. International Finance. Foreign exchange, theories of adjustment disequilibria in the international balance of payments, international investment, international monetary and banking organizations.

Econ. 450/550-3. Comparative Economic History of Developing Areas. History of trade, commercial policies, banking and financing, throughout colonial and precolonial periods, until the present day. Special attention to the effects of colonialism and other relationships with industrialized countries on economic development. This course serves as background for other courses in area studies and economic development.

Econ. 451/551-3. Economic History of Europe. Evolution of industrial society with emphasis on its growth and development from colonial times to the present.

Econ. 452/552-3. Economic History of the United States. American economic organization and institutions and their development from colonial times to the present.

Econ. 453/553-3. Natural Resource Economics. An analysis of problems associated with social 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. Prer., Econ. 202 and Econ. 480/580 or equivalents.

Econ. 455/555-3. Environmental Economics. Effects of economic growth on the environment; application of economic theory of externalities to environmental policy issues, cost-benefit analysis; program budgeting and welfare economics to problems of the physical environment. Prer., Econ. 202, 480/580 or equivalents.

Econ. 456/556-3. Agricultural and Rural Economics. Analysis of the rural sector and related problems and policies; economics of agriculture, agrisuburban, and rural-urban relations; role of agriculture in economic development.

Econ. 458/558-3. Comparative Agricultural Systems and Development. Organization of agriculture and policies relating to the rural economy in different countries. Examination of such topics as the world food problem, rural population trends, land reform programs, agricultural technology, and rural-urban development strategies.

Econ. 460/560-3. Introduction to Human Resources. The economics of investments in man including the economics of poverty and the application of cost benefit analysis to social welfare programs.

Econ. 461/561-3. Labor Economics. Determination of wages, hours, and working conditions in the American economy. Includes economic effects of trade unionism and other social institutions that have been developed to promote equality of bargaining power between labor, management, and the public.


Econ. 471/571-3. Comparative Economic Systems. Critical study of socialism, capitalism, communism, utopianism, syndicalism, cooperatives, and other proposed economic systems.

Econ. 476/576-3. Economics of the Public Service Industries. Policy and policy issues in the regulated industries: transportation, communications, electricity, and gas.


Econ. 478/578-3. Policies of Economic Development. Current conditions and policies of national and international economic development, with emphasis on accelerating and maintaining economic and social growth.


Econ. 481-3. Introduction to Econometrics. Designed to give undergraduate economics majors an introduction to econometric theory. The multiple regression model and problems encountered in its application are developed in lecture and individual applied projects. Prer., Econ. 381.

Econ. 486/586-3. Economic Development Planning and Project Analysis. A study of the techniques of economic programming and planning in less developed countries, including an understanding of social economic data as national income and product accounts, monetary accounts, balance of payments, government budgets, and input-output tables, all with reference to the techniques of economic planning. The students will form teams to prepare a mock economic plan for some less developed country. Prer., Econ. 381.


Econ. 489/589-3. The Economics of Africa and the Middle East. Current problems of development faced by African and Middle Eastern economies. Emphasis on case studies, regionalism, planning, and the ramifications of economic change.

Econ. 489/590-3. Economic Development of East Asia. Emphasis on Japanese and Chinese experience after WW II. Topics include initial conditions, roles of agricultural and industrial sectors, government planning and policy, process of capital accumulation, foreign trade, evaluation, and lessons for developing countries.


Econ. 507-3. Applied Economic Theory. Course develops competence in techniques of applied micro/macro theory for those going directly into policy and problem solving jobs. Topics include estimating demand, cost, and production functions; operational models of production, processes from industry/agriculture, capital theory with resource applications, benefit-cost analysis. Prer., Econ. 402 or Econ. 480 or equivalent.

Econ. 532-2. Calculus for Economists. Partial derivatives and their applications to economics; optimization, both unconstrained and constrained; matrices and determinants. Course is offered through the Economics Institute. Prer., Econ. 480 or equivalent, plus consent of director of Economics Institute.

Econ. 536-3. Econometrics. The single equation regression model with two or more variables, least squares estimators and their properties, problems in single equation regression estimation, and the simultaneous equation model. Course is offered through the Economics Institute. Prer., Econ. 381 or equivalent, plus consent of director of Economics Institute.


Econ. 538-3. Advanced Intermediate Macroeconomic Theory. A brief review of intermediate macroeconomic theory and advanced theory of modern inflation. Course is offered through the Economics Institute. Prer., Econ. 408 and Econ. 535 or equivalents, plus consent of the director of the Economics Institute. Econ. 535 may be taken concurrently.

Econ. 581-3. Econometric Methods and Applications. Designed to introduce first-year graduate students to basic econometric theory.
and applications. An attempt will be made to integrate this course with the other core courses required of economics graduate students. For example, empirical examples will be drawn from the economics literature they will be reading for other classes. Prer., Econ. 381 or equivalent.

Econ. 600-3. History of Economic Thought. Advances the student's cultural appreciation of the technical apparatus of current economic concepts. Students read in the original texts of certain great economic writers from the industrial revolution to the 1920s. Secondary sources will be used in some instances.


Econ. 602-3. Macroeconomic Theory I. Considers the theory of aggregate analysis and accompanying policy implications. A general equilibrium model is constructed and applied to the problems of unemployment, inflation, and growth. Particular emphasis is given to theories of consumption, investment, and the supply of and demand for money.

Econ. 603-3. Microeconomics Theory II. Continuation of Econ. 601.

Econ. 604-3. Macroeconomic Theory II. Continuation of Econ. 602.


Econ. 611-3. Money and Central Banking. Monetary and financial institutions with focus on relationships among monetary policy, international credit, and balance of payments. Prer., Econ. 511; prereq., Econ. 507 or 602.


Econ. 622-3. Seminar: Fiscal Policy. Continuation of Econ. 621. A critical analysis of public policy with emphasis on problems of economic stability, growth, and employment. Either course may be taken independently for credit.

Econ. 625-3. Urban and Regional Economics: Theory and Methods. Course covers basic theories in spatial location of economic activity and land use and surveys techniques developed to analyze, measure, and predict regional and urban structure and growth, such as economic base studies, regional social accounts, input-output analysis. Prer., Econ. 426/4268 or consent of instructor.

Econ. 626-3. Topics in Urban and Regional Economics. Investigates various theoretical topics in urban and regional economics and focuses on policy issues. Course format will involve student research and presentations throughout the term. Prer., Econ. 625.


Econ. 635-2. Mathematics for Economists: Special Topics. Development of selected topics and applications in mathematics for economists and especially linear algebra and/or differential equations. Course is offered through the Economics Institute. Prer., Econ. 480/580 or equivalent, plus consent of director of the Economics Institute.

Econ. 636-2. Statistics for Economists: Special Topics. Development of selected topics in statistics and their applications to economic research. Course is offered through the Economics Institute. Prer., Econ. 381 or equivalent, plus consent of director of Economics Institute.

Econ. 637-2. Microeconomics Theory: Special Topics. Development of selected topics in microeconomic theory and their applications to economic policy. Research paper required of all participants. Course is offered through the Economics Institute. Prer., Econ. 407 or equivalent, plus consent of director of Economics Institute.

Econ. 638-2. Macroeconomic Theory: Special Topics. Development of selected topics in macroeconomic theory and their applications to economic policy. Research paper required of all participants. Course is offered through the Economics Institute. Prer., Econ. 498/508 or equivalent, plus consent of director of Economics Institute.


Econ. 653-3. Seminar: Natural Resources Economics. An analysis of problems associated with social 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. Prer., Econ. 407, 408, and 480/480 or consent of instructor.

Econ. 654-3. Seminar: Environmental Economics. Theory of externalities: alternative policies for environmental management, taxes, subsidies, regulations, property rights, including joint production models; macro-impacts of environmental policies; transboundary problems; preservation/development. Prer., Econ. 480/580, 507, or consent of instructor.

Econ. 655-3. Agriculture and Agribusiness. Analysis of agricultural supply and marketing processes and their interactions with farming enterprises in industrial and developing economies; the management of farm and farm-related enterprises; commodity markets; government and agriculture.

Econ. 659-3. World Agriculture. World food and raw material needs and production capabilities; comparative agricultural systems and policies in relation to economic development; international trade in agricultural products.

Econ. 669-3. Seminar: Human Resources. The economics of investment in human capital including the economics of poverty and the application of cost-benefit analysis to social welfare programs.

Econ. 667-3. Seminar: Labor Market Policies. Economic analysis of wage determination and labor market operation. Detailed study of the supply and demand for labor under competitive and non-competitive conditions; concentration on level and structure of wage rates, bargaining theory, discrimination, unions, labor mobility and migration, unemployment, and inflation.


Econ. 875-3. Seminar: Industrial Organization and Control. The large firm in relation to its rivals, suppliers, and customers (theory and industry studies); control of business through antitrust and other government regulation.

Econ. 677-3. Economic Planning and Development. Deals with role of planning in economic development with particular reference to investigation of planning problems in Southeast Asia and the Middle East.


Econ. 679-3. The Economics of Energy and Development. A general survey seminar which covers the economics dominating the field of energy, investigating alternative sources with the economic ramifications of each, and the economics of the logistical and ecological problems involved, related to the role of energy in economic growth of both developed and developing countries and the issues of scarcity, conservation, and imports.

Econ. 681-3. Intermediate Econometrics. Application of statistical inference to economic research. Principal topics are probability
theory, statistical inference, and regression analysis. Prereq., Econ. 481/581 or equivalent.


Econ. 711-3. Advanced Monetary Theory. Major contribution to monetary and banking theory up to the present day.


Econ. 900-variable. Independent Study. Consent of instructor and department required.

Econ. 926-variable. Independent Study. Consent of instructor and department required.

Econ. 930-variable. Independent Study. Consent of instructor and department required.

Econ. 940-variable. Independent Study. Consent of instructor and department required.

Econ. 950-variable. Independent Study. Consent of instructor and department required.

Econ. 950-variable. Independent Study. Consent of instructor and department required.

ENGLISH

For freshman-level composition courses, see Arts and Sciences, College Expository Writing Program (CEWP).

Engl. 119-3. Introduction to Creative Writing. The student will be introduced to the techniques of fiction and poetry. Student work will be scrutinized by the instructor and discussed in a workshop atmosphere by other students.


Engl. 128-3. Introduction to Women's Literature. This course will serve as an introduction to the study of literature by women in England and America. Both poetry and fiction will be read, and varying historical periods will be covered. The course is designed to acquaint the student with the contribution of women writers to the English literary tradition and to investigate the nature of this contribution.

Engl. 130-3. Introduction to Drama. Reading and analysis of plays.

Engl. 140-3. Introduction to Poetry. Reading and analysis of poetry.

Engl. 198-3. Introduction to English Studies. An introduction to the skills, theories, and values of literary study.

Engl. 200-3. Critical Writing. Practical criticism of novels, poems and plays, with emphasis on written work. Introduction to and practice in using various critical approaches to works of literature. Prerequisite, Engl. 119.

Engl. 202-3. Introductory Poetry Workshop. An introductory course in poetry writing. Prereq., an A or B in Engl. 119 or permission of the instructor after submitting a manuscript (five-seven poems). May be taken up to three times for credit.

Engl. 205-3. Introductory Fiction Workshop. An introductory course in fiction writing. Prereq., an A or B in Engl. 119 or permission of the instructor after submitting a manuscript (one short story). May be taken up to three times for credit.


Engl. 222-3. Introduction to Folklore. A cross-cultural introduction to folklore and folklife, examining forms, values, and functions.

Engl. 225-3. Film Narrative. A survey of the various types of film narrative, focusing on American and international classics of the sound era.

Engl. 226-3. Images of Women in Literature. A survey of images of women in English literature from the Middle Ages to the present.

Engl. 252-3. Masterworks of British Literature. Close reading and study of major poems, plays, and prose works of British literature from Chaucer to Yeats.

Engl. 253-3. Modern and Contemporary Literature. Close study of significant 20th-century poetry, drama, and prose works by European and American writers. The readings will range from the 1920s to the present.

Engl. 260-3. Great Books I. 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 Hum. 101, 102.

Engl. 261-3. Great Books II. Close study of literary classics of Western civilization: selected dialogues of Plato, one work of Latin literature, Dante's Inferno, and a few works of other writers such as Cervantes, Moliere, and Goethe. Not open to students who have credit in Hum. 101, 102.


Engl. 276-3. Modern and Contemporary American Literature. Close study of important literary works of the 20th century, with some emphasis on works written in the last decade.

Engl. 270-3. Introduction to African Literature. (BL St. 260.)


Engl. 273-3. Survey of Afro-American Literature II. (BL St. 293.)

Continuation of Engl. 272 but may be taken independently of that course.

Engl. 275-3. The Native American in American Literature I. This course surveys traditional and contemporary Indian literature, demonstrating its relationship to American literature.


Engl. 302-3. Intermediate Poetry Workshop. An intermediate course in poetry writing. Consent of instructor based on submission of manuscript (five-seven poems). May be taken up to three times for credit.

Engl. 305-3. Intermediate Fiction Workshop. An intermediate course in fiction writing. Consent of instructor based on submission of manuscript (one short story). May be taken up to three times for credit.

Engl. 315-3. Report Writing. Instruction and practice in various forms of reports, papers, and articles. Style and editing are emphasized.


Engl. 380-3. The Bible as Literature. Survey of literary achievements of the Hebrews, as represented by the King James Bible—The Old Testament.


Engl. 385-3. Chaucer: The Canterbury Tales. A study of Chaucer's major works with emphasis on The Canterbury Tales. Reading will be done in Middle English. A short introduction to the language will precede study of the poetry.


Engl. 402-3. Advanced Poetry Workshop. An advanced course in poetry writing. Consent of instructor based on submission of manuscript (five-seven poems). May be taken up to three times for credit.

Engl. 405-3. Advanced Fiction Workshop. An advanced course in fiction writing. Consent of instructor based on submission of manuscript (one short story). May be taken up to three times for credit.

Engl. 408-3. Playwriting: Short Form. (Thtr. 475.)


Engl. 419-3. Advanced Shakespeare. For advanced students only. Close readings of works spanning Shakespeare's career.


Engl. 424-3. American Novel II. From 1900 to the present.

Engl. 425-3. Modern Novel. A close study of masterpieces by such novelists as Proust, Joyce, Woolf, Lawrence, Mann, Kafka, Faulkner, and Nabokov from a comparative perspective. Close attention to form, theme, and ideas characteristic of the modern period.


Engl. 427-3. Topics in Women's Literature. An advanced course which focuses on areas of research interest in the study of women's literature, such as selected themes or critical issues. Students will be expected to contribute original research to the topic under consideration. Prn., Engl. 125 or 226 or 328.


Engl. 431-3. Development of British Drama II. From 1660 to the present.


Engl. 446-3. Modern Poetry. A study of the major British and American modern poets, with emphasis on those who did their most significant work between 1900 and 1945: Yeats, Pound, Eliot, Stevens, Auden, Williams, Moore, Crapse, and Thom (exact list varies with instructor).


Engl. 449-3. Problems in Literary Theory and History. This course investigates a particular topic in depth. Topic varies.


Engl. 451-3. Medieval Literature II. An intensive study of the major literary works of the Middle Ages after 1666.


Engl. 473-3. Contemporary Afro-American Literature II. (Bl.St. 477.)


Engl. 481-3. Literature for Adolescents. (T.Ed. 444.)

Engl. 482-3. Methods and Materials in English. (T.Ed. 452.)


Engl. 485-3. History of the English Language. Outline of history of the language, including a brief survey of sound changes affecting modern English, of history of grammatical forms, and of the vocabulary. Elementary knowledge of English grammar will be assumed. Not open to students who have taken Engl. 484.


The following nine courses are open to senior English majors only.

Engl. 490 to 494-3. Seminar: Topics in English. Study of such topics as satire, comedy, tragedy, American humor, the Mexican-American in American literature.
Engl. 495 to 499-3. Seminar: Major Authors. Intensive study of the works of one major British or American author.

Engl. 500-509-3. Studies in Major Authors. Individual British and American authors. (Author for a given semester to be specified in the Schedule of Courses.)


Engl. 520-3. Studies in the Novel. In-depth analyses of novels that are significant in mainstream traditions or that display major departures. The novels are studied as art forms in specific cultural settings.

Engl. 521-2 to 6. Poetry Workshop. Designed to give students practical criticism of their poetry, and to develop a sense of critical standards. Admission by submission of manuscript and/or consent of instructor.


Engl. 523-2 to 6. Fiction Workshop. Designed to give students practical criticism of their fiction and to develop a sense of critical standards. Admission by submission of manuscript and/or consent of instructor.


Engl. 527-3. Recent Poetry. Covers poetry, mainly American, written since World War II, with emphasis on the contemporary and its roots in the traditions of the language and composition.


Engl. 554-3. Restoration and 18th-Century Literature. Explores the poetry, novel, and nonfiction prose of the period, with rotating emphasis on genres and topics.


Engl. 565-3. Readings in American Literature. Extensive reading in the history of American literature as a basis for a graduate major or minor in the field. Emphasis on bibliographies and critical works.


Engl. 582-3. Law and Literature. (Hum. 482.) Explores the relations between law and literature by studying key works of literature in context—Antigone, Shakespeare's Measure for Measure, Racine's Les Plaideurs (in translation), Dickens' Bleak House, Kafka's The Trial, and others, together with selected readings from law reports, cases, and the like.


Engl. 594-3. Poetics. An advanced poetics course for creative writing students. Instruction in the use of a variety of forms from different eras and traditions in fiction and poetry.

Engl. 600 to 609-3. Studies in Major Authors. Intensive study of works of one major British or American author for a given semester to be specified in the Schedule of Courses.

Engl. 610 to 619-3. Special Topics. Intensive study of specialized topics in English and American literature to be specified in the Schedule of Courses.


Engl. 682-3. Middle English. Reading of literary selections from Middle English with much detail of English words and sounds to account for present usages.


Engl. 800-30. Doctor's Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.


Engl. 950-variable credit. Independent Study. Graduate Level I. 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. 951-variable credit. Tutorials in Medieval Studies.

Engl. 952-variable credit. Tutorials in Renaissance Studies.

Engl. 953-variable credit. Tutorials in 18th-Century studies.


Engl. 956-variable credit. Tutorials in Modern Literature.

Engl. 957-variable credit. Tutorials in Contemporary Literature.

Engl. 958-variable credit. Tutorials in Literary Theory.


Engl. 962-variable credit. Advanced Renaissance Studies.


FILM STUDIES

F.S. 300-3. Beginning Filmmaking. Offered to instruct students in making Super 8 films. Instruction covers use of cameras and editing equipment, basic editing and splicing techniques, and analysis of pertinent films. The emphasis may be on making personal experimental films or on making narrative sound films, according to the instructor. There is no lab fee for filmmaking courses, but students are expected to provide their own equipment and purchase materials. The Film Studies Program maintains an equipment pool with modest registration and rental fees for students needing equipment.

Hum./F.S. 305-4. Film History I. An intensive introduction to film history and theory, from 1895 to 1933. Topics to be covered include the beginnings of still and motion picture photography, the growth of narrative and structural complexity from Lumiere to Gance, the influence of Griffith, American silent comedy, Soviet theories of montage, German expressionist and street films, an overview of experimental and animated films, the transition to sound, and the beginning of film theory. Lectures, discussions, and research papers supplement complete screenings of such films as The Birth of a Nation, The Gold Rush, Greed, Bonaparte and the Revolution, Un Chien Andalou, The Man With a Movie Camera, Vampyr, and The Road to Glory.

Hum./F.S. 306-4. Film History II. 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 auteurs such as Bergman, Kurosawa, Fellini, Hitchcock, Bunuel, Antonioni, and Coppola.

F.S. 307-3. Major Film Movements. (310) Usually this course will be a historical-aesthetic survey dealing with the various national cinemas, to be taught in conjunction with the appropriate language department. Typical offerings are The French Film, The German Film, The Russian Film, and soon. Occasionally the course may offer a more detailed approach to a more restricted subject, i.e., French
New Wave, German Expressionist Cinema, Italian Neo-realism. Course may be repeated for credit with department consent.

F.S. 398-3. Major Film Directors. (540) Focuses on the work of a single director or a group of related directors. Course content will vary from semester to semester. Consult the Schedule of Courses for specific topics. Course may be repeated for credit with department consent.

F.S. 310-3. Documentary Film. A historical survey of the genre, from the silent film era to contemporary examples. May include autobiographical diary and propaganda films.

F.S. 340-3. Advanced Special 8 Filmmaking. Instruction in shooting and editing Special 8 sound, as well as lab techniques. Students will be required to make completed films, i.e., projects that involve a semester of preparation, shooting, editing, and final prints.

F.S. 350-3. Intermediate Filmmaking, 16mm. A film production class in 16mm taught on a revolving basis in fine arts (with emphasis on professional experimental films) and in film studies (with a documentary and/or narrative orientation). The class will cover the following: 16mm camera operations, splicing, editing, sound transfer and recording, and dealing with the lab. Each student will be expected to make a film by the end of the semester. Students should expect to spend a few hundred dollars on equipment rental, film stock, and lab costs. Course may be repeated for credit with department consent.

F.S. 450-3. Advanced Filmmaking. Advanced training in 16mm camera operation, splicing, editing, sound transfer and recording, and conforming. Students will be required to edit on the Steenbeck flatbed and produce a film that contains sound shot in double system. Course may be repeated for credit with department consent.

F.S. 460-3. Colloquium in Film Aesthetics. A seminar for the serious roundtable discussion and critique of film as a possible art form, with emphasis upon the development of an appropriate verbal and written language for description of film.

F.S. 840-1 to 3. Independent Study.

See also:

FINE ARTS

Studio

Drawing

F.A. 100-2. Basic Drawing. Orientation course including pictorial design, life drawing, still life, and landscape, using varied drawing techniques and materials. May not be repeated.


Photography

F.A. 210-3. Beginning Photography. (Formerly F.A. 319) An introduction to techniques and concepts of photography as it relates to the fine arts. Emphasis on photography as a means to formal and expressive ends. Students must have access to an adjustable camera. Preq.: soph. standing. May not be repeated.

F.A. 217-3. Beginning Photography. Exploration of possibility of relating more sophisticated technical concepts and materials (e.g., zone system and non-silver systems) to the creative process. Preq.: F.A. 216. May not be repeated.


F.A. 418-3. New Directions in Photography. Investigation of the use of the photographic image in non-standard ways, such as the use of liquid emulsion on a variety of materials and the realization of the photographic image in three-dimensional configurations. Preq.: F.A. 216 and 217, or equivalent. May be repeated. Note: Course content changes each semester.

F.A. 419-3. Advanced Photography. Exploration of advanced techniques and concepts of photography as it relates to the fine arts. Emphasis on photography as a means to formal and expressive ends. Preq.: F.A. 216, 217, two semesters of 319, or equivalent. May be repeated. Admission by portfolio.


Painting


F.A. 221-3. Color. A basic introduction to the relative effects of color as used by the artist. Emphasis is on the practice of color relations including basic characteristics, mixtures, illusions, optical mixture, color intervals and color quantity. Prereq.: F.A. 100 plus one more 100-level fine arts course. May not be repeated.

F.A. 222-3. Intermedia. Spring. Interdisciplinary studio course encouraging experimentation with media and integration of traditional areas of drawing, painting, photography, and sculpture. Areas to be covered include 2-D and 3-D collage/photo-montage/assemblage, correspondence art, video and audio art. Prereq.: one basic studio course. May not be repeated.

F.A. 320-3. Painting. Basic investigation of materials of the painter and their use in expressing the student's ideas. Prereq.: F.A. 120 plus one more 100-level fine arts course. May be repeated once.


F.A. 322-3. Aspects of Painting. A lecture course providing insights into the art of painting. Contemporary painting as well as that of the past, is examined and discussed in depth.

F.A. 323-3. Mural Painting. Will examine the special problems of painting murals. Students will execute at least one mural in a public place, under the direct supervision of the instructor.

F.A. 420-3. Advanced Painting. Expressive pictorial problems involving varied subject matter and painting media with an emphasis on individual development. Prereq.: F.A. 320, 6 hrs. credit, and 321, 6 hrs. credit. May be repeated.


Water Media Painting


F.A. 331-3. Water Media Painting. Transparent and opaque water media experience emphasizing problems of motivation, expression and techniques involving varied subject matter. Prereq.: F.A. 330 or equivalent; F.A. 221 is recommended. May not be repeated.

F.A. 430-3. Advanced Water Media Painting. Advanced painting problems using transparent and opaque water color media, with an

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1Courses which may be repeated may be used for partial fulfillment of a college requirement only once.
emphasize on individual development. Prereq., F.A. 330 and 331, or equivalent. May be repeated.

**F.A. 530-3.** Graduate Water Media Painting.

**Printmaking**

**F.A. 240-3.** Beginning Intaglio and Relief. Introduction to intaglio and relief printing and printing media. Prereq., F.A. 100 and 200. May not be repeated.

**F.A. 241-3.** Beginning Lithography. An introduction to the techniques, including metal plate lithography. Prereq., F.A. 100 and 200. May not be repeated.

**F.A. 244-3.** Printmaking Survey. A practical and historical survey of printmaking. Basic introduction to intaglio, lithography, silk screen, relief, and photo processes will be explored by the student in the print studios, alternating with weekly slide lectures on the history of techniques and significant printmakers.

**F.A. 340-3, 440-3.** Intermediate Intaglio and Relief and Advanced Intaglio and Relief. Continued study and experimentation in intaglio and relief processes in black and white, color, and possible photo imagery. Prereq., one other printmaking course. May be repeated once.

**F.A. 341-3, 441-3.** Intermediate Lithography and Advanced Lithography. A continuation of stone and metal plate lithography with an emphasis on individual creative development and further development in color printing processes. Prereq., one other printmaking course. May be repeated once.

**F.A. 443-2.** Photo Processes. An exploration into the use of photo image through the reproduction process, such as line shot, halftone, and color separation. Emphasis will be placed on the creative use rather than mechanical application. Prereq., one other printmaking course and consent of instructor. May be repeated.

**F.A. 444-3.** Papercrafting. Students will learn both two-dimensional and three-dimensional papercrafting techniques. Paper pulp and an art medium will be stressed and students will make their own paper mold. Prereq., upper division standing.

**F.A. 540-3.** Graduate Intaglio and Relief.

**F.A. 541-3.** Graduate Lithography.

**F.A. 543-3.** Graduate Photo Processes.

**F.A. 544-3.** Graduate Papercrafting.

**Sculpture**

**F.A. 150-2.** Basic Sculpture. Orientation course involving three-dimensional form, expressive problems based on the human figure, and other forms in various sculptural materials. May not be repeated.


**F.A. 250-3.** Figure Modeling in Clay. Fall. Human anatomical structure studied with relationship to creative work in sculpture. Prereq., F.A. 150 or 151. May not be repeated.


**F.A. 550-3.** Graduate Sculpture.

**Art Education**

Art education majors desiring teacher certification are required to take F.A. 364, 366, 367, 368, and 369, and must consult art education advisers concerning the remainder of the program. Only F.A. 369 may be repeated.

**F.A. 363-2.** Art for the Elementary Teacher. (Formerly F.A. 469.) For majors in elementary education, with emphasis on art in the elementary school.

**F.A. 365-3.** Art in Elementary Schools. For students wishing to receive certification for teaching art in public elementary schools. Deals with the theoretical and practical problems of teaching art in the elementary school.

**F.A. 365-3.** Art Materials in Recreation. Designed specifically for the recreation major. Provides a workshop-type opportunity for students to become familiar with art materials that can be used effectively in a variety of recreation situations. Also includes a theoretical introduction to art and its role in recreation.

**F.A. 366-2.** Art Materials Workshop. Introduction to and exploration of materials available for use by the art educator in both two- and three-dimensional materials used with various age level groups.


**F.A. 368-1.** Practicum in Art Teaching. Supervised teaching of children and young people stressing the development of effective planning and presentation of art concepts and materials. Coreq., F.A. 364 and 368.

**F.A. 465/568-3. Issues in Art Education.** Provides students with a wide base for understanding art education purposes, trends, policies, and art education's potential as a viable discipline. Focuses on categories of general interest in art education.

**F.A. 564-variable credit 1 to 3. Seminars in Art Education.** Subjects and instructors will vary.

**Jewelry**

**F.A. 377-3.** Jewelry Design. (Formerly F.A. 317.) Creation of jewelry with metals and non-metals. Emphasis on individual design decisions. May not be repeated.


**F.A. 577-3. Graduate Jewelry Design.** (Formerly F.A. 517.)

**Ceramics**

**F.A. 286-3.** First-Year Ceramics. (Formerly F.A. 386.) A basic introductory course in the techniques of wheel-thrown and hand-built forms, and the exploration of glazes and glazing procedures and firing of clay forms. Prereq., two basic studio courses. May not be repeated.

**F.A. 385-3.** Wheel Throwing. A concentration in concepts and techniques dealing with wheel-thrown forms. An in-depth study of functional and semi-functional including glazing and firing of these forms. Prereq., F.A. 288. May not be repeated.


**F.A. 486-3.** Advanced Ceramics. (Formerly F.A. 458.) Lecture, research, and experimentation in clay (wheel and hand construction techniques). Prereq., F.A. 388 and 389. May be repeated.


**F.A. 588-3.** Graduate Ceramics. (Formerly F.A. 538.)

**F.A. 599-3. Graduate Ceramics Seminar.** (Formerly F.A. 599.) Spring.

**Seminars**

**F.A. 403/503-3.** Art of the Last Decade, Trends and Criticism. A selective study of significant areas of visual art of the last decade, including major critical opinions. Prereq., 20 hours of fine arts.

**F.A. 491/591-3. Special Topics.**


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F.A. 485-3. Studio Seminar. For students intending to pursue graduate work and/or a professional career in art. Emphasis will be on developing an aesthetic overview of their work and interests, and how they relate to the problems of professional activity today. Prer., B.F.A. candidate.

F.A. 498-2. Art Seminar. For fine arts honors students and advanced undergraduates. Requires a considerable amount of outside reading in the fields of aesthetics and art history. Discussion group will meet one evening each week. Admission by consent of instructor only.

F.A. 598-2. Graduate Art Seminar.

**Visiting Artist**

F.A. 497/597-3. Visiting Artist Studio. Advanced undergraduates and graduates are provided opportunities for interviews and critiques of their work by nationally and internationally known artists. Emphases: providing continuous input concerning significant developments in art and giving students comprehensive views of contemporary issues concerning art. May be repeated. Prer., portfolio review.

F.A. 598-2. Graduate Visiting Artist Seminar. A forum in which the visiting artists interact with the class in whatever format the artist chooses: discussions, reports, or group projects of some other nature.

**Art History**

Double-level (400/500) courses are open to both advanced undergraduate and graduate students. An undergraduate student will normally register for the 400 level; a graduate student for the 500 level. A higher level of performance and extra work will be expected of the graduate student. Not all art history courses are offered every year. Students should check the current Schedule of Courses. Seniors may take 500-level courses only after consultation with the instructor.

F.A. H. 100-3. Experiencing Art—Image, Art, and Idea. An innovative course intended to provide a broad introduction to the understanding and appreciation of art from all time periods and all parts of the world. Particularly directed to nonmajors.


F.A. H. 282-3. Art of the Renaissance, the Baroque, and the Rococo. A survey of sculpture, painting, and architecture from Italy through the Rococo.

F.A. H. 283-3. Art of the 19th and 20th Centuries. Survey of sculpture, painting, and architecture from the late 18th century to the present, beginning with Neoclassicism and Romanticism. Impressionism and all the other "isms" of the 19th and 20th centuries will be covered. Prer., F.A. H. 280, 281, or 282.

F.A. H. 284-3. Introduction to Asian Art. (Formerly F.A. H. 190.) Designed for students with no previous experience in the study of Asian art, the course will treat the development of sculpture, painting, architecture, and the other visual arts of South Asia, the Far East, and Southeast Asia, especially as they are connected by the religious themes of Hinduism and Buddhism.


F.A. H. 404/504-3. Art of the Ancient Near East. A survey of the architecture, sculpture, and painting of the eastern Mediterranean from their beginnings to the end of the Sassanian Empire to include the arts of Anatolia, Mesopotamia, and Persia. Prer., F.A. H. 280 or equivalent.

F.A. H. 405/505-3. Art of India and Southeast Asia. A survey of the architecture, sculpture, and painting of India and those areas of southeast Asia influenced by India from the period of Mahabha Darn and Harappa to recent times. The Himalayan region will be treated, as will Tantric art in general.

F.A. H. 406/506-3. Art of Islam. Art and architecture of the Islamic peoples from the death of Muhammad through the 18th century from Spain to India.

F.A. H. 407/507-3. Byzantine Art. (Cl. 420/520.) Art of the Eastern Christian Empire from the accession of Constantine to the conquest of Constantinople with a synopsis of developments from 1453 through the 18th century.

F.A. H. 515-3. Modern Sculpture From Rodin to the Present. An extensive examination of outstanding sculptors in Europe and America from Rodin to the present; American sculpture since World War II will receive special emphasis. Prer., F.A. H. 283 or consent of instructor.


F.A. H. 428/528-3. Classical Art and Archaeology. (Anth. 428/528, Cl. 428/528.) See Cl. 428/528.

F. A. H. 431/531-3. Etruscan Art and Archaeology. (Anth. 431/531, Cl. 431/531.)

F.A. H. 432/532-3. Roman Art and Archaeology. (Anth. 432/532, Cl. 432/532.)

F.A. H. 438/538-3. The Late Renaissance and Mannerism. Italian painting, sculpture, and architecture from about 1520 to 1580. The problem of Mannerism and the beginning of late Renaissance art in Europe will be treated. Prer. F.A. H. 282 or consent of instructor.


F.A. H. 452/552-3. European Art From 1850 to 1930. A survey of the major movements in painting in France and England from the Revolution of 1830 to the Impressionist crisis of 1866. Although the emphasis is on painting, major expressions in sculpture and architecture will also be discussed. Prer., F.A. H. 283 or consent of instructor.

F.A. H. 456/556-3. Perspectives on Art and Criticism. An examination of some traditional and current ideas which have shaped, defined, or influenced the goals, practices, and evaluations of the visual arts. Lectures, readings, discussion. Open to fine arts majors or students with 9 or more hours in art.

F.A. H. 460-3. Undergraduate Seminar: Selected Topics in Art History. A seminar course dealing with selected areas or problems within the history of art. Consult current Schedule of Courses for seminar topic. Prer., any two of the following: F.A. H. 280, 281, 282, 283, 284, or equivalent.


F.A. H. 486/586-3. Italian Gothic Art. Developments in Italian painting, sculpture, and architecture from about 1200 to 1400 A.D., including interactions with northern Europe and the so-called Proto-Renaissance. Prer., F.A. H. 281, 282, or consent of instructor.

F.A. H. 470/570-3. Art of Africa and Oceania. Native arts of non-Western peoples of Africa and Oceania. Sculpture, architecture, and minor arts for both archaeological and ethnological cultures. Emphasis upon the function of art in society as well as aesthetic analysis.


F.A. H. 474/574-3. The Arts of Japan. Appreciation and chronological development of the arts of Japan. Emphasis upon the arts of Shintoism and Buddhism as well as the particular Japanese aesthetic from prehistoric times to the present.

F.A.H. 478/578-3. 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. Prereq., F.A.H. 281 or consent of instructor.

F.A.H. 477/577-3. Women Artists from the Middle Ages to the Present. Fall. A survey of women's art in the West with emphasis on painting and sculpture. Prereq., a survey of art history or instructor's consent.


F.A.H. 480/580-3. Italian Renaissance Art. Fall. Italian art and architecture from 1400 to the death of Donatello (1466), with emphasis on the development of Renaissance art in Florence and central Italy. Prereq., F.A.H. 282 or consent of instructor.

F.A.H. 481/581-3. Italian Renaissance Art. Spring. Italian art and architecture from about 1470 to 1520, including the diffusion of Renaissance ideas throughout Italy, and the development of the High Renaissance in central Italy and Rome. Prereq., F.A.H. 282 or consent of instructor.


F.A.H. 483/583-3. Art in France, 1500-1750. Spring. Examines the developing French style through the various foreign influences, the impact of classicism, and finally the efflorescence of that uniquely French expression, the Rococo, and its reflections in Germany and Austria. Prereq., F.A.H. 282.


F.A.H. 485/585-3. Spanish and Netherlands Painting in the 17th Century. Spring. A critical survey of Baroque painting in Spain, Flanders (modern Belgium), and the Dutch Republic. Despite obvious cultural differences among Holland, Catholic Flanders, and Spain, the common thread of Baroque vision will be traced through the three cultures.

F.A.H. 486/586-3. American Art to 1945. Fall. A survey of art of the United States from the earliest colonial period to 1945, including minor arts as well as architecture, sculpture, and painting.


F.A.H. 491/591-3. Art in the 19th Century. Fall. Study of visual arts in Europe from Goya through Post-Impressionism, with particular attention to major movements of Neo-Classicism, Romanticism, Realism, and Impressionism. Primary emphasis on art of painting, but major expressions in sculpture and architecture will also be involved.


F.A.H. 493/593-3. Modern Art. Spring. Emphasizing the various "isms" of the 20th century, the course begins with the early Fauves and Cubists, including Analytic and Synthetic Cubism. Also studied are Italian Futurism, de Stijl and the Bauhaus, Dada, and Surrealism. Prereq., F.A.H. 283 or consent of instructor.


F.A.H. 548-3. Topics in Roman and Etruscan Art and Archaeology. (Anth. 547, Class. 548.) Consideration of various aspects of Roman and/or Etruscan art and archaeology. Topics to be explored may vary and will be announced in advance. Prereq., consent of instructor.


Independent Studies

A student may register for independent study in studio or art history. Consult departmental office for policies and procedures relating to registration.

F.A.H. 530 to 949-variable credit (1 to 3). Undergraduate Independent Study.

F.A.H. 560 to 969-variable credit (1 to 3). Graduate Independent Study.

F.A.H. 940-variable credit (1 to 3). Undergraduate Independent Study.

F.A.H. 950-variable credit (1 to 3). Graduate Independent Study.

Thesis


Fine Arts Exhibitions

The Department of Fine Arts sponsors exhibitions of painting, graphic arts, photography, and sculpture from its own collections and from those of major museums, collectors, artists, and galleries throughout the country. The exhibitions are held in the Five Dwelloway Gallery and the other two University of Colorado Art Galleries, which are all located in the Sibley-Wolle Fine Arts Building.

The Phillips, Brackett, Faye, and Oliver collections and the Department of Fine Arts collections are also located on the campus.

FRENCH AND ITALIAN

French

For comparative literature and linguistics departmental courses and phonetic sciences, see those sections.

Fr. 101-5. Beginning French I. Fall, Spring. Open only to students with no previous knowledge of French or upon consultation.

Fr. 102-4. Beginning French II. Fall, Spring. Open only to students who have had Fr. 101 at the University of Colorado or upon consultation.

Fr. 105-5. Beginning French Review. Fall, Spring. Reserved for students with up to two years of high school French on basis of foreign language placement code.

Fr. 201-4. Second-Year Oral Grammar Review and Conversation. Fall. Prereq., Fr. 102 or 105 or placement.
Fr. 211-4. Second-Year French Reading and Conversation. Fall, Spring. Prer., Fr. 102 or 105 or placement.
Fr. 212-3. Second-Year French Reading and Conversation. Fall, Spring. Prer., Fr. 211 or placement (three years of high school French).
Fr. 301-3. French Phonetics and Pronunciation. Fall. Spring. Prer., Fr. 212 or equivalent, or upon consultation. Should be taken before or concurrently with any 300-level literature course.
Fr. 302-2. Oral Practice. Fall, Spring. Prer., Fr. 301 or upon consultation. Should be taken before or concurrently with any 300-level literature course.
Fr. 303-3. Oral Professional French II. Fall, Prer., Fr. 202, 204, 212, or equivalent.
Fr. 305-3. French Composition. Fall, Prer., Fr. 202 or 212 or equivalent. Should be taken before or concurrently with any 300-level literature course. Must be taken before Fr. 306.
Fr. 311-3. Main Currents of French Literature. Fall. Prer., Fr. 212 or upon consultation. Fr. 305 is recommended as a prepr.
Fr. 312-3. Main Currents of French Literature. Spring. Prer., Fr. 311 or upon consultation.
Fr. 316-3. Romance Literature in English Translation II. See Span. 316. Does not count toward major in French.
Fr. 370-3. Scientific and Technical French. Prer., second-year French or equivalent. To enable students to learn technical and scientific vocabulary for use in translating articles, technical data, and specifications and in general make use of their French in the industrial world. Not open to freshmen.
Fr. 399-1 to 3. Independent Study. Bordeaux program only.

All courses at the 400 level or above, unless otherwise indicated, are offered on a three-year cycle. They are not open to freshmen or sophomores.

Fr. 401-2. Advanced Composition. Fall. Prer., Fr. 306 or upon consultation. Should be taken before or concurrently with 400-level literature courses.
Fr. 402-2. Advanced Composition. Spring. Prer., Fr. 401 or upon consultation. Should be taken before or concurrently with 400-level literature courses.
Fr. 403/503-3. Advanced Oral Practice and Interpreting. Fall. Prer., Fr. 302 or Fr. 305 or upon consultation. Frey.
Fr. 408/508-3. Structure of French. Fall. Some of the typical patterns of French will be analyzed, using the techniques of modern linguistics. No previous knowledge of linguistics is assumed. Prer., Fr. 301 or 501 or upon consultation. Mayer.

Prer. for all following courses, French 311-312, graduate standing, or upon consultation.
Fr. 411/511-2 to 3, 412/512-2 to 3. French Special Topics. Different topics will be offered and, in a number of cases, cross-listed with the Department of Comparative Literature or other departments.
Fr. 490-3. Methods of Teaching French and Professional Orientation. Fall. To be taken one semester prior to or concurrently with student teaching. Tinelli.
Fr. 597-2. College Foreign Language Teaching. (Ger. 597, Ital. 597, Span. 597.) Fall. Required for TAs and graduate part-time instructors. Baker.
Fr. 612-2, 613-2. Seminars in French Literature. For use of visiting lecturers and distinguished visiting professors.
Fr. 814-2. Seminar: Special Topics. To be taught by French faculty.

Courses listed below are offered on a three-year cycle. One graduate seminar offered per year; centuries vary.
Fr. 672-2. Racine. Barcillon.
Fr. 676-2. Rousseau. Stavanan.
Fr. 700-3. Master’s Thesis.
Fr. 800-39. Doctor’s Dissertation. All doctoral students must register for no fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.
Fr. 940-1 to 3. Independent Study: Language. Upon consultation only.
Fr. 945-1 to 3. Independent Study: Literature. Upon consultation only.
Fr. 950-1 to 3. Independent Study. Upon consultation only.

For courses in comparative literature, linguistics, and phonetic sciences, see those sections.

Italian
Ital. 101-5. Beginning Italian. Fall, Spring. Four skills of listening, speaking, reading, and writing are progressively developed in a predominantly oral presentation. Language laboratory work expected.

Geography

Geog. 100-3 or 4. Environmental Systems — Climate and Vegetation. A general introduction to the atmospheric environment of the earth: the elements and controls of climate and their implications to hydrology, vegetation, and soils.

Geog. 101-3 or 4. Environmental Systems — Landforms and Soils. An introductory survey primarily concerned with two essential aspects of the natural environment—landforms and soils. Major emphasis is directed to the genesis, distribution, and utility of surface features in a variety of learning situations, including lecture, lab, tutorials, and field trips.

Geog. 198-3. World Regional Geography. Using the interrelated concepts of population, urbanization, trade-resources and development as an organizing framework, the world’s regions are geographically analyzed and placed in global perspective.

Geog. 198-3. Introduction to Human Geography. A systematic introduction to the broad field of human-environment relationships. Emphasis on topics that may include growth and distribution of populations, locational analysis of economic activities, origin, development, and problems of urban communities, and spatial analysis of cultural, historical, and political phenomena.

Geog. 200-3. World Geographic Problems. Set in several regions, problems include resource-use decision making, locational analysis. Third World poverty and community development, and political and economic urban land use conflict. Small student groups in role-playing simulations leading to human decisions causing geographic change.


Geog. 305-3. Cartography I. Two lectures, one 2-hr. lab. per wk. The art and science of mapmaking with emphasis on research, design, and reproduction.

Geog. 306-3. Map Interpretation. Basic introduction to the skills and reasoning ability needed to appreciate and use maps as research tools and illustrative devices. Emphasis on map reading and geographic interpretation of U.S. and selected foreign maps.

Geog. 320-3. Topics in Meteorology. (A.G. 320.) Fall and Spring. See Astro-Geophysics course description.


Geog. 342-3. Conservation Thought. Historical survey of human consumption of earth materials; environmental and global considerations of population growth, cultural attitudes, and technological development; the diverse goals and philosophy of conservation movements in time and place.

Geog. 370-3. Geographic Analysis of Issues in American Society. The geographic viewpoint, especially regional differentiation and systems models, applied to such socioeconomic concerns as pollution, poverty, racism, violence, and political reorganization. Topics will vary.

Geog. 381-3. Latin America. National and regional overview of culture, history, resources, population, socioeconomic change, and other contemporary geographic problems. Hill.

Most 400-600-level courses are offered in alternate years.

Ital. 105-5. Accelerated Italian for Reading and Research. Prereq., upper division undergraduates and graduates. A full year condensed into one semester, designed especially for students who have knowledge of another Romance language.

Ital. 211-3. Second-Year Italian Reading, Grammar, and Composition. Fall. Spring. Conducted in Italian except for grammar explanations. Designed to provide a thorough grammar review, to improve reading abilities, and to improve writing skills. Prereq., grade of C or better in Ital. 102 or equivalent.


Ital. 312-3. Survey of Italian Literature. Study in literary history and more classical forms of the Italian language. Special emphasis on major literary movements of the Middle Ages, Age of Humanism, and Early and High Renaissance. Conducted in Italian. Prereq., Ital. 212 or upon consultation.

Ital. 313-3. Survey of Italian Literature. Literature of the 16th, 17th, and 18th centuries. Attention shall be devoted to comprehension of material at a literal level. Conducted in Italian. Prereq., Ital. 212 or upon consultation.

Ital. 315-3. Romance Literature in English Translation I. (Port., Span., Fr., It.) S2 See Span. 315. May not be taken for credit toward a major in Italian.

Ital. 316-3. Romance Literature in English Translation II. (Port., Span., Fr., It.) S2 See Span. 316. May not be taken for credit toward a major in Italian.

Ital. 321-3. Advanced Conversation and Composition. Fall. Devoted to assigned translations and compositions with discussion of grammatical and stylistic problems encountered, and to conversation at an advanced level. Prereq., Ital. 212 and 211 or upon consultation.


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Geog. 305-3. Historical Geography of the United States. A study of human adjustment to and alteration of landscapes encompassed by the United States at successive stages of time. Emphasis given to the role of geography during the westward movement of settlement.

Geog. 306-3. The Geography of Africa. A study of the physical and cultural and regional aspects of Africa; analytical comparison of natural and cultural regions; development of present nation-states.


Geog. 405-3. Cartography II. Two lectures, one 2-hr. lab. per wk. Advanced cartography with emphasis on independent research and projects. Field trips to leading map publishers and printers arranged.

Geog. 406/506-3. Geographic Interpretation of Aerial Photos. The properties and applications of aerial photography. The emphasis is on important qualitative and quantitative characteristics of this type of imagery with applications e.g., landform recognition, drainage, land use, transport, urban features discussed in the sections of the class. Required lab. Morrow-Jones.


Geog. 416-3. Teaching Geography. Practicum and/or tutorial, by special arrangement only, in the teaching of geography, e.g., serving as small-group leaders or tutors in introductory courses, or developing and/or testing curriculum materials. Prer., consent of instructor.

Geog. 417/517-3. Research Seminar. Development of skills for research with emphasis on primary and secondary sources, on methods of evaluating source materials, and on geographic writing.

Geog. 421-3. Physical Climatology—Principles. A course introducing the physical principles of flows of heat and moisture to and from the earth's surface, the interaction and modeling of such flows, and their distribution in space and time. Prer., Geog. 100 and 220 or equivalent. Barry or Grenland.

Geog. 422-3. Physical Climatology—Applied. Applications of the principles of physical climatology are examined in areas such as water balance, agriculture and forestry, and urban climatology. Prer., Geog. 421 or equivalent. Barry or Grenland.

Geog. 431-3. Principles of Geomorphology. (Geol. 463.) See Geology for the course description.

Geog. 432/532-4. Mountain Geomorphology. (Geol. 460/560.) Field course emphasizing study of landforms produced by weathering and soils, mass movement, erosional processes under all climatic and altitudinal conditions. Prer., a college course in physical geography and consent of instructor. Mountain Research Station, summers only.

Geog. 433/533-4. Mountain Climatology. Survey and analysis of the climatic characteristics of selected mountain environments, their study in the field; emphasis on Rocky Mountains. Prer., a college course in weather and climate and consent of instructor. Taught from Mountain Research Station, summers only.


Geog. 440-3. Land Management Systems. Seminar and field survey of natural resources management systems relating to forest, farm, range, and other land use classes. Productivity, valuation and taxation characteristics of land management types. Study of land law; tenure; land reform practices; regional and world comparisons.

Geog. 443-3. Seminar: Conservation Trends. An advanced upper division seminar toward some progress in environment and geography majors. An undergraduate forum for interdisciplinary discussion and research into the current and future direction of conservation. (Senior majors only.)

Geog. 446-3. Land Use Policy and Administration. Offered infrequently. An introduction to the theoretical and practical problems encountered in the establishment and administration of land use policies. Special emphasis will be given to current Colorado issues and the decision processes.


Geog. 482/582-3. Urban Geography. A study of the social, behavioral, political, and demographic factors which influence the development and maintenance of communities in contemporary urban environments, with primary emphasis on U.S. cities. Palm.


Geog. 471/571-3. Political Geography. A systematic study of the relations between geography and politics, especially as a background for better understanding of international affairs. Topics such as frontiers and boundaries, power analysis, electoral geography, resource utilization, and strategic concepts are included. Myers.

Geog. 472/572-3. Historical Geography of Europe. A study of how people have changed the landscape of Europe through time, including an analysis of the past geography of Europe at selected periods of time. Myers.


Geog. 474-3. Environments and Peoples. A study of interrelations between diverse environments and peoples—past, present, and future—particularly to view cultural tradition and change as communicated through the medium of environment. Hill.

Geog. 475/575-3. Seminar: Recreational Geography. An inquiry into the spatial distribution and environmental conditions of recreation. Emphasis will be on outdoor recreation in mountainous settings. The implications of recreational values to resource managers and land use decisions will be included. Prer., Geog. 341 and 342. Helburn.

Geog. 482/582-3. Historical Geography of Eastern North America. Offered alternate year. A study of how people have developed settlements and utilized and changed the landscape of North America east of the Mississippi River through time, including an analysis of the past geography of certain regions of eastern North America at selected periods of time. Myers.

Geog. 483/583-3. Historical Geography of Western North America. Offered alternate year. A study of how people have developed settlements and utilized and changed the landscape of North America west of the Mississippi River through time, including an analysis of the past geography of certain regions of western North America at selected periods of time. Myers.

Geog. 488-3. The Rocky Mountain Region. Study and analysis of the existing environmental systems as they affect human utilization of the area and the resulting population dispersal therein. Loeffler.

Geog. 487-3. Geography of Colorado. Location, distribution, evaluation, and utilization of Colorado resources with emphasis on the major problems of resource development and use in the population explosion. Loeffler.

Geog. 489-3. Soviet Union. A systematic and regional survey of features that characterize the physical, economic, and social geography of the U.S.S.R. Erickson.

Geog. 488-3. Geography of Western Europe. A regional survey of the cultural, economic, social, political, and political geography of Western Europe east of the Rhine, emphasizing the distinctive character and problems of each major area. Myers.

Geog. 490-3. Geography of Central, Northern, and Southeastern Europe. A regional survey of the cultural, economic, social, physical, and political geography of Europe east of the Rhine, emphasizing the distinctive character and problems of each major area. Myers.
Geog. 514-3. Techniques in Geocology. Offered occasionally. Introduction to methods currently applied in geocological field studies (microclimatology, glaciology, hydrology, geomorphology, plant ecology, hydrology, and laboratory analysis. Prer., consent of instructor. Barry, Caine, Greenland.

Geog. 521-3. Seminar: Physical Climatology. A research seminar concerned with problems of mass and energy exchange in the earth-atmosphere system. Topics to be selected from such areas as air quality, bioclimatology, hydrology, climate change, and the climates of urban, agricultural, and natural environments. Prer., Geog. 421 or consent of instructor. Greenland.


Geog. 524-3. Topics in Physical Geography. (Precise title specified in Schedule of Courses.) Recent research topics which vary from year to year. This course may be taken twice as the topics vary.

Geog. 530-3. Physical Geography of the Arctic Regions. Offered infrequently. Analysis of physical parameters defining arctic regions; climates: biogeography; land and sea ice and permafrost; regional physiographies with emphasis on Arctic Canada and Arctic Scandinavia; discussion of physical processes currently active; history of glacial and periglacial activity. Prer., a college course in physical geography and consent of instructor.


Geog. 602-3. Data Processing in the Earth Sciences. (Geol. 615.) Offered occasionally. See Geology for the course description. Prer., Geol. 402 or Geol. 477, or equivalent, or consent of instructor. Greenland.

Geog. 611-3. History and Nature of Geography. A history of geographical ideas including methodological issues in contemporary geography. Palm or Hill.

Geog. 616-3. Seminar: Geographic Education. A survey and critique of ideas from education, psychology, philosophy, and geography related to teaching and learning, especially for graduate students in geography who plan careers in college teaching. Hill or Helburn.

Geog. 617-3. Geography Teaching Materials. Emphasis will be upon the creation of materials for classroom use in geography. Curriculum theory and available extant materials will be reviewed. Prer., Geog. 616 or instructor consent. Helburn or Hill.

Geog. 618-3. Seminar: Geographic Problems. Application of research methods to selected problems. Instructor and topic will vary and will be announced. Course may be repeated under different topics with advisor’s approval.

Geog. 619-1 to 3. Experimental Teaching in Geography. Advanced graduate students in geography experimenting with new course content or structure, instructional objectives, curriculum materials, evaluation devices, communication skills, and the like. Prer., Geog. 516 plus practicum such as teaching assistantship. Hill and Helburn.

Geog. 619-3. Readings in Climatology. Offered alternate years. Selected topics in current climatological literature discussed in seminars. Specific themes will vary but may include aspects of microclimatology, paleoclimatic reconstruction, climatic applications of satellite data. Prer., consent of instructor. Barry or Greenland.

Geog. 630-4. The Arctic and Alpine Environments. (EPOB 510, Geol. 640.) Offered alternate years. Concentration on multidisciplinary aspects of environmental processes and Quaternary history of the arctic-alpine region. This will involve introduction of new and recent faculty research in the Canadian Arctic and in the alpine area of the Rocky Mountains. Local field trips. Prer., consent of instructor. Ives.


Geog. 671-3. Seminar: Political Geography. Offered alternate years. Development and consideration of the history and methodology of the field, including an analysis of a selected systematic topic such as frontiers and boundaries, international rivers, conflicting claims to territory, electoral geography, etc. Myers.

Geog. 672-3. Seminar: Historical Geography. Offered alternate years. Discussion of the scope and methodology of historical geography, including consideration of past and current trends, as well as future prospects. Seminar presentations on topics selected for their substantive importance. Myers.

Geog. 674-3. 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. Erickson or Hill.


Geog. 800-30. Doctor’s Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.

Geol. 930-1 to 3. Undergraduate Independent Study. By special arrangement with faculty. Only for students presenting strong geography preparation. Prer., consent of instructor and departmental approval.

Geol. 950-2 to 3. Graduate Independent Study. Independent research for graduate students only. Prer., consent of instructor and departmental approval.

**GEOLICAL SCIENCES**

The following courses are not open to majors in geological sciences: Geol. 103, 104, 113, 114, 370, and 397.

Geol. 101-4. Introduction to Geology I. Introductory geology for majors and nonmajors. Three lect. and one lab. or field trip per wk. Study of the earth: its materials, its characteristics, and its dynamic processes, and how it relates to people.

Geol. 102-4. Introduction to Geology II. Introductory geology for majors and nonmajors. Three lect. and one lab. or field trip per wk. Study of the evolutionary history of the earth and life. Prer., Geol. 101 or equivalent.

Geol. 103-3. Introduction to Geology I. Similar in topics to Geol. 101 but closed to geology majors. Three lect. per wk.

Geol. 104-3. Introduction to Geology II. Similar to topics in Geol. 102 but closed to geology majors. Three lect. per wk. Prer., Geol. 103 or equivalent.


Geol. 114-3. Dynamic Earth II — The Solid Earth. Spring. Basic concepts of the physics of the solid earth, earthquakes, their causes and prediction. Earth structure, earth’s gravity and magnetic fields, and earth’s rotation.


Geol. 153-4. Geological Development of Colorado and the West. Three lect. and one field trip or lab. per wk. An outline of the development, through time, of the geology of Colorado. Follow-up for those who have had Geol. 101.

Geol. 201-2. Advanced Introductory Geology. One lect. and one lab. or field trip per wk. Advanced topics in introductory geology, geochemistry, and geophysics; for potential geology majors who have taken an 8-hr. course in beginning geology. Prer., Geol. 101 and either Chem. 105 or 106 with grade-point average of 2.5, Math. 130, and either Chem. 103 or Phys. 111.


Geol. 340-4. Evolution of Continental Ecosystems. An inquiry into the evolution of important ecosystems of the past and present. Biological and geological data for reconstructing ecosystems will be discussed in detail and applied to creating scenarios of past ecosystems. Vertebrates and their structure will be emphasized. Prereq.: Geol. 101-102/253-201. Braddock.

Geol. 341-4. Marine Paleobiology. The course surveys the functional morphology, ecology, evolution, and classification of marine organisms and their application to problem solving in geology and biology. Both living and fossil representatives of diverse Phyla are utilized to illustrate the major concepts and methods of paleobiology. Prereq.: Geol. 102/153, or one year of biology, or consent of instructor. Warner.


Geol. 347-3. Introductory Petrology. An introduction to the petrology of igneous, metamorphic, and sedimentary rocks. Emphasis is placed on theories of origin and on studies of hand samples using a 10-power hand lens, supplemented by an introductory coverage of thin section petrography. Prereq.: Geol. 311. Walker, Larson, or Jones.


Geol. 404/504-3. Geological Hydrology. Surface and ground waters are examined as a dynamic system within a geological framework. Implications for human management of watercourses, water supplies, and water quality are considered. Prereq.: physical geology, Math. 130 (or equivalent), introductory physics, or consent of instructor. Curtis.


Geol. 412/512-4. Structural Geology II. Mechanics applied to the deformation of rocks. Stress, infinitesimal strain, behavior of elastic and plastic rocks, fault mechanics, mechanical effects of pore fluids, introduction to petrofabrics, and other topics. Lab. included. Prereq.: Geol. 312, Phys. 111-112. Braddock.


Stability diagrams, ion exchange, weathering, geochemical prospecting, and topics in thermodynamics. Prer., college chemistry and minor or. Geol. 527 or 528 recommended. Rummells.

Geol. 532-4. Subsurface Geology. Not offered every year. Consideration of the geology of the magmatic and hydrothermal environments. The role of stable and radioactive isotopes and female elements in interpreting petrologic processes. Prer. or coreq., stratigraphy and structural geology, or consent of instructor. Curtiss.


Geol. 540-4. Quaternary Stratigraphy. Summary of geological and pedologic methods used to recognize, define, and correlate Quaternary deposits and interpret Quaternary history. Prer., introductory geology and Geol. 463/465, or consent of instructor. Birkeland.


Geol. 545-3, 546-3. Micropaleontology. Offered in alternate years. Classification, occurrence, and interpretation of minute fossils, especially Foraminifera. Prer., Geol. 341-342 or consent of instructor. Etches.

Geol. 549-3. Geochemistry of Hydrothermal Ore Deposits. Offered alternate years. Laboratory studies, thermodynamic data, chemical data, fluid inclusions, stable isotopes, and field occurrences are all used to explain the composition, origin, and history of hydrothermal ore deposits. Prer., Geol. 327. Munson.


Geol. 557-1 to 3. Topical Seminar: Paleobiology and Paleoenvironments. A seminar on current topics of exceptional interest built around a series of prominent invited speakers. (Co-listed with M.S. 503 at CSM. In 1982.) Prer., Geol. 341 or equivalent in paleo or E.D. biology. Kauffman and staff, visiting lecturers.


Geol. 560-3. Recent Techniques in Paleobiology. Alternate years. Instruction and practica with techniques of physical and chemical preparation of fossils, data analysis and presentation, and illustration. Prer., Geol. 341 or equivalent biology or anthropology. Kauffman and staff.


Geol. 567-2. Plate Tectonics. The most recent and the fundamental ideas regarding the hypothesis of the New Global Tectonics with emphasis on the geophysical aspects. Prer., basic courses in physics, geology, and mathematics; graduate status or consent of instructor. Wyss.

Geol. 570 through 579 variable credit. Geological Topics Seminar. Seminar studies in geological subjects of special current interest are offered primarily for graduate students, as departmental staff and facilities permit.

Geol. 580-4. Structural Geology. Mantle applied to the deformation of rocks, finite strain, plastic flow of crystals, ductile deformation of rocks, petroleum analysis, and other topics. Laboratory included. Prer. Geol. 412/415 or equivalent. Bredin.

Geol. 582-2. Geophysical Instrumentation. An introduction to the principles on which the design of instruments for various geophysical observations is based. Emphasis on seismographic and strainmeters, with some discussion of gravimetric and electromagnetic instruments. Prer., Phys. 322, 331, A.Math. 236, Kinslinger.


Geol. 613-3. Geotectonics. Tectonics of type areas of the world, deformation mechanisms, plate tectonics. Prer., structural geology, petrology, or consent of instructor.


Geol. 627-2. Advanced Topics in Thermodynamics and Mineralogy. Current problems in thermodynamics as applied to mineralogy and petrology are discussed in seminar format. Individual student research will be required. Prer., Geol. 527. Munoz.


GEOG 688-3. Rock Physics. Not offered every year. Magnetic, electrical, optical, thermal, and mechanical properties of rocks. Emphasizes basic concepts of solid state physics and shows the use of these properties in helping to interpret the geologic records. Basic courses in physics, mathematics, and geology recommended. Open on consultation. Spetsler.


GEOG 800-30. Doctor's Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.

GEOG 893 to 949-Variable credit. Independent Study in Geology. Time and credit to be arranged. For advanced undergraduates and graduates who have high scholastic standing. Open only upon consultation.

GEOG 950 to 959-Variable credit. Independent Study.


GERMANS LANGUAGE AND LITERATURES

German

See Schedule of Courses for specific course offerings in each semester.

GER 101-4. Beginning German I. Fall, Spring. For students with no previous training in German.

GER 102-4. Beginning German II. Fall, Spring. Prereq., GER 101 or equivalent.

GER 201-4. Intermediate German. Fall, Spring. A review and continuation of the basic skills begun in the first year: reading, writing, speaking and oral comprehension. Fulfills college language requirement. Prereq., GER 102 or equivalent.

GER 202-4. Intermediate German: Reading. Fall, Spring. Prereq., GER 201 or three levels of high school German or equivalent. Fulfills Graduate School language requirement for the Ph.D.

GER 205-2. Intermediate German: Conversation. Fall, Spring. For students who wish supplementary conversational practice on the third semester level. This course does not satisfy the foreign language requirement. Students may take this course concurrently with GER 201. Prereq., GER 102 or equivalent.

GER 206-4. Intermediate German: Communication Skills. Fall, Spring. Prereq., GER 201 or three levels of high school German. Fulfills Graduate School language requirement for the Ph.D.

GER 222-4. Scientific German. Fall, Spring. Prereq., GER 201 or three levels of high school German, or upon consultation. Fulfills Graduate School language requirement for the Ph.D.

GER 301-3. Advanced Conversation and Grammar. Fall, Spring. Required for German majors. Prereq., GER 202 or 206 or 222, or four levels of high school German, or upon consultation.

GER 302-3. Advanced Conversation and Composition. Fall, Spring. Required for German majors. Prereq., GER 301 or upon consultation.

GER 303-3. Business German. Fall, Spring. Prereq., GER 202 or 206, or four levels of high school German or upon consultation. A study of general commercial practices, vocabulary, and terminology applied in business transactions of various kinds with special emphasis on oral and written communications and correspondence; useful in subsequent business careers.

GER 308-2. German Pronunciation and Diction. An introduction to phonology. Prereq., GER 202 or 222, or upon consultation.

GER 310-3. The Language of German Literature. Fall. Combines an introduction to German literature with intensive work in the language. Designed particularly for those without study abroad and those entering 300-level courses directly from high school. Prereq., four semesters of college German or equivalent.

GER 311-3. German Literature I. Fall, Spring. An examination of selected literary texts from 1010 to the present. Prereq., GER 202 or 222, or upon consultation. May be taken either before or after or concurrently with GER 312.

GER 312-3. German Literature II. Fall, Spring. An examination of selected literary texts up to 1910. Prereq., GER 202 or 206 or 222, or upon consultation. May be taken either before or after or concurrently with GER 311.

GER 325-3. Germany and the Germans. Introduction to the people and cultures of contemporary Germany as revealed through politics, history, educational systems, theatre, film, art, and literature.

GER 351-3. German Language in English Translation I. Fall. Reading knowledge of German not required. Prereq., sophomore standing or above, or upon consultation. Blomster or Wessel.

GER 352-3. German Language in English Translation II. Spring. Reading knowledge of German not required. Prereq., GER 351 or upon consultation. Blomster or Wessel.

GER 383-3. The History of the German Film. Reading knowledge of German not required. Prereq., sophomore standing or above, or upon consultation. Schmidt.

GER 401-3. Advanced Composition, Conversation, and Stylistics I. Fall, Prereq., GER 302 or upon consultation. Required for German majors.

GER 402-3. Advanced Composition, Conversation, and Stylistics II. Spring. Prereq., GER 401 or upon consultation. Required for German majors.


GER 411-3. German Literature of the 19th Century. Fall, alternate years. Prereq., GER 311 and 312 or upon consultation. Hall or Schmidt.


GER 413-3. German Classicism. Fall, alternate years. Prereq., GER 311 and 312 or upon consultation.

GER 433-3. German Classicism. Fall, alternate years. Prereq., GER 311 and 312 or upon consultation.

GER 437-3. Introduction to German Literary History I. Fall, Prereq., GER 311 and 312 or upon consultation. Hall or Schmidt.

GER 438-3. Introduction to German Literary History II. Spring, Prereq., GER 437 or upon consultation. Blomster or Schmidt.

GER 450-Variable credit. Seminar: Literature in Cultural Context. Provides a broader framework for the work of literature, viewing it from various cultural perspectives. Specific content of course is defined by the instructor each time it is given. In English translation.

GER 481-2. Seminar: German Literature in Translation. Reading knowledge of German not required. Prereq., junior standing or above or upon consultation.

GER 482-variable credit. Hermann Hesse. In English translation; reading knowledge of German not required. Prereq., junior standing or above or upon consultation. Blomster.

GER 491-3. Richard Wagner and the Middle Ages. In English translation; reading knowledge of German not required. Prereq., junior standing or above or upon consultation. Firestone.

GER 495/595-3. Methods of Teaching German. Fall. Required of students who desire the recommendation of the department for secondary school teaching positions. For student teaching in German, see T.Ed. 471 under the School of Education.

GER 501-3. Advanced Language Skills I. Fall. Training in oral and written language arts: speaking in groups, reciting, and lecturing; English to German translations of difficult texts; writing expository prose. Schmidt.

Ger. 511-3. Topics in German Linguistics. Content varies. Topics include language acquisition and error analysis. German dialects and others. Prer., Ger. 410/510 or upon consultation. Firestone or Lewis.

Ger. 514-3. History of the German Language I. Fall. Stresses the cultural and political factors which helped to shape the language. The main linguistic aspects dealt with are lexical and semantic changes. Firestone or Oster.


Ger. 521-3. Introduction to Middle High German. A study of classical medieval German, with readings from works by principal Middle High German poets. Firestone or Hall.

Ger. 524-3. Early German Literature. A survey of German literature from the earliest monuments through about 1600. Readings in Modern German translation. Hall.


Ger. 532-3. German Literature From 1600 Through Classicism. A survey of literary forms, movements, and writers from the Reformation and German Renaissance through the Baroque and the 18th century. Wessell.


Ger. 581-3. German Civilization. A survey of cultural history with an emphasis on movements that have contributed most in shaping modern Germany in its spiritual and artistic manifestations. With slides and tapes. Knowledge of German required. Blomster or Schmidt.

Ger. 592-variable credit. Seminar: Interdisciplinary Studies. Course taught jointly by members of this department with faculty from other departments. Relationships most frequently studied in this course include those between literature and history, music, philosophy, or the fine arts.

Ger. 596-2. Educational Media in the Foreign Language Classroom. Designed to familiarize the foreign language teachers with the technique of selection, preparation, and application of multimedia in the teaching of foreign language.

Ger. 597-2. College German Teaching. Fall. Required of new part-time instructors who have no previous teaching experience.

Ger. 601-3. Proseminar. An introduction to the techniques and problems of scholarly research and writing; familiarization with research tools, followed by application to a specific project in German literature.


Ger. 711-3. Seminar: German Literature.


Ger. 800-30. Doctor's Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.

Ger. 910-1 to 3. Independent Study.

Ger. 940-1 to 3. Independent Study.

Ger. 950-1 to 3. Independent Study.

Also recommended as supplementary courses for German majors are all courses in Scandinavian languages and literatures, and Hist. 435 and 436, History of Germany.

**Scandinavian Languages and Literatures**

Nor. 101-5. Beginning Norwegian I. Fall.

Nor. 102-5. Beginning Norwegian II. Spring. Prer., Nor. 101 or upon consultation.

Nor. 211-3. Second-Year Norwegian Reading and Conversation I. Fall. Fulfills the college language requirement for the B.A. and B.F.A. degrees. Prer., Nor. 102 or upon consultation.

Scand. 225-3. Contemporary Sweden and Norway. Spring. (Taught in English.) A comprehensive overview of Swedish and Norwegian society with emphasis on economic and political life, institutions and organizations, people and culture, manners and customs.


Scand. 910-variable credit. Independent Study. Prer., permission of instructor.

Scand. 940-variable credit. Independent Study. Prer., permission of instructor.

**Swed.**

Swed. 101-5. Beginning Swedish I. Fall.


Swed. 211-3. Second-Year Swedish Reading and Conversation I. Fall. This course fulfills the college language requirement for the B.A. and B.F.A. degrees. Prer., Swed. 102 or upon consultation.

Swed. 325-3. Modern Sweden. A discussion of various aspects of modern Sweden with emphasis on achievements in areas such as social welfare, civil liberties, education, environment, and the living and life standards resulting from them. Taught in English.


Swed. 940-variable credit. Independent Study. Prer., permission of instructor.

**HISTORY**

Hist. 101-3. History of Western Civilization I. Lectures and class discussions on the development of western civilization from its beginnings in the ancient near East to the time of the establishment of the first modern states in the 18th century.

Hist. 102-3. History of Western Civilization II. A survey course dealing with political, economic, social, and intellectual developments in European history from the 17th century to the present. Similarities and contrasts between European states will be underscored, as well as Europe's changing role in world history.

Hist. 103-3. Introduction to Asian History: The Middle East and India. An introductory survey of the history of the Middle East and India. Attention is divided equally between the traditional civilizations of Islam and Hinduism and patterns of modernization and nation-building in the 20th century.

Hist. 104-3. Introduction to Asian History: China and Japan. An introductory survey of the history of China and Japan, covering the main features of the traditional civilizations of these areas as well as more recent phenomena such as modernization, nationalism, and revolution in the 19th and 20th centuries.

Hist. 105-3. The World of the Ancient Greeks. (Clas. 105.) This survey course presents the emergence, major accomplishments, and decline of the world of the ancient Greeks from the Bronze Age.
civilizations of the Minoans and Mycenaeans to the career of Alexander the Great.

Hist. 106-3. The Rise and Fall of Ancient Rome. (Class. 106.) A survey of ancient Roman history from the origin of the city to the decline of the Roman Empire in the Western Mediterranean and the emergence of the Byzantine Empire in the Eastern Mediterranean. Hist. 141-3. The History of England I: Deals with the period from Roman times to the 17th century. Covered are social, political, and constitutional affairs which contributed to the creation of the English nation.

Hist. 142-3. The History of England II. The period from the 17th century to the present. Political, economic, social, and imperial developments which contributed to the creation of the modern industrial and democratic state are the major issues covered.

Hist. 151-3. The United States: From the settling of the New World to 1885. A survey of American history from the first settlement until the end of the Civil War. Hist. 152-3. The United States Since 1885. A general survey of the social, economic, political, and cultural development of the United States from the close of the American Civil War to the present.


Hist. 202-3. Chicano History: 1848 to Present. (Ch. Sta. 202.) Introduction to the historical development of Chicano society and thought from 1848 to the present.

Hist. 203-3. Topics in Ancient History. (Class. 203.)

Hist. 204-3. Topics in Ancient History. (Class. 204.)

Hist. 205-3. Encounters With History. A topical and experimental approach to the study of history, using team-teaching and multimedia methods designed to explore ways in which encounters with history are meaningful educational experiences in the modern world. Prereq. permission of instructor.

Hist. 207-3. History of Christianity I: To the Reformation. A general introduction to the history of Christianity from its beginnings through the first period of the Protestant Reformation. Examines religious life and the church in relation to the social and cultural setting.

Hist. 209-3. History of Christianity II: From the Reformation. A general introduction to the history of Christianity from the Reformation to the present. Examines religious life and the church in relation to the social and cultural setting.

Hist. 211-3. Culture and Institutions of the Middle Ages. Political, institutional, and cultural history of Europe from the 4th to the 13th centuries.

Hist. 212-3. Culture and Institutions of the Middle Ages. Political, institutional, and cultural history of Europe from the 13th to the 18th centuries with particular attention to the disintegration of the medieval order resulting from the national state, the secularization of society, and the decline of the church.


Hist. 216-3. Afro-American History II. (Bl. St. 216.) See Black Studies for course description.

Hist. 219-3. Topics in European Intellectual History. Lectures deal with a variety of themes which vary each semester. Main focus is usually some aspect of 19th- or 20th-century thought such as Marxist, Romanticism, Nazism, Existentialism, the novel and history, etc. Check with instructor.

Hist. 225-3. Problems in German History: Nazi Germany. Concerned with the origins of German National Socialism, with the rise of the National Socialist movement to power, and with Nazi social and racial policies. Prereq. Western Civilization sequence.

Hist. 248-3. Topics in 18th-, 19th-, and 20th-Century English History. Issues dealing with major historical developments such as industrialization, or the careers of prominent individuals such as Winston Churchill are considered in depth. Designed for freshmen and sophomores.

Hist. 253-3. History of Colorado. Emphasizes the historical variety and ethnic diversity of Colorado. Along with traditional themes in Colorado history, such as the gold rush, attention will be given to Indian and Hispanic activity and culture.

Hist. 261-3. The Modern World to 1900. Thematic studies in the political, economic, social, and intellectual history of those areas exerting the most influence upon the world today.

Hist. 262-3. The Modern World Since 1900. Thematic studies in the political, economic, social, and intellectual history of those areas exerting the most influence upon the world today.

Hist. 270-3. History of Japan Through Cinema. This course uses commercial feature-length films as a vehicle for looking at different chronological periods and understanding life and times. The films of Kurosawa, Mizoguchi, Ozu, and other leading directors will be used.


Hist. 272-3. History of the Modern Far East. A continuation of Hist. 271. This course deals with recent and contemporary developments in the Far East and Southeast Asia. Included are historical aspects of the Vietnam war.

Hist. 289-3. History of Women in the United States. An examination of the role of women—social, economic, political—in American history from Colonial times to the present.


Hist. 303-3. Selected Readings in Renaissance and Reformation.


Hist. 310-3. Selected Readings in German History.


Hist. 312-3. Selected Readings in the American West.


Hist. 319-3. Selected Readings in Modern Middle East History.


Hist. 360-3. The Indian in American History: The Eastern Region. Pre-European social and cultural developments, longevity, and continuity of human history in North America is explored. The Indian's role in eastern North American history is demonstrated.

1Also available through correspondence study.
Hist. 361-3. The Indian in American History: The Western Region. The longevity and continuity of human history in North America is explored by examining the ways in which Indian societies west of the Mississippi River responded to Euro-Americans, the Indian's role in western North American history is demonstrated.

Hist. 372-3. Teaching History. Designed for students who will become teachers of history at the elementary or secondary levels. Explores the varieties and uses of history and ways to relate history to student concerns.

Hist. 378-3. Japan at War. History of Japan at war from the feudal period through World War II, with emphasis on the 20th century. This examination of modern imperialism and the impact of the West upon Asia and Africa since 1800; then an analysis of nationalist and independence movements in those continents over the same period. Then approaches to the Rural History of Modern Mexico, 1800 to 1900. Examination of long-term changes and continuities in rural societies of Mexico since independence. Special attention to commercial agriculture and transformation of rural life in the 19th century, agricultural uprisings, Revolution of 1910, and structure of rural society today.

Hist. 384-3. The Cuban Revolution. An examination of the historical background to revolution in Cuba and of social, economic, and political change since 1895.


Hist. 390-3. Historical Practice. Approximately 60 percent of the articles in general-interest newspapers and 45 percent of the non-fiction books published in America are historical. This course is designed to teach students to write history for such general publication.

Hist. 391-3. History of Zionism and Israel. An examination of Zionism ideas, the Zionist movement, and the emergence of the Jewish state of Israel in the 19th and 20th centuries.


Hist. 400-3. Women in Asian History. A consideration of major issues affecting Asian women throughout history, focusing on aspects of development as they affect women: traditional roles and ideas, the family, colonization, nationalism, education, the industrial revolution, the impact of technological change and aid programs.

Hist. 401-3. Women and Society in Industrial Europe. Examines the impact of industrialization and related social change on women in modern European history. Topics will include: work, family, sexuality, and women in movements for social and political change. Prer., Hist. 102 or equivalent and upper division standing.


Hist. 404-3. The Scientific Revolution, 1543-1687. The history of scientific development and its relation to other intellectual and social characteristics of the 18th and 19th centuries.

Hist. 407-3. History of the Byzantine Empire. (Clas. 407.) Approaches Byzantium as the heir to the Greco-Roman tradition, paying considerable attention to the lines of continuity with the ancient past but recognizing discontinuity as well. Readings will present a survey of Byzantine history and civilization.

Hist. 408-3. The Roman Republic. (Clas. 408.) See Classics for course description.

Hist. 409-3. The Roman Empire. (Clas. 409.) This intense survey of Imperial Roman history will begin with the Roman Revolution and end with an examination of the passing of centralised political authority in the Western Mediterranean. Emphasis will be on life, letters, and personalities of the empire.

Hist. 411-3. Social Foundations of European Civilization. The study of the social structures of Europe and their relationship to political, religious, and economic institutions from 400-1000 A.D.


Hist. 413-3. Constitutional and Legal History of England to 1485. The origins and development of the legal and political institutions and concepts of England. Special reference and emphasis is accorded the implications of these developments to contemporary American and English systems.

Hist. 414-3. Constitutional and Legal History of England to 1714. Continuation of Hist. 413 with emphasis on the Tudor and Stewart constitutional crises down to the accession of the Hanoverian Dynasty.

Hist. 415-3. History of Science From the Ancients to Sir Isaac Newton. A history of science from the Pre-Socratics to Isaac Newton, underscoring major intellectual themes in scientific thought and the historical context in which they developed.

Hist. 417-3. Pre-Colonial History of West Africa. Survey of West Africa's history from earliest times through the slave trade.

Hist. 419-3. European Intellectual History, 1750-1870. Treats the major developments in European thought from the Enlightenment to Nietzsche, special attention given to the individuals whose ideas have had the greatest influence on modern intellectual history, e.g. Rousseau, Hegel, Herder, Marx, Kierkegaard, Baudelaire, Darwin, and the others. Prer. upperclass standing or consent of instructor.

Hist. 420-3. European Intellectual History, 1870-Present. Topics which receive particular emphasis: Nietzsche and the soul of Europe; Nietzsche against middle class society, the literary and artistic avant garde (Impressionism to Existentialism), the psychoanalytic movement, the European Right and Left, Post-WW II European thought. Prer. upperclass standing or consent of instructor.

Hist. 422-3. History of World War II. A history of World War II, with emphasis on the military, political (including diplomatic), economic, and social aspects of the conflict that occurred in Asia from 1937-1945 and in Europe from 1939-1945.

Hist. 423-3. Europe During the Renaissance. Explores the history and culture of Western Europe, ca. 1300-1520. Comprehensive in scope, with analysis of political, economic, social, religious, intellectual, and artistic matters. Discusses the significance of the Renaissance as the origin of modern civilization.

Hist. 424-3. Age of the Reformation. Examines two major, interrelated topics: the political and social history of the 16th century in western and central Europe and the momentous religious changes of the reformation and their cultural consequences.


Hist. 426-3. The Age of Reason, Montesquieu to Voltaire. A study of major European intellectual trends from the late 16th century through the Enlightenment.

Hist. 427-3. History of East-Central Europe to 1815. History of Eastern theocratic empires of Turks and Hapsburgs from the 16th to 19th centuries, the development of political consciousness of various peoples comprising these empires, conflicts between Eastern theocracies, and rising secularism of Western Europe, culminating with the Napoleonic Wars.

Hist. 428-3. History of East-Central Europe Since 1815. Problems connected with dissolution of East European empires at the end of WW I, the formation of the nation states, the viability of these states in the 20th century, and the restoration of the imperial order after WW II.

Hist. 430-3. History of France Since 1815. A survey of French political, economic, and social institutions with analysis of domestic and foreign policies as well as discussion of French creativeness in the arts in the 19th and 20th centuries.

Hist. 431-3. Nineteenth-Century Europe. Beginning with the impact of the French revolutionary and Napoleonic era and ending with the causes of WW I, the course deals with the political, economic, and social institutions of the European states in the 19th century.

Hist. 432-3. Twentieth-Century Europe. Involved with European political, economic, and social institutions from WW I to the present, with emphasis on 20th-century communism and fascism and developments in the western European democracies.

Hist. 433-3. French Revolution and Napoleon. The causes of the French Revolution are analyzed. Covers in detail the basic political,
economic, and social changes and the legacy in Europe and the world of the French revolutionary and Napoleonic eras.

**Hist. 434-3. Colonial America, 1600-1750.** A survey of the settlement and development of the American Colonies with emphasis on the social, economic, political, and intellectual foundations of the United States.

**Hist. 435-3. German History to 1848.** A cultural, political, and social history of Germany up to and including the revolutions of 1848. Particular emphasis will be placed upon the political history of Prussia and upon such cultural phenomena as German romanticism.

**Hist. 436-3. German History Since 1849.** A cultural, political, and social history of Germany since 1849. Particular emphasis will be placed upon German unification, Bismarckian foreign policy, the rise of neo-Romanticism, Weimar politics, and the rise of National Socialism.

**Hist. 443-3. Tudor England.** An examination of the Tudors and the development of Renaissance England under this remarkable dynasty.


**Hist. 447-3. England, Age of Revolution, 1688-1832.** Deals with the major political, social, and economic events and movements in England between the accession of James II and the passage of the first Reform Act.

**Hist. 448-3. England in the Age of Collectivism.** Deals with the major themes of British history from the passage of the Reform Act of 1832 to the present.

**Hist. 449-3. The Gilded Age.** Examines the social and economic changes which transformed American life during the years 1870-1900. Labor violence, urban protest, political corruption, and racial and ethnic conflict are some of the consequences of those changes.

**Hist. 451-3. The American Revolution.** A survey of the events leading to the War of Independence and the creation of the United States.

**Hist. 453-3. Civil War and Reconstruction.** Describes the forces at work in the antebellum period that led to sectional warfare; the social, economic and political changes effected by the war; the American agony of reconstruction; and the long-range results of that difficult era.


**Hist. 456-3. Jacksonian America.** Focuses on the creation of the American party system and the political events that shaped it, sectionalism, slavery, moral reform, and the way the party system was destroyed.

**Hist. 457-3. The Early American Frontier.** Examines the westward movement from the colonial period through 1850 in the region east of the Mississippi, with a major focus on unique problems of societies on the successive frontiers and their relationship to civilization and national policy.

**Hist. 458-3. The Later American Frontier.** Deals primarily with the Trans-Mississippi west during the 19th century, the westward advance of various frontiers, and their influence upon national development. Emphasis upon the economic factors and the associated cultural and social growth of the region.

**Hist. 459-3. The American Southwest.** Focusing on the region's three main peoples (Indian, Hispanic, and Anglo), this course will emphasize the dynamics of inter-ethnic relations. Indian migrations, Spanish conquest and Indian response, Mexican-Indian interaction, and Anglo domination are some of the themes discussed.

**Hist. 460-3. Mexican-American Southwest.** History of Mexican-Americans. Tracing their origins to the Spanish conquest of Mexico and colonization of the borderlands; Southwest colonial society and relations with Indians; impact of American conquest; development of Mexican-American society.

**Hist. 461-3. Popular Culture in America to 1900.**


**Hist. 463-3. American Society and Thought to 1865.** Concerned with the American family and community in different social environments. Looking at families of different ethnic, religious, and class backgrounds; observing how they are changed by the passage of time, new economic conditions, or new political institutions.

**Hist. 464-3. American Society and Thought Since 1865.** Primarily concerned with family roles and community values, and how they are altered by economic, demographic, and intellectual changes. Some of the major themes will be acculturation, changing occupational opportunity, the idea of success, and popular culture.


**Hist. 466-3. U.S. History, 1948 to the Present: Lecture.** Emphasis on the Eisenhower years, the New Frontier, the Great Society of the 1960's, American involvement in Vietnam and popular reaction to that conflict, the Nixon domestic and foreign policies, and the social and economic problems of the 1970's.

**Hist. 467-3. Diplomatic History of the U.S. to 1914.** Traces the rise of the United States from the status of a weak new nation to that of an imperial world power with interests everywhere.

**Hist. 468-3. Diplomatic History of the U.S. Since 1914.** Traces the rise of the United States to a position of dominance from 1900 until the present. Not only describes the events of diplomatic history but seeks to explain the economic, social, and intellectual roots of foreign policy.

**Hist. 470-3. History of Urban America.** Surveys the growth of American cities and urban life styles from the 18th century to the present. Compares the role of cities, their structure and problems, during three stages of growth—commercial, industrial, and modern.

**Hist. 472-3. History of Modern Chinese Intellectual Thought.** An upper division survey of the major intellectual movements in modern China from Ch'ing Neo-Confucianism, imprimism, nationalism, to Chinese communism.


**Hist. 474-3. Rise of Revolutionary China.** A survey of political, social, and economic events in China since 1790.

**Hist. 475-3. Ancient and Medieval Japanese History.** Beginning with the long prehistoric and protohistoric period, continues into the age of the bureaucratic state, then focuses on Japan's exceptionally long feudal experience which brought Japan to the Meiji Restoration of 1868.

**Hist. 476-3. Modern Japanese History.** Beginning with early modern Japan in the late feudal period, proceeding into the spectacular and rapid modernization of the Meiji era, including Japan's prewar experience of democracy and peaceful diplomacy. Concludes with WW II and postwar reforms.

**Hist. 478-3. History of Modern India.** A survey of the history of modern India. Covers such major themes as Mogul rule, the British Raj, the growth of nationalism, and the independence struggle.

**Hist. 479-3. United States Military History to 1900.** The development of military and naval art of war in American history, in its peacetime and wartime aspects from colonial times to the end of the Spanish-American War. Emphasis: the increasing influence of technology upon warfare after 1850.

**Hist. 480-3. Military History: Lecture.** A survey of America's national defense and war efforts from the Spanish American War to the present, with emphasis on the causes and consequences of modern conflicts.

**Hist. 481-3. History of Mexico to 1821.** Beginning with the roots and evolution of Pre-Columbian civilizations and concluding with the gaining of Mexican Independence in 1821. Emphasis on the society and culture of the Aztecs and Mayans, the Spanish conquest of Mexico, and the Mexican economy.

**Hist. 482-3. The Emergence of Modern Mexico.** Survey of Mexican history continues with the establishment of independence in 1821, examining the upheavals of the Mexican Revolution, and culminates with recent events in Mexico.

**Hist. 483-3. Brazil and Argentina Since Independence.** Traces the development of Brazil and Argentina through the 19th century to the present. Special attention is given to comparative topics and to significant trends such as the military in politics, eras such as the Vargas and Peron regimes.

¹Also available through correspondence study.
Hist. 485-3. History of Spain. Covers the reigns of Isabella and Ferdinand to the present with special emphasis on state formation and the Hapsburg empire in Western Europe from 1600-1700, urban and rural societies, and the Spanish Civil War, 1939-39.

Hist. 488. The Middle East. An examination of Islam from 600 to the early modern period. Attention is divided equally between (1) Arab, Iranian, and Turkish political and economic history and (2) the arts and sciences characteristic of the civilization of Islam (theology, philosophy, mysticism, etc.).

Hist. 489-3. The Modern Middle East. Primarily from 1800 to the present. Attention is divided equally between (1) political history and international relations in the region and (2) patterns of economic, social, and cultural modernization in the main countries of the region.

Hist. 490-3. History of Flight and Space Exploration. A survey of the history of flight in the atmosphere and beyond. Attention will be given to the origin and evolution of lighter-than-air, heavier-than-air, and rocket-propelled craft employed in space exploration.

Hist. 491-3. The Arab-Israeli Problem. An examination of the clash between modern Jewish and modern Arab nationalism over the area of Palestine/Israel since the late 1800s. The course concludes with a simulation exercise in which students work through a hypothetical crisis.

Hist. 493-3. History of Russia Through the 17th Century. The establishment and expansion of the Russian state and the development of the political, economic, and social machinery necessary to administer it. From the ancient times to the reign of Peter the Great and the proclamation of a Russian empire.

Hist. 494-3. Imperial Russia. A survey of the major cultural, social, and economic changes from the reign of Peter the Great through the first Russian revolution of 1905.

Hist. 496-3. The Russian Revolution and the Soviet Regime. The fall of Nicholas II and the Russian revolution of 1917 to the fall of Khrushchev, beginning with a description of the policy, people, and meetings of Lenin, Trotsky, and Stalin, and thereafter covering in detail the significant domestic and international events.

Hist. 496-3. A Social History of Russia. Examines the social history of Russia from the mid-19th century throughout the 20th century. Explores the impact of industrialization, the revolution of 1917, and subsequently, the interventions of the various states of Russian society. Particular attention will be paid to changing attitudes, values, and modes of life that accompanied the transformation of Russian society. Prer. junior or senior standing.

Hist. 497-3. Russian Intellectual History. A survey of the ideas and where appropriate, the activities of the major Russian thinkers from the late 19th century to the Soviet period.


Hist. 505-3. The New South. Denver campus only.


Hist. 517-3. Greek Inscriptions. (Gr. 570.)


Hist. 541-3. History of Africa. 1850. Denver campus only.


Hist. 596-3. Old South and National Disunion. Denver campus only.


Hist. 601-3. Historiography: Introduction to the Professional Study of History. Covers some of the major historiographical schools and trends that have emerged during the course of the discipline in Europe and the United States.

Hist. 602-3. Teaching History in Higher Education.

Hist. 603-3. Readings in Roman History. Selected readings in aspects of Roman History.


Hist. 615-3. Readings in the History of Science.


Hist. 621-3. Readings in Medieval History.


Hist. 634-3. Readings in European Intellectual History.

Hist. 635-3. Readings in Modern German History.

Hist. 643-3. Readings in Modern European History.


Hist. 647-3. Readings in English History Since 1688.


Hist. 654-3. Readings in the American Southwest.


Hist. 659-3. Readings in Feminism and Social Change.


Hist. 673-3. Readings in Modern Indian History.


Hist. 683-3. Readings in Mexican American Southwest. Denver campus only.

Hist. 685-3. Introduction to Historic Preservation. A survey of historic preservation programs and the techniques employed by private and public agencies at the local, state, and national levels to safeguard America's heritage.

Hist. 689-3. Introduction to Archival Management: Lecture. The evolution of archival and manuscript repositories and the methods employed to preserve and make available to researchers public and private records; the acquisition, arrangement, and description of records, and techniques for making them available for reference.

Hist. 691-3. Readings in Middle Eastern History.

Hist. 693-3. Readings in Modern Russian History.

Hist. 695-3. Readings in the History of European Women.

Hist. 697-3. The Russian Revolutionary Movement.


Hist. 723-3. Latin Paleography.


1Also available through correspondence study.
INTERDISCIPLINARY STUDIES, CENTER FOR

Courses listed under CIS carry elective credit. Under some circumstances they may be credited to a specific major. See the Schedule of Courses for other current listings.

CIS 280-3. Nature of Law I. (Phil. 302.) Fall. Introduction to law for liberal arts students, focusing on underlying principles and developments. To gain insight into nature, functions, limits of law. First semester: general nature of law, relation of law to justice and power, diverse systems, legal process, legal reasoning.


CIS 480-3. Modes of Thought I. Readings and discussion concerning the modes of thought appropriate to the diverse problems: theoretical, practical, or creative — that man formulates or confronts. Practice in the arts of analytical reading, clear speaking, and precise writing is encouraged. Registration by consent of the instructor.

CIS 481-3. Modes of Thought II. Alternative to CIS 480 with other selected topics.

Humanities

An interdisciplinary major in humanities is offered by the Center for Interdisciplinary Studies. For requirements, see Humanities section. The sequence Hum. 101-102 fulfills the college humanities requirement.

Hum. 101-6. Introduction to the Humanities I. Fall. Six meetings a week (three discussion classes, three lectures and demonstrations in art and music). Analytical and comparative study of works in literature, philosophy, music, and the visual arts. From Aesop to Baroque, emphasizing structure, content, and style in specific examples.


101. Credit cannot be received for both Hum. 101-102 and Engil. 160-161 (formerly 123-121).

Hum. 103-3. Asian Humanities: India I. Fall. An integrated introduction to the classical literature, art, and music of India. In addition to the great epics, Mahabharata and Ramayana, works of Hindu-Buddhist philosophy and religious discipline, mythology, aesthetic theory, drama, and devotional poetry will be considered, with special attention to their expression in art forms.


Hum. 301-3. Twentieth Century: Art, Science, and Society. Focus will be on the relationships among artistic, intellectual, political, and cultural events with selection of particular figures and movements as examples for study.

Hum. 302-3. Narrative in the Arts. Explores the nature of narrative, its forms of presentation in literature, film, dance, art, and music as verbal and nonverbal modes of relating a story with consideration of the importance of fictional and documentary narrative. Prer., Hum. 101-102 recommended, 6 hrs. of literature, consent of instructor.

Hum. 303-3. The Comic Sense. An interdisciplinary approach to comedy, examining art, music, literature, and film from different periods. Comic theory interrelated with the study of particular works.

Hum. 304-3. The Tragic Sense. A study of some of the great tragic works of art, music, and literature from the Greeks to the 20th century. Tragic theory invoked as an aid to interpretation.

Hum. 314. Film History I. Follows film's historical and aesthetic growth by viewing silent and early sound films (half of the films shown are silent). Genres studied include documentary, experimental films and classic Russian, German, French, and American films made before 1940.

Hum./Film Stc. 306-4. Film History II. This course starts with the late 1920s and early 1940s films of Renoir, Welles, Cocteau, and Hitchcock and follows the historical growth and evolution of film aesthetics to the present. Neo-realist, French New Wave, and recent experimental films are studied.

Hum. 318-3. Computers and Folklore. Involves a rapid survey of various genres of folklore: ballads, folk song and drama, riddles, riddles, limericks, puns, and jokes, as well as nonverbal folklore. Individual and class projects are carried out, making use of established computer-aided methods of analysis.

Hum. 401-3. Film and Fiction. The course explores the similarities and differences between literature and film as narrative arts. Several novels, short stories, plays and the films made from them are studied. Problems in point of view, manipulation of time, tone, structure, and setting are examined.

Hum. 402-3. Film Theory. Prer., Hum. 305 or consent of instructor.

Hum. 408-3. Period Studies. Will focus on the literature, art, and music of a particular period or movement. For example, the Romantic Quest: late 19th-century art and literature.


Hum. 415-3. The Legacy of Humanism. Examines the traditions of humanism from Socrates to the present day. The concepts of man shared by Petrarch, Erasmus and More, Shakespeare and Milton, Newman and Whitehead will be examined closely.

Hum. 416-3. Myth in the Arts. (Clas. 416/516.) A study of representative myths in the arts, music, and literature of the ancient and modern worlds. Recommended prer., Hum. 101-102 or Clas. 110.

Hum. 483-3. The Arts and Aesthetic Theory. (C. Lit. 580.) Readings in 20th-century aesthetics with emphasis on the direct relation between aesthetic theory and the several arts. Prer., Hum. 101-102 or 9 hrs. in any one of the arts, or consent of instructor.


Hum. 483-3. Law and Literature II. Spring, alternate years. Continuation of Hum. 482. Seminar investigating problems of censorship, obscenity, etc. Prer., Hum. 482 or consent of instructor.

Natural Science


Nat.Sci. 122-4. Physical Science for Nonscientists II. (Phys. 102.) Spring. Format of this class is similar to Nat.Sci. 121, with a continuing exploration of selected topics in physics and astronomy (e.g., sound and light waves, Einstein’s theory of relativity, modern cosmology).


Nat.Sci. 124-4. Biology for Man II. Spring. A continuation of 123 with the emphasis on man as a functioning organism. Organ systems including common malfunctions are studied around the central theme of a constant internal environment.

Nat.Sci. 125-6. Man and Nature. Fall, Spring. Selected general topics involving man’s relationship to his environment are used to integrate the physical and biological sciences. Such topics include energy and its transformations, humans as knowers and controllers of nature, or humans as agents in the processes of the biosphere.

Nat.Sci. 321-3. History of Science: Ancients to Copernicus. (Phil. 341.) The history of science and natural philosophy from the ancient Hellenistic and medieval developments of astronomy, physics, biology and medicine to the rebirth of Ptolemaic astronomy by Copernicus. Taught collaboratively by faculty in the sciences and philosophy. Prereq., upper division status or permission.

Nat.Sci. 322-3. History of Science: Copernicus to Newton. (Phil. 342.) The genesis of modern science in the 16th and 17th centuries through the achievements of Bacon, Descartes, Kepler, Galileo, and Harvey, including such strands as the Reformations, Renaissance mysticism, advances in mathematics and instrumentation, and the rise of the scientific-mechanical philosophy. Prereq., upper division status or permission.

Nat.Sci. 323-3. History of Science: Newton to Einstein. (Phil. 343.) The history of physical and biological sciences from the epochs making achievements of Charles Darwin in biology to the dawn of the 20th-century revolutions in physics, chemistry, and genetics. The course deals with the successes of the mechanical philosophy of nature and its eventual problems. Prereq., upper division status or permission.

Nat.Sci. 324-3. Perspectives of 20th-Century Science. (Phil. 344.) A historical study of some of the leading developments of 20th-century science, selected for their scientific or social significance, including quantum theory of atomic structure and the chemical bond, Einstein’s relativity, quantum mechanics, nuclear fission, the genetic code, continental drift, concepts of the ecosystem, and other topics. Prereq., upper division status or permission.

Nat.Sci. 325-3. History of Biology. Spring. Survey of major themes in development of biological theory from ancient times to present, emphasizing complementary roles of observation, experiment, and technical innovation, and influence of general cultural environment on scientific advance. Readings in primary and secondary sources, lectures, discussions. Prereq., upper division status or permission.


Nat.Sci. 421-3. Environmental Studies. Fall. A multidisciplinary consideration of modes of learning with strong emphasis on an individual research project. To further an understanding of science and the ways science deals with environmental phenomena, class meetings will be devoted to discussions of readings, lectures, demonstrations, and student presentations. The goal of the course is to allow students to expand their understanding of science as a way of looking at the world. Prereq., one year of college science and consent of instructor.


Social Science

Soc.Sci. 101-3, 102-3. Controversy and Challenge in Modern Social Thought. Designed to acquaint the student with intellectual and cultural developments in the social sciences. Major thinkers, beginning in the 18th century, as well as later challenges to their theories, will be discussed.

Soc.Sci. 440-3. Heritage of American Ideas I. Major concepts in American thought such as democracy, individualism, equality, progress, reform, and freedom, with emphasis on their development and modification, consideration of the contributions of leading figures and movements influential in the shaping of American society.


Soc.Sci. 450-3. American Lives. Spring. Analysis of 19th-20th century American autobiography from the standpoint of literature, history, anthropology, and psychology. Attention will be given to what it meant to grow up in the United States from the 1850s to the 1970s.

Soc.Sci. 451-3. Social Scientists Make History, 1880-1940. The focus of this course is on an analysis of the formative period of scholarly social thinking and theorizing in America. Social scientists are portrayed as members of cultural, social, and historical environments that influenced the content and development of their theories.

Soc.Sci. 452-3. The Labor Movement in American Society. Examines the role of the labor movement as an institutional force in the American political and economic system, with particular emphasis on labor and workers in modern society. Junior or senior standing or consent of instructor.

Soc.Sci. 910-1 to 3. Independent Study. Fall, Spring. Individual projects, including the opportunity to aid in the teaching activities of the staff. Consent of instructor required.

Linguistics

Ling. 100-3. Language. Offered each semester. A nontechnical exploration of human language for the general citizen. Emphasis on the basics of how language works, the creative aspects of language, and the languages of America today.

Ling. 150-3. Basic Traditional Grammar. Offered each semester. A general course intended to present the fundamentals of grammar in the Western tradition. Emphasis is on making the concepts and uses of grammar (as exemplified in English and closely related foreign languages) understandable to the non-specialist.

Ling. 200-3. Introduction to Linguistics. Offered each semester. An introduction to the study of languages as structural systems. Principles of sound patterns, word formation, meaning, and sentence structure. Some attention to language acquisition, psycholinguistics, language families, dialects, historical change in languages, and different language types.

Ling. 211-3. Writing Systems of the World. Offered irregularly. An overview of the structural features of human languages and a review of the different ways these are represented in selected ancient and modern writing systems.


Ling. 350-3. Language and the Public Interest. Offered every third semester. A study of language in public and private use, with concentration on semantic devices as found in the language of political
propaganda, advertising, business, and government, as well as in the everyday use of language between and among people.


Ling 424/524-2. Survey of the History of Linguistics. Offered every third semester. Historical survey of views on language, and examination of linguistic thought in all historical periods from Panini to de Saussure. This course may not be substituted for Ling 724, and it cannot be counted toward the Ph.D. in linguistics.


Ling 461/561-3. English Structure for Teachers of English to Speakers of Other Languages. Offered yearly. Description of the morphological and syntactic categories and structures of English. Prereq., Ling 200 or graduate standing.

Ling 462/562-3. Methods of Teaching English to Speakers of Other Languages. Offered yearly. The theory of second-language teaching together with techniques for teaching and testing. Curriculum design, sequencing topics, drill and examination preparation, and classroom teaching techniques will all be covered. Prereq. or coreq., Ling 460/560 and 461/561.

Ling 463/563-3. Practicum in TESOL. Offered yearly. Professionally supervised practice teaching of English classes for non-natives. Enrollees will acquire classroom experience in pronunciation, grammar, reading and writing with students of varying ability, at first under careful supervision but with greater freedom as teaching proficiency is developed. Prereq., three of the following: Ling 460/560, 461/561, 462/562.


Ling 497/597-3. Introduction to Diachronic Linguistics. Offered every third semester. A course designed to familiarize the student with the terminology, methods, and theories dealing with phenomena of language change through time. Prereq., Ling 200 and 330 or consent of instructor. Not valid for linguistics Ph.D.

Ling 498-3. Senior Seminar in Linguistics. Offered irregularly. Topics offered in the senior seminar will vary from year to year, depending on interest of faculty and prospective students. Offerings will be at an intermediate level of difficulty. Prereq., Ling 200, 330, 401, 493.


Ling 642-3. Syntactic Theory. Offered every third semester. Topics in syntactic theory, including the interaction of syntax with semantics and pragmatics, constraints on transformations, and introduction to the mathematical theory of grammar. Prereq., Ling 540 and 634, or consent of instructor.


Ling 657-3. Advanced Diachronic Linguistics. Offered every other year. Problems dealing with the comparative method, internal reconstruction, subgrouping, borrowing, semantic change, interpretation of written records, and the historiographic uses of diachronic linguistics. Prereq., Ling 401/501 and 497/597 or consent of instructor.

Ling 717-3. Areal Linguistics. Offered irregularly. Study of linguistic features shared by numerous languages or dialects within a given region, usually Africa or North America. The particular area or areas studied, however, will depend on the interests of the instructor and of the students. Prereq., consent of instructor.

Ling 724-2. History of Linguistics. Offered irregularly. This course will cover different topics chosen from the four or five historical periods covering the history of linguistics. It is intended to reveal the coherence of linguistic ideas in their historical setting. Prereq., consent of instructor.


Ling 740-3. Advanced Syntax. Offered irregularly. Deeper analysis of one aspect of the language of an individual student's choice according to a particular theory of grammar. Each student is expected to produce a partial grammar of one linguistic topic in this course. Prereq., Ling 630, 650.


Ling 750-2. Field Methods. Offered irregularly. A course intended to give the student experience in the collection of linguistic data from an informant. Some attention will be given to library research on the topic language. Prereq., Ling 630 or consent of instructor.

Ling 797-3. Seminar: Discertological Linguistics. Offered irregularly. Advanced topics in the theory of language change or in the reconstruction of language history. Prereq., Ling 697 or consent of instructor.


Ling 800-30. Doctor's Dissertation. All doctoral students must register for not fewer than 20 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 under Change in Requirements for Doctoral Degree.

Ling 920-1 to 3. Independent Study. Prereq., consent of instructor.

Ling 940-1 to 3. Independent Study. Prereq., consent of instructor.

Ling 950-1 to 3. Independent Study. Prereq., consent of instructor.

Ling 980-1 to 3. Independent Study. Prereq., consent of instructor.

African Linguistics


Amerindian Linguistics

Amin 101-5. introduction to the Lakota (Sioux) Language. Offered irregularly. Principal attention will be given to learning to speak the language, although reading will also be taught.

Amin 102-5. Introduction to the Lakota (Sioux) Language. Offered irregularly. Continuation of Amin 101.


Romance Linguistics

For Romance Linguistics, see French and Italian.

English as a Second Language

ESL 160-3. Spoken English for Foreign Students. Offered each semester. Oral drills with the goal of promoting fluency and listening
comprehension. Will not fulfill humanities or major requirements. Prer., consent of instructor.

ESL 181-3. Advanced Spoken English for Foreign Students. Offered each semester. Continued practice in speaking and listening comprehension, with attention to grammar and pronunciation as well as meaning and appropriateness. Will not fulfill humanities or major requirements. Prer., consent of instructor.

ESL 182-3. Written Composition for Foreign Students. Offered each semester. Distinction between spoken and written English and an emphasis on the grammar and vocabulary of the letter. Will not fulfill humanities or major requirements. Prer., consent of instructor.

ESL 183-3. Advanced Written Composition for Foreign Students. Offered each semester. Continued work on grammar and vocabulary but with greater emphasis on the mechanics of writing and organization of material for longer connected discourse. Will not fulfill humanities or major requirements. Prer., consent of instructor.

MATHEMATICS

Note: A prerequisite course must be completed with a grade of C or better.

Math. 101-3. College Algebra.1 Simplifying algebraic expressions, factoring, linear and quadratic equations, inequalities, exponentials, logarithms, functions and graphs, complex numbers, binomial theorem. No credit for students with credit in Math. 110 or A. Math. 120. Prer., 1 yr. of high school algebra.

Math. 102-2. College Trigonometry.1 Trigonometric functions, identities, solutions of triangles, addition and multiple angle formulas, inverse trigonometric functions, laws of sines and cosines. No credit for students with credit in Math. 110 or A. Math. 120. Prer., 1 yr. of high school algebra and 1 yr. of plane geometry, or Math. 111.

Math. 103-3. The Structure of the Number System. The natural numbers, integers, rational and real numbers, mathematical systems and properties of operations, and systems of numeration. For elementary majors for B.S. in education degree.


Math. 108-3. Calculus for Social Science and Business. Differential and integral calculus of algebraic, logarithmic, and exponential functions for business and social sciences. Math. 130 carries only 2 hrs. credit if the student has credit in Math. 108. Prer., two years of high school algebra or Math. 101 or equivalent. Algebra proficiency exam given first week; not required for students with C or better in college algebra.

Math. 110-5. College Algebra and Trigonometry. Intended primarily for students who plan to take Math. 130. Equivalent to Math. 101 plus Math. 102. See descriptions for those courses. Students with credit in Math. 101 will receive only 3 hrs. credit in Math. 110. Students with credit in Math. 102 will receive only 3 hrs. credit in Math. 110. Prer., 1 yr. of high school algebra and 1 yr. of plane geometry.

Math. 111-3. The Spirit and Uses of Mathematics I. Fall. For liberal arts students and prospective elementary teachers. Math. 111-112 meets one year of the humanities requirement of the College of Arts and Sciences. Students who have taken Math. 230 may not use Math. 111-112 for the humanities requirement. Includes a study of the nature of mathematics, its methods, its role in our society and the structure of our number systems. Additional topics will be chosen by the instructor from number theory, elementary calculus, computing, modern geometry and algebra, logic. Prer., one year of high school algebra and one year of plane geometry.


Math. 121-3. Geometry for the Elementary Teacher. Intuitive and logical development of the fundamental ideas of geometry, such as parallelism, congruence, measurement. For elementary majors for B.S. in education degree. Prer., Math. 111 or equivalent.

Math. 130-5. Analytic Geometry and Calculus I. Rates of change of functions, limits, derivatives of algebraic functions, applications of derivatives, integration. Students with credit in Math. 106 will receive only 2 hrs. credit in Math. 130. Prer., three years of high school mathematics, including trigonometry, or Math. 110 or 101 and 102. Note: A. Math. 135, 136, 235, and 236 is a sequence designed for engineering students.

A. Math. 135-4. Calculus for Engineers I. Rates of change, limits, derivatives of algebraic functions, applications, and integration. Prer., 2 yrs. of high school algebra, 1 yr. of geometry, 1/2 yrs. of trigonometry, and an acceptable score on the mathematics placement test.


Math. 182-4. Calculus for the Life Sciences. An intuitive development of differential and integral calculus; first order linear differential equations and continuous probability arising from mathematical models in biology. Students with credit in Math. 180 or A. Math. 136 will receive no credit in Math. 182. Students with credit in Math. 180 will receive only one additional hour in Math. 182. Prer., Math. 181 or adequate algebra and consent of instructor.


Math. 272-3. Introduction to Abstract Mathematics. A course designed to bridge the gap between lower division mathematics courses and the more abstract and theoretical upper division courses. The topics covered vary. Topics often included are informal logic, set theory, relations and functions, axiomatic systems with examples from algebra or geometry, number systems. Prer., Math. 230 or A. Math. 136.


Math. 411-3. Advanced Finite Mathematics I. Basic methods and results in combinatorial theory. Enumeration methods, elementary properties of functions and relations, graph theory. Considerable emphasis is placed on applications. Prer., one semester of calculus.

1Also available through correspondence study.

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Math. 431-3. Advanced Calculus I. Various topics of one variable, the real number system, continuity, differentiation, sequences and series, convergence, uniform convergence, Taylor's theorem, integration. Prereq. Math. 240 or A.Mat. 236, and either Math. 313, 272, or A. Mat. 236.

Math. 432-3. Advanced Calculus II. Calculus of several variables including continuity, differentiation and integration; implicit function theorem; inverse function theorem; Fourier series if time permits. Prereq. Math. 431, and either Math. 313 or A.Mat. 236.

Math. 433/507-3. Advanced Calculus III. Not offered every year. Vector fields; Green's, Stokes', and divergence theorems; Taylor's theorem for functions of several variables; calculus on manifolds if time permits. Prereq. Math. 432 or consent of instructor, and Math. 313.


Math. 448/545-3. Applied Topics in Complex Variables. Applications of complex variables with emphasis on the classical functions (e.g., Legendre, Bessel) defined by differential equations, especially their asymptotic properties and their behavior under changes of variable. Laplace and Fourier transforms. Other topics as interest and time permit. Prereq. Math. 445.

Math. 447/649-3. Introduction to Partial Differential Equations I. Initial and boundary value problems for the wave, heat, and Laplace equations; separation of variables method, eigenvalue problems, Fourier series, orthogonal systems. Prereq. A.Mat. 236 or Math. 313 or 431, or 443.


Math. 451-3. Introduction to Mathematical Logic. Sentential logic and first-order logic. Completeness theorems. Prereq. two upper division courses in mathematics, or consent of instructor.


Math. 455-3. Set Theory. A careful study of the theory of cardinal and ordinal numbers, definition by recursion, the statement of the continuum hypothesis, simple cardinal arithmetic, and other topics chosen by the instructor. Prereq. Math. 240 or 272.


Math. 472/510-3. History of Mathematics. A selection of topics in the history of mathematics from the earliest times to the present, with emphasis on great mathematicians and the development of the calculus in the 17th century, and the history of algebra, analysis, and geometry in the 19th and 20th centuries. Prereq. two upper division courses in mathematics.


Note: Undergraduates must have departmental approval to take 500-level mathematics courses; 600-level courses are open only to graduate students.

Normally, the courses below are offered every year; courses offered in alternate years or irregularly are indicated by 1.


Math. 505-3. Topics in Combinatorial Analysis.1 Topics such as finite combinatorial analysis, combinatorial questions entering in topology, infinite permutations and transformations, graph theory. Prereq. consent of instructor.


1Also available through correspondence study.
Math. 537-3, 538-3. Topics in Applied Mathematics. Selected topics in mathematical problems arising from various applied fields such as mechanics, electro-magnetic theory, economics, etc. Prer., consent of instructor.


Math. 545-3. Applied Topics in Complex Variables. Same as Math. 446.

Math. 546-3. Theory of Automata. The idea of computability will be discussed, with computational models ranging in complexity from a Turing machine up to a caricature of a modern digital computer. The formal theory of languages and its relation to these computational models will be explored. Prer., consent of instructor.


Math. 580-3. Sample Surveys. Application of statistical sampling theory to the design of population surveys, including simple random, stratified, systematic, and cluster sampling. Ratio estimates and cost minimization. Prer., undergraduate statistics or consent of instructor.


Math. 587-3. Statistical Methods in Research. Design and analysis of experiments, employing t-tests, chi-square tests, analysis of variance and covariance, regression analysis, distribution-free methods, graphical methods and other quick and approximate procedures with emphasis on applications in the behavioral, biological, and physical sciences. Prer., consent of instructor.


Math. 603-3, 604-3. Algebraic Topology I, II. Homology and cohomology theories; homotopy theory, obstruction theory, and applications. Prer., modern algebra and topology or consent of instructor.

Math. 605-3, 606-3. Topics in Topology. Selected advanced topics to be chosen by instructor.


Math. 611-3, 612-3. Topics in Number Theory I, II. May include theory of algebraic numbers, L-series and zeta functions, the zeta functions of an algebraic variety, character sums, multiplicative and additive number theory, Diophantine equations and approximations, or other topics chosen by instructor. Prer., Math. 512 or consent of instructor.


Math. 621-3, 622-3. Algebraic Geometry I, II.


1Also available through correspondence study.

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and conformal groups; metric manifolds; covariant differentiation; Einstein space-time; cosmologies; unified field theories. Prer., consent of instructor.

Math. 627-3. 628-3. Topics in Geometry I, II. \( ^{1} \) Selected advanced topics to be chosen by instructor.

Math. 631-3, 632-3. Topics in Real Variables I, II. \( ^{2} \) Abstract measure theory, function spaces, and other topics. Prer., Math. 531-532 or consent of instructor.


Math. 635-3, 636-3. Functional Analysis I, II. \( ^{1} \) Introduction to such topics as Banach spaces (Hahn-Banach Theorem, open mapping theorem, etc.), operator theory (compact operators and integral equations, spectral theorem for bounded self-adjoint operators), Banach algebras (the Gelfand theory). Prer., Math. 531-532.


Math. 639-3, 640-3. Topics in Analysis I, II. \( ^{1} \) Selected advanced topics to be chosen by the instructor.


Math. 645-3, 646-3. Topics in the Theory of Banach Algebras. \( ^{1} \) The Gelfand theory for commutative algebras, representation theory, algebras of operators, function algebras, group algebras, applications to operator theory and to quantum mechanics. Prer., Math. 531-532 or consent of instructor.


Math. 651-3, 652-3. Asymptotics and Special Functions. \( ^{1} \) General theory of asymptotic expansions. The standard special functions such as the Gamma and Beta functions, Bessel functions, Legendre functions, and hypergeometric functions will be discussed and their asymptotic behavior studied. Prer., Math. 432 and 536.


Math. 673-3, 674-3. Topics in Logic. \( ^{1} \) Selected advanced topics in logic or foundations to be chosen by the instructor.


Math. 800-30. Doctor's Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit, refer to the Graduate School section of the catalog under Change in Requirements for Doctoral Degree.

Math. 910-1 to 3. Independent Study.

Math. 940-1 to 3. Independent Study.

Math. 950-1 to 3. Independent Study.

Math. 960-1 to 3. Independent Study.

MUSEUM

Musm. 401-4/501-3. Introduction to Museology. \( ^{1} \) Spring. For majors in anthropology, biology, fine arts, geological sciences, history, or other museum-related subjects. Background in history and literature of museums, their objectives and methods; laboratory exercises in curatnship, exhibition theory, and administration. Prer., consent of instructor. Staff.


Musm. 448/548-3. Museum Field Methods in Anthropology. \( ^{1} \) Available only in summer. Archaeological field techniques including excavation, mapping, recording, photography, interpretation, and field laboratory.

Musm. 448/548-3. Museum Field Methods in Geology. \( ^{1} \) Available only in summer. Paleontological and paleoecological field techniques including collecting, recording of geographic, stratigraphic, and quarry information; preservation, and interpretation, including applicable readings. Prer., for all field methods courses, instructor's consent.

Musm. 452-552-4. Malacology. \( ^{1} \) (EPOH 467/567.) \( ^{1} \) Spring, alternate years. Biology of mollusks: morphology, classification, physiology, development, ecology, distribution, economics, and evolution of mollusks. Laboratory and field work will emphasize identification and biology of local land and freshwater molluscan fauna. Prer., general biology. Wu.

Musm. 940-variable credit. Independent Study. Prer., consent of instructor.

Musm. 950-variable credit. Independent Study. Prer., consent of instructor.

MUSIC

The following courses offered in the College of Music are accepted for College of Arts and Sciences credit (see College of Music in Course Description section).


Mus. 382-3. Music Literature I.

Mus. 383-3. Music Literature II.


\( ^{1} \) Also available through correspondence study.

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ORIENTAL AND SLAVIC LANGUAGES
AND LITERATURES

Arabic

Language Courses

Arab. 101-5. First-Year (Beginning) Arabic. Fall.

Chinese

Language Courses

Chln. 411-3. Readings in Modern Chinese Literature I. Fall. A literary study of selected works of modern authors. Prer., Chln. 312 or equivalent.
Chln. 412-3. Readings in Modern Chinese Literature II. Spring. Continuation of Chln. 411, with special emphasis on the works of Lu Hsun. Prer., Chln. 411 or equivalent.
Chln. 421-3. Introduction to Classical Chinese. Fall. Systematic introduction to the classical language, based on pre-Han and Han materials. Prer., Chln. 212 or permission of instructor.
Chln. 422-3. Readings in Classical Chinese. Spring. A study of selected texts of classical literature, both poetry and prose, mainly from the Six Dynasties and T'ang era. Prer., Chln. 421 or permission of instructor.
Chln. 910-940. Independent Study (Undergraduate).
Chln. 950-980. Independent Study (Graduate).

Literature Courses (in English)


Hebrew

Hebr. 101-5. First-Year (Beginning) Hebrew. Fall.

Japanese

Language Courses

Jap. 101-5. First-Year (Beginning) Japanese. Fall.
Jap. 910-940. Independent Study (Undergraduate).
Jap. 950-980. Independent Study (Graduate).

Russian

Russ. 101-5. Beginning Russian. Fall. Introduction to the Russian language. Two different approaches are available. See department's general information announcement.
Russ. 103-3. Beginning Russian for Scientists and Social Scientists. Fall. An approach to Russian through the reading of texts in the student's special field of study.
Russ. 201-5. Second-Year Russian. Fall. Reading, speaking, writing, and understanding contemporary Russian. Recommended to students who intend to continue their formal study of Russian into the third and fourth years. Prer., Russ. 102 or equivalent.
Russ. 211-3. Reading Russian. Reading of significant texts in Russian from the sciences, social sciences, and press. Prer., Russ. 102 or 104 or equivalent.
Russ. 301-3. Third-Year Russian. A review of Russian grammar is coordinated with reading, speaking, writing, and understanding modern Russian. Some texts from modern and 19th-century Russian literature will be used. Prer., Russ. 202 or equivalent, or 211 or 212 and consent of instructor.
Russ. 331-3. Readings From the Soviet Press and Periodical Literature. A study of Russian newspaper and journal texts, read in Russian, with balanced emphasis on language improvement and content. Prer., Russ. 212, or consent of instructor.
Russ. 322-3. Russian Science and Social Science Readings and Translation. Similar to Russ. 331, but with emphasis on technical writings in Russian and including practical training in techniques of translation from Russian into English. Prer., Russ. 212, or consent of instructor.
Russ. 401-3. Advanced Grammar Topics and Composition. Prer., Russ. 392 or consent of instructor.
Russ. 411-3. Masterpieces of Russian Literature. Fall. Readings in Russian of representative works of a single Russian author; for example, Dostoevsky, Gogol, Tolstoy, Chekhov. Prer., Russ. 392 or consent of instructor.

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PHILOSOPHY

Phil. 100-3. Introduction to Philosophy. An introduction to the fundamental questions of philosophy through a study of the ideas of several major philosophers.

Phil. 102-3. Ethics. Introductory study of major philosophies on the nature of the good for man, principles of evaluation, and moral choice.

Phil. 103-3. Ways of Knowing. An examination of various traditions of knowing and dealing with the world, such as those found in science, philosophy, art, mysticism, and primitive and modern religions.

Phil. 104-3. Philosophy and Society. Introduction to philosophical thought through critical analysis of the institutions of society. Representative topics: the university in American society, millenarianism, imperialism, racism, revolution, participatory democracy vs. representative democracy, etc.

Phil. 105-3. Philosophy and Religion. A philosophical introduction to problems of religion, such as the existence of God, faith and reason, religious language, etc.

Phil. 106-3. Philosophy and the Sciences. Consideration of topics and problems related to the physical and biological sciences, such as freedom and determinism; mind and body; artificial intelligence; sciences and ethics; current theories of the universe, space, time, matter, energy, causality, etc.

Phil. 107-3. Philosophy and the Arts. Consideration of philosophical 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. 110-3. Philosophy Through Literature. Introduction to philosophy through literature. Selected novels, plays, and short stories which exemplify traditional problems in philosophy.


Phil. 113-3. Seminar: Critical Writing and Reasoning. Intensive practice in writing with clarity and precision, and in the orderly development of arguments. Each section will focus on a core of readings dealing with a substantive topic. Check with department for specific topics.

Phil. 114-3. Technology and Human Values. An examination of the value presuppositions and implications of technology. Of particular interest to students in the sciences, engineering, business, and the health-related fields.

Phil. 180-3, 181-3. Great Philosophical Ideas. Introductory course for the more able and interested student. Emphasis on reading and critical discussion of selected works from three or four major philosophers, ancient and modern, per semester.

Phil. 192-3. Open Topics in Philosophy. A variety of new courses at the introductory level for which existing descriptions are not appropriate. See current departmental announcements for specific content.

All courses at the 200 level require 3 hours of philosophy unless otherwise indicated.


Phil. 209-3. Philosophy and Psychology. Interdisciplinary course on issues where philosophy and psychology meet; for example, topics such as self-hood, motivation, psychotherapy, freedom, human behavior. Selected readings in philosophy and psychology.


Phil. 217-3. Theories of Knowledge. Introductory study of major philosophies concerning the basis, extent, and standards of knowledge and certainty.

Phil. 229-3. Major Social Theories. Introductory study of major philosophies of the past in relation to political, economic, and social issues.

Phil. 244-3. Symbolic Logic. Pr., sophomore standing.

Also available through correspondence study.
All courses at the 300 level require 6 hours of philosophy unless otherwise indicated.

Phil. 302-3. Ethical Theory. A study of major issues and theories in ethics. Prer., 6 hrs. of philosophy or instructor’s consent.
Phil. 305-3. Topics in the History and Philosophy of Physics. (Phys. 305.) Topics will vary from year to year and may include scientific methodology, the role of experiment and case studies in the history of physics. Prer., one year of physics or consent of instructor.
Phil. 315-3. Models of Medicine. An examination of such problems as the nature and evidence for current medical models: the roots of modern medicine in Greek thought; alternative models of medicine (Shamanistic, Eastern, Holistic); the medical model and psychoneurotic theories for the understanding of health and physical health; the relation of medical and therapeutic models to theories of human nature. Prer., upper division standing.
Phil. 320-3. Social and Political Philosophy. Systematic discussion and analysis of such philosophical ideas as community, freedom, political power, violence, etc.
Phil. 328-3. Philosophy of Education. Reading and analysis of some selected writings in the philosophy of education, with special attention to theories of learning, knowledge, and choice.
Phil. 330-3. Philosophy of Mind. Problems in the philosophy of mind, including the mind-body problem, knowledge of other minds, compatibility of free will and determinism, etc., and discussion of such concepts as action, intention, desire, enjoyment, memory, imagination, dreaming, self-knowledge, etc.
Phil. 335-3. Metaphysics and Epistemology.
Phil. 340-3. Introduction to Philosophy of Science. Examination of some major concepts and problems of scientific thought: explanation, confirmation, causality, measurement, and theory construction.
Phil. 341-3. History of Science, Ancients to Copernicus. (Nat.Sci. 321.)
Phil. 342-3. History of Science, Copernicus to Newton. (Nat.Sci. 322.)
Phil. 343-3. History of Science, Newton to Einstein. (Nat.Sci. 323.)
Phil. 344-3. Perspectives of 20th-Century Science. (Nat.Sci. 354.)
Phil. 361-3. The Religions of Greece. (Clas. 361.) Prer., Clas. 110 recommended.
Phil. 370-3. Aesthetic Theory. Introduction to major theories of aesthetics and contemporary discussions of problems in aesthetics, i.e. the nature of art, the problem of evaluation in art.
Phil. 392-3. Open Topics in Philosophy. A variety of new courses at the 300 level for which existing descriptions are not appropriate. See current departmental announcements for specific content.

All courses at the 400 level require 9 hours of philosophy unless otherwise indicated.

Phil. 403-3. Twentieth-Century Philosophy. Study of two or three major philosophical movements during the present.
Phil. 407-3. Existentialist Philosophy.
Phil. 408-3. Introduction to Phenomenology. An examination of the contribution of phenomenology to selected topics in the theory of mind, philosophy of mind, ontology, epistemology through a study of such philosophers as Husserl, Heidegger, Sartre, and Merleau-Ponty.
Phil. 409/509-3. 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. Prer., 9 hrs. of philosophy or psychology.
Phil. 418-3. American Philosophy.
Phil. 424-3. Philosophical Problems and Contemporary Culture. Issues and controversies in contemporary culture, their relation to modern theories of society, and their manifestations in the arts, science and technology, education, religion, and ethics. No prereq.
Phil. 425-3. Marxism. A historical and systematic study of the principal themes of Marxist thought, its Hegelian origins to its contemporary varieties, emphasizing in particular the works of Marx and Engels themselves.
Phil. 426-3. Philosophy of Law. Consideration of various views of the nature of law, its role in society, and its relation to other disciplines. Investigation of philosophic commitments which underlie and affect legal conceptions and procedures. No prereq.
Phil. 427-3. Philosophy of History. Contemporary issues in critical and speculative theories of history, including the problems of methodology, explanation, values, and the relationship between history and social philosophy. No prereq.
Phil. 438-3. Rationality, Democracy, and Policy. The object of this course is to provide philosophical and political approaches to an understanding of social decision-making and to examine the possibilities for choosing rational courses of action. This course will deal with topics such as the two-course combination in political science, philosophy, or economics.
Phil. 444/544-3. Mathematical Logic. Prer., Phil. 244.
Phil. 460-3. Theology Forum Seminar. Discussions on a variety of theological and philosophical topics. Some reading, much discussion, occasional guest speakers. Students may enroll for repeated credit with permission of instructor to a maximum of 3 hours.
Phil. 470-3. History of Aesthetics. Study of the principal historical systems of aesthetic inquiry, tracing the development of central themes in such writers as Plato, Aristotle, Plotinus, Kant, and Hegel.
Phil. 474-3. Philosophy and Literature: Philosophical Sources of Literature. Study of individual philosophers and philosophical movements which are significant for the understanding of literature.
Phil. 485-3. Stoicism. (R-St. 485, Chin. 485.)
Phil. 489-3. Comparative Oriental and Western Philosophies. Recommended preparation, Phil. 300 and 301, 310. Comparison of oriental philosophical traditions with Western traditions, with special attention to methods of comparison.
Phil. 491-3. Single Philosopher. Intensive study of one systematic philosophical writer with attention to the scope, methods, and integrity accomplished by it. Prer., 6 hours of philosophy.
Phil. 493-3. Open Topics in Philosophy. A variety of new courses at the 400 level. See current departmental announcements for specific content.
Phil. 508-3. Special Topics in Philosophy. Seminars not listed as courses in which the instructor meets regularly with three or more students to discuss special topics in philosophy.

All courses at the 500 and 600 levels require 12 hours of philosophy unless otherwise indicated.

Phil. 500-3. Medieval Philosophy.
Phil. 504-3. Theory of Value. This course will examine the nature and variety of types of values, with the focus placed on conflicts among values and the role of values in decision making and the development of social policy. Prer., 12 hours of philosophy or graduate standing.
Phil. 503-3. Ethics. Representative positions in normative ethics and meta-ethics.
Phil. 509-3. Philosophy and Psychological Theory. (Same as Phil. 409.)
Phil. 510-3. Topics in the History of Philosophy.
Phil. 522-3. Social and Political Philosophy. Systematic study of traditional and current theories of the philosophical justification of kinds of social and political orders, etc. Prereq., 12 hours philosophy or consent of instructor.
Phil. 530-3. Philosophy of Mind. Some of the major topics in philosophy of mind, such as the mind-body problem, the problem of knowledge of other minds, etc.; and discussion of such concepts as consciousness, self-knowledge, action, explanation of behavior, intention, dreaming, sensations, etc.
Phil. 534-3. Epistemology. A study of some of the major topics of epistemology such as the foundations of knowledge, perception, introspection, belief, certainty, the analytic-synthetic distinctions, etc.
Phil. 535-3. Metaphysics. Traditional and contemporary theories of the basic categories used to describe nature and man's relationship to it, including such concepts as substance, identity, space and time, causality, determinism, ontology, etc.
Phil. 542-3. Philosophy of Science. Topics connected with development and nature of science; structure of scientific theories, testing of hypotheses, Theory of decisions in science and ethics. Basic conceptions and models of abstraction in history of science.
Phil. 548-3. Philosophy of Language. A study of some of the major 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, language and ontology, etc.
Phil. 560-3. Philosophy of Religion. A study of topics falling under the philosophy of religion such as proofs for God's existence; religious language; mysticism; psychology of religion; modern theological movements; miracles, and study of individual theologians.
Phil. 570-3. Aesthetics. An analysis of the principal topics of aesthetics, including such issues as the formal structure of aesthetics, the nature of critical judgments, and the status of the work of art.
Phil. 580-3. Philosophy of Plato. (Class. 580.)
Phil. 581-3. Philosophy of Aristotle. (Class. 581.)
Phil. 582-3. Philosophy of Hume.
Phil. 583-3. Philosophy of Kant.
Phil. 584-3. Philosophy of Spinoza.
Phil. 585-3. Philosophy of Wittgenstein.
Phil. 588-3. Locke, Berkeley, Hume.
Phil. 589-3. Philosophy of Hegel. Textual exposition of Hegel's Logic and his Phenomenology of the Spirit, with special emphasis on the latter.
Phil. 593-3. Topics in Recent Philosophy.
Phil. 597-5. Seminar: Comparative Philosophy. Seminar in the problems and literature of relating non-Western philosophical methods, traditions, and results to Western equivalent or para-equivalents.
Phil. 598-3. Special Topics in Philosophy. Seminars not listed as courses in which the instructor meets regularly with three or more students to discuss special topics in philosophy. Prereq., 12 hours of philosophy and consent of instructor.
Phil. 646-3. Seminar: Phenomenology.
Phil. 690-3. Master's Research.
Phil. 700-4 to 6. Master's Thesis.
Phil. 830-30. Doctor's Dissertation. All doctoral students must register for a minimum of 90 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree. Ph.D. 904-variable credit. Independent Study.

Phil. 950-variable credit. Independent Study.

Courses in other individual philosophers will occasionally be given. Prereq., consent of instructor.

**PHYSICAL EDUCATION AND RECREATION**

**Physical Education**

P.E. 197-1. Recreational Dance Forms. Dance techniques. Open to dance, physical education, and recreation majors.

P.T. 198-0. Introduction to Physical Therapy. An introduction to the field of physical therapy and information regarding requirements for the pre-physical therapy curriculum.


P.E. 238-1. Fencing.


P.E. 239-1. Badminton.

P.E. 240-1. Recreational Sports. 

P.E. 241-1. Tennis.

P.E. 242-1. Track and Field.

P.E. 250-1. Activities of Low Organization.

P.E. 262-1. Basketball.

P.E. 263-1. Field Hockey.

P.E. 264-1. Flag Football-Speedway.


P.E. 287-1. Softball.


P.E. 290-no credit. Introduction to Physical Education. Introduction to physical education as a profession.


P.E. 298-1 to 3. Practicum in Physical Education. Practical experience in coaching or teaching in organized situations with direct supervision.

P.E. 320-3. Sport and American Society. Introduction to sport, as one of the most pervasive human activities in America. Relationship of sport to various social institutions and processes. Utilizing a multi-disciplinary approach to subject matter taken from physical education, sociology, psychology, American literature, religious studies, and anthropology. Not open to P.E. majors.


P.E. 346-3. Introduction to Special Physical Education. Overview of handicapping conditions, Public Law 94-142, mainstreaming, behavior management techniques, assessment and evaluation, and perceptual motor learning and the exceptional child.

P.E. 347-2. Adapted Activities. For professional students. Basic skills, methods and teaching techniques for adapted activities: swimming, volleyball, bowling, track and field, etc. Some field experience may be required.

P.E. 399-3. Sports Humanities. The development, characteristics, and values of sports and exercise systems in American culture with reference to societal values assigned these areas in past cultures.


P.E. 372-3. Motor Learning and Performance. An introduction to theories of perceptual motor learning and variables affecting motor performance; laboratory sessions and individual research projects are required.

P.E. 401-1 to 3. Professional Seminar: Physical Education. Presentation of special aspects of current practices, materials, and trends in physical education.


P.E. 413-4. Administration, Curriculum, and Evaluation in Physical Education. Processes and practices in program development, operation, and evaluation in various educational settings.

P.E. 415-3. Management of Aquatic Programs. Designed to provide the necessary techniques, management skills and knowledge required to administer modern aquatic programs.


P.E. 419-2. Leadership and Values in Modern Sports Programs. Explores the underlying values and principles that dictate the nature, scope and practices associated with the administration and management of sports programs.

P.E. 437-2 to 8. Internship in Physical Education. Opportunity for field laboratory work in a variety of settings.


P.E. 448-3. Gerontology in Physical Education and Recreation. Designed to create an awareness of aging as a developmental process and to foster an understanding of the older person in a changing social milieu. Physiological, psychological, and sociological aspects of aging will be emphasized with emphasis on methods by which physical and recreational needs may be met.

P.E. 449-2. Seminar-Practicum in Adapted Physical Education and Recreation. Theory and practice in therapeutic aspects of physical education and/or recreation. Readings, discussions on current trends and problems. Prereq.: P.E. 34 or consent of instructor.


P.E. 458-3. Methods of Teaching Physical Education in Secondary Schools. Prereq.: 300, and 1 of 3 required credits completed or current enrollment in physical education courses P.E. 235-260. A 2.5 grade-point average is required.


P.E. 490-2. Physical Education for the Elementary School. (For elementary education majors only.) A study of activities, teaching methods, and program planning for grades K-6. This course is specially designed for the elementary education major who wishes to gain some experience in the teaching of physical education.

P.E. 490-3. Introduction to Research in Health, Physical Education, and Recreation. An introduction to types of research, the methods for accomplishing research, and the skills necessary to complete research in the fields of health, physical education, and recreation. Prereq.: junior standing.


P.E. 510-3. Teaching Elementary Physical Education. An investigation of major methods and strategies for teaching motor skills applicable mainly to the elementary school child. Practical experience with children will be provided.


P.E. 531-3. Trends in Recreation. Analysis of changing political, social, economic, and industrial orders and the possible influences on leisure-time pursuits.

P.E. 532-3. Therapeutic Recreation Service Systems. The analysis and evaluation of clinical and community therapeutic recreation service system models from the theoretical and applied approach. Several local systems will be examined as case studies.

P.E. 534-3. Education, Schools, and Recreation Services. The role of the education system in the provision of recreation and leisure services will be explored. Topics include community education, leisure education, community schools, interagency cooperation, advising councils, and citizen involvement in the leisure service delivery system.

P.E. 550-3. Recreation Leadership at the Administrative Level. Designed to study the characteristics of leadership as they relate to influencing the delivery of recreational leisure services in public and private agencies. Course content includes decision making, communication, group dynamics, and techniques in leadership assessment.

P.E. 559-3. Organization and Administration of Community Recreation. Analysis, synthesis, and evaluation of administrative organization and operations of community recreation/leisure delivery systems. Course includes a community assessment project.


P.E. 560-3. Physiological Basis for Physical Activity. Immediate and long-range adaptations of the body to exercise. Adjustment of selected body systems to the stress of physical activity. Prereq.: college physiology or study of exercise physiology. Except with consent of instructor, the course is to be taken concurrently with P.E. 568.

P.E. 571-3. Injuries and Management of Sports Injuries I. Continuation at an advanced level of P.E. 446. Lectures and laboratory presentations relative to the physical aspects of sports training, rehabilitation, nutrition, prevention, evaluation and injury management. The medical aspects of sport are emphasized. Prereq.: college anatomy, P.E. 446, or equivalent desirable.


P.E. 566-3. Human Performance Laboratory Techniques. Laboratory procedures and biomedical instrumentation pertinent to human performance laboratories are presented through lecture and laboratory participation. Except with consent of instructor, to be taken concurrently with P.E. 560.

P.E. 570-3. Sociological Basis of Sport. An examination of the interrelationships between sport participation and socio-cultural variables with emphasis on the social structure and dynamics of sport groups.

P.E. 572-3. Motor Learning. Presumes a background in learning theory. Critical analysis of theories and conditions affecting motor learning and modification or performance. Laboratory sessions and individual research projects required. Prereq.: graduate course in educational psychology or behavioral psychology.

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Recreation

Rec. 201-3. History and Philosophy of Recreation and Leisure. Analysis of the historical development of a philosophy of leisure with special application to our present American society.

Rec. 212-3. Recreation Leadership Skills. This course covers motivation, activity skills, and materials important to the development of skillful recreation leadership. Several topics covered are new games, environmental activities, the arts, special events, and social activities.

Rec. 213-3. Organization of Sports Programs. Organizational patterns of recreational, intramural, extramural, and competitive sports programs. Consideration of funding, promotion, and administration of different types of programs.

Rec. 222-2. Camp Leadership. Modern principles of camping, camp programs, and counselor training.

Rec. 300-3. Leisure and Society. Analysis of factors contributing to leisure and work life styles in our technological society. Examination of those psychological, sociological, and philosophical forces supporting or detracting from man's search for leisure. Not open to P.E. majors.

Rec. 310-3. Principles of Community Recreation. An overview of community recreation responsibilities including settings, structure, services, funding, and leadership.

Rec. 317-1 to 4. Fieldwork in Community Recreation. The study of the organization structure of a recreational setting and the methods by which its effectiveness is determined. Forty contact hrs. with an agency is required for each br. of credit.


Rec. 327-1 to 4. Fieldwork in Outdoor Recreation. See course description under Rec. 317.

Rec. 330-3. Principles of Therapeutic Recreation. A study of the developing history, philosophy, and theory of the recreational and leisure services designed to meet the varying needs of individuals who are handicapped or disabled.

Rec. 337-1 to 4. Fieldwork in Therapeutic Recreation. See course description under Rec. 317.

Rec. 340-3. Principles of Commercial Recreation. The development of commercial recreation in the American society, the impact of private recreation on public recreation programs, the many and varied opportunities will be covered. Field trips and guest lecturers will supplement the lectures.


Rec. 400-2. Senior Seminar in Recreation. Extensive readings and analysis of the recreation profession and the concepts of leisure. Students are required to have an oral interview for a baccalaureate position.

Rec. 401-3. Program Planning in Recreation. To acquaint the student with the basic principles involved in developing a well-rounded recreation program based upon measurable goals and objectives. Prereq., Rec. 201.

Rec. 403-3. Park and Recreation Areas and Facilities. An overview of the variety of recreational areas and facilities utilized by the public in their leisure pursuits. Planning, management, maintenance, financing and programming will be studied.

Rec. 410-3. Administration of Community Recreation. Designed to provide understanding of the broad scope of public recreation administration and to develop competency in the various administrative work areas.

Rec. 418-10. Internship in Community Recreation. A semester placement with a recreation agency to study the total operation of services and how they are managed and delivered. To be completed the final semester of the senior year. Prereq., Rec. 317.


Rec. 430-3. Techniques in Therapeutic Recreation. Study of various techniques used in recreational and leisure services designed and adopted to meet varying abilities of disabled and handicapped individuals in hospitals, schools, rehabilitation centers, and recreation centers. Prereq., Rec. 330 and 201, or consent of instructor.
Rec. 434-3. Clinical and Community Aspects of Therapeutic Recreation. Examination of selected clinical and community therapeutic recreation service programs for the purpose of evaluating the impact of various models of service delivery on special populations.

Rec. 439-10. Internship in Therapeutic Recreation. See course description under Rec. 418. Prereq., junior and senior majors only.

Rec. 440-3. Financial Management of Parks and Recreation. Specific techniques of management currently being utilized in the profession. Budgeting, tax expenditure justifications, and specific program accounting and how to set up a budget will be accentuated.

Rec. 448-10. Internship in Commercial Recreation. See course description under Rec. 418. Prereq., junior and senior majors only.

Rec. 941-1 to 3. Independent Study in Community Recreation. Prereq., consent of instructor.

Rec. 942-1 to 3. Independent Study in Outdoor Recreation. Prereq., consent of instructor.

Rec. 943-1 to 3. Independent Study in Therapeutic Recreation. Prereq., consent of instructor.

Rec. 944-1 to 3. Independent Study in Commercial Recreation. Prereq., consent of instructor.

PHYSICS


Phys. 111-4. General Physics. Two lect., two rec. per wk., plus three evening exams in the semester. First semester of 3-semester sequence for science and engineering students. Covers kinematics, dynamics, momentum of particles and rigid bodies, work and energy, gravitation, simple harmonic motion, and introduction to thermodynamics. Prereq., knowledge of algebra, geometry, and trigonometry; coreq., calculus through derivatives and indefinite and definite integrals of polynomials and trigonometric functions, as typically covered in Math. 130 or A.Math. 125.


Phys. 114-1. Experimental Physics. To be taken concurrently with Phys. 112. One lect., one 2-hour lab. per wk.


Phys. 207-3. Energy in a Technical Society. Three lect. per wk. Various aspects of energy: the physics involved in the sources and uses of energy in our society, the state of depletion of the fossil fuels, nuclear energy, solar energy, and other alternative sources of energy and their possible effects on the environment. No background in physics is required.

Phys. 208-3. The Physics of Contemporary Social Problems. Three lect. per wk. Continuation of Phys. 207. Various contemporary areas of concern such as air and water pollution, transportation, resources, and communications are discussed from the point of view of the physical principles involved and the impact on society. The object of this course is to understand the scientific questions involved in making decisions in these areas. No background in physics is required.


Phys. 215-1. Experimental Physics. One lect., one 2-hour lab. per wk. To accompany E.Phys. 213. The course includes many experiments of modern physics, including atomic physics, solid state physics, electron diffraction, radioactivity, and quantum effects.

Phys. 216-2. Experimental Physics. Two lectures; Phys. 215 and one lab. to be taken concurrently with Phys. 213 for physics majors in Plan 3. Two 2-hour lab. per wk. Registration by special arrangement with A. Bartlett.


Phys. 257-2, 258, 259-variable credit. Special Topics in Physics. Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors.

Phys. 301-5, 302-5. General Physics. Three demonstration lectures, one recitation, and one lab. per wk. plus four evening exams in the semester. Phys. 301 covers mechanics, heat, and sound; 302 covers electricity and magnetism, light, and modern physics. An elementary but thorough presentation of the fundamental facts and principles of physics. Majors in mathematics, chemistry, and others taking calculus are urged to take instead Phys. 111, 112, 114, 213, and 215. Prereq., 1½ years high school algebra and satisfactory grade on mathematics placement test.

Phys. 303-2, 304-3. Introductory Modern Physics. (Not for physics majors.) Three lect.-rec. per wk. to follow non-calculus general physics such as Phys. 101-102 or 201-302. Students with calculus should register instead for Phys. 213 and 215. For non-majors who wish to enlarge their understanding of the theory and applications of the sciences, which include atomic and nuclear structure, elementary particles, relativistic cosmology, and quantum mechanics. Emphasizes the change in the scientists’ view of nature in the 20th century. Also includes special topics and applications in the students’ fields of interest. Prereq., general physics and trigonometry, or consent of the instructor. Phys. 303 is prerequisite for Phys. 304.

Phys. 305-3. Topics in the History and Philosophy of Physics. Topics will vary from year to year and may include scientific methodology, the role of experiment and case studies in the history of physics. Prereq., one year of physics or consent of instructor.

Phys. 317-2, 318-2. Junior Laboratory. One lect. and one 3-hour lab. per wk. Includes experiments on data handling, electrical measurements, electronics, optics, vacuum techniques, heat and thermodynamics, mechanics, and modern physics. Emphasis will be on developing basic skills and on design of experiments. Each student will carry at least one project experiment each semester. Coreq. for Phys. 317 is Phys. 331. Phys. 317 is prereq. for Phys. 318.


Phys. 341-3. Thermodynamics and Statistical Mechanics. Statistical mechanics applied to macroscopic physical systems; statistical thermodynamics, classical thermodynamic systems; applications to simple systems. The relationship of the statistical to the thermodynamic points of view is examined. Prereq., Phys. 321.

Phys. 370-3. Practical Electronics and Laboratory Instrumentation. Spring. Not for physics or electrical engineering majors. This course is intended to meet the needs of chemists, engineers, biologists, psychologists, science teachers, etc. Elementary DC and AC circuit analysis and electrical measurements, diodes and transistors, power supplies, linear and digital integrated circuits. Emphasis is on understanding circuit operation and characteristics. Prereq., algebra, trigonometry, general physics; coreq., Phys. 376.

Phys. 375-1. Electronic Instrumentation Laboratory. Spring. Not for physics majors. The lab. course to be taken concurrently with...


Phys. 602-2. Design and Analysis of Experiments. Intended for students planning and carrying out experiments. Methods for estimating expected noise level and maximizing signal-to-noise ratio. Topics in electronics, optics, vacuum techniques, and statistics. Examples from various areas of low energy experimental physics at the University of Colorado.


Phys. 625-3, 626-3, 627-3. Introduction to Quantum Mechanics I, II, and III. Quantum phenomena; relation to classical physics; Schrödinger and Heisenberg pictures, applications to problems, approximation techniques; angular momentum; scattering theory; Pauli spin theory; radiation theory; relativistic wave equations with simple applications; introduction to field theory and second quantization. Coreq., Phys. 621 for Phys. 625; Phys. 631 for Phys. 626.


Phys. 652-3. Atomic, Molecular, and Nuclear Processes. Alternate years. Study of physical processes of importance in astrophysics, including atomic and molecular structure, absorption, ionization, recombination, collision processes involving electrons or heavy particles, laser broadening, nuclear reaction mechanisms and rates, nuclear processes.

Phys. 653-3. Topics in Chemical Physics. Alternate years. A broad survey of molecular structure as deduced primarily from molecular spectra. Topics selected from interaction of radiation with matter, molecular rotation, molecular vibration, molecular electronic energy levels, structural information provided by nuclear magnetic resonance, electron spin resonance and molecular-beam spectroscopy, structural information provided by electron, neutron and X-ray diffraction, molecular optical dispersion phenomena. Prereq., introductory quantum mechanics, Phys. 322, Chem. 556, or equivalent.


Phys, 697-3, 888-3. Nuclear Physics. 688, alternate years. Intrinsic properties of nucleons and the nucleon-nucleon interaction; nuclear models, scattering of nucleons by nuclei in terms of an optical model, and nuclear reactions.

Phys, 690-3, 691-3. Theory of the Solid State. 691, alternate years. 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, 692-3, 693-3. Theory of Elementary Particles. 693, alternate years. Systems 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, 695, 696, 697, 698, 699-variable credit. Special Topics in Physics. Various topics not normally covered in the curriculum; offered intermittently depending on student demand and availability of instructors.

Phys, 700-4 to 6. Master’s Thesis. An approved problem in theoretical or experimental physics under the direction of staff members, intended to introduce the student to procedures in research and development work. Work of an original nature is expected.

Phys, 800-30. Doctor’s Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.

Phys, 940-variable credit. Independent Study. Selected topics for undergraduate independent study. Subject matter to be arranged. Prer., consent of instructor.

Phys, 950-variable credit. Selected Topics for Graduate Independent Study. Subject matter to be arranged. Prer., consent of instructor.

POLITICAL SCIENCE

Note: A course listed below is not necessarily offered every year.

American

Lower Division

P.Sc, 110-3. The American Political System. Emphasis upon inter-relations among levels and branches of government, formal and informal institutions, processes, and behavior. Required of majors who do not take P.Sc, 101-102. Not open to those who have credit in P.Sc, 101 and/or 102.

Upper Division

P.Sc, 353-3. Government and Capitalism in the United States. An examination of competing theoretical approaches to questions related to the origins, development, and purposes of modern government in the United States; particular attention is paid to the impact of transformations in the underlying structure of the capitalist economy.

P.Sc, 400-3. Government Regulation of Business. Consideration of theory and practice of government relationship to business and professional activity on both state and national levels. Analysis of selected regulatory programs and policies and their impact on the constitutional system. Not open to freshmen and sophomores.


P.Sc, 408-3. State Government and Administration. Present-day national, state, and interstate relations; constitutional development; legislative, executive, and judicial processes and problems; administrative organization and reorganization; state finances; major state services; future of the states. Special attention is given to the government of Colorado.

P.Sc, 407-3. Urban Politics. Examination of the structure of political and social influence in urban areas; selection of urban leadership; relationship of the political system to governmental and social institutions.

P.Sc, 408-3. Municipal Government and Administration. Municipalities and relationships to the states and the national government; local politics; forms of municipal government; application of ideas and techniques of public administration to management of municipal affairs; activities of cities, e.g., planning, public utilities, law enforcement, fire protection.

P.Sc, 409-3. Comparative Metropolitan Systems. Comparative analysis of the major metropolitan systems of North America and Europe: the structural environment, decision making in the bureaucracies and political groupings, governmental interaction and communication.

P.Sc, 432-3. Public Administration. A comprehensive basic course which considers the power of organization, the problem of bureaucracy, the determination of organizational objectives, decision making, the allocation of resources, organizational structure, staffing problems, and the evaluation of institutional performance.


P.Sc, 435-3. The Environment and Public Policy. Consideration of constitutional, political, and geographic factors in the development of public policy affecting the use of natural resources and management of the environment; organization, procedures, and programs for use of natural resources; administration of environmental policies.


P.Sc, 444-3. Contemporary Culture and Politics. A study of the influences, values, and ramifications of politics in contemporary American culture, as manifested in literature, social and political philosophy, psychological and psychoanalytical writings, radical movements, and general essays.

P.Sc, 445-3. American Political Thought: Development of American political theories and ideas from colonial period to present.

P.Sc, 446-3. Administrative Law. General nature of administrative law, types of administrative action and enforcement, analysis of rule-making and adjudication, administrative due process, judicial review.

P.Sc, 447-3. Constitutional Law I. Nature and scope of the following American constitutional principles as developed by the U.S. Supreme Court: federalism, jurisdiction of the federal courts, separation of powers, the taxing power, and the commerce power. Case method. Not open to freshmen and sophomores.

P.Sc, 448-3. Constitutional Law II. Continuation of P.Sc, 447, with emphasis on the war power, powers of the President, citizenship, the Bill of Rights, and the Civil War amendments. Case method. Not open to freshmen and sophomores.

P.Sc, 449-3. The Judicial System. Examination of the principal actors in the legal system—police, lawyers, judges, citizens—and the roles they play in the political process. Differential treatment of varying economic groups will be emphasized.

P.Sc, 451-3. Black Politics. Elitism and black powerlessness; black interest groups, base, structure, and functions of black political organizations; goals and political styles of black politicians; community control; trends (radicalism and separatism vs. accommodation) and future of black politics in the United States.

P.Sc, 452-3. Urban Policy Analysis. Examination of the processes whereby governments formulate, implement, and evaluate programs designed to deal with major social and economic problems. Special

*Also listed under Theory.
emphasize on an evaluation of urban programs in welfare, education, law enforcement, housing, and urban renewal.


P.Sc. 454-3. War, Peace, and Strategic Defense. The role of force in American foreign policy, especially in relation to other super powers. Particular emphasis is placed on the political and economic analysis of strategic forces and their effects. Arms control treaties and negotiations are studied.

P.Sc. 455-3. The Mexican American in Politics. (Ch St. 455.) Analysis of the social, cultural, and economic factors which affect political behavior of Mexican Americans. Special attention will be paid to the Mexican American cultural heritage and to relations between Mexican Americans and Anglo Americans.

P.Sc. 456-3. Bureaucratic Power in American Politics. Examines public agencies as political actors engaging in public policymaking including 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.

P.Sc. 492-3. Women and the Law. Role of the courts in the development of public policy toward women. Case law will be combined with readings on the political position of women in society and the structure of judicial decision-making.

International/Comparative

Lower Division

P.Sc. 201-3. Introduction to Comparative Politics: Developed Political Systems. Comparison of legal institutional features; social, economic, ideological forces; patterns of recruitment and decision-making; implications of planned socioeconomic and political change in Western politics. Geopolitical emphasis will vary with the instructor, but there will be a balanced comparison of several countries representing a broad cross-section of the Western world. Closed to those with credit in P.Sc. 211 and/or P.Sc. 912.

P.Sc. 202-3. Introduction to Comparative Politics: Developing Political Systems. Comparison of political features within the non-Western world: traditional political culture, nationalism, political integration, political structures and groups, modes of recruitment, the style of politics, implications of planed socioeconomic change. Geopolitical emphasis will vary with the instructor, but there will be a balanced comparison of several countries representing a broad cross-section of the non-Western world.


P.Sc. 222-3. Introduction to International Relations. Introductory conceptual approaches, the actors, national and international dynamics of the international environment, problems and issues.

P.Sc. 270-3. International Violence. Introduction to knowledge about international violence. Emphasizes ecological causes of war, found in the global system, and ways in which decision makers and ordinary citizens can choose peace.

Upper Division


P.Sc. 409-3. Advanced Comparative Politics—Western Europe. An intensive analysis of the political systems and processes of the Western European democracies. Political culture and constitutionalism; executive-legislative relationships; parties and interest groups; administrative processes and the impact of social change in political institutions.

P.Sc. 412-3. The Canadian Political System. The political practices and institutions of Canada. Monarchy, Parliament, administration, and courts; federal-provincial relations; provincial and local government; political parties and political behavior at all levels; Canadian relations with the United States and with the Commonwealth.

P.Sc. 413-3. Political Systems of the Middle East and North Africa. Comparative analysis of the political process in the Middle East and North Africa. Islamic political theory and its contemporary manifestation. The role of nationalism and the "quest for modernity" in the development of this region. Programmed modernization in transitional politics.


P.Sc. 419-3. Political Systems of Sub-Saharan Africa. Analysis of major types of political systems in Sub-Saharan Africa and intensive case studies of selected countries exemplifying each type. Anichonald movement and adoption of new political institutions and values. Special political problems of multiracial and multicultural societies.

P.Sc. 421-3. International Relations. Readings and discussion of the actors, international interaction, and the international system. Emphasis on understanding the relationships between concepts, approaches, goals, methods, and substance of relations among states and on trends which transcend sovereignty.

P.Sc. 422-3. Seminar: Control of Foreign News Coverage—International Perspectives. Studies formal and informal controls and their consequences, chiefly in print media. Special attention to the new information order, and opportunities for substantive/conceptual and empirical research with domestic and foreign materials.

P.Sc. 423-3. American Foreign Policy. Examination of the foundations, assumptions, objectives, and methods of U.S. foreign policy. Special attention to the domestic and external problems of adapting U.S. policy to the changing world environment.

P.Sc. 425-3. International Organization. The objective of this course is to analyze the phenomenon known as international organizations, to determine whether it is an effective instrument for achieving peace and security and for the promotion of human welfare.

P.Sc. 429-3. International Law. An investigation of the body of law which regulates relations between nation states and provides a framework for the solving of common problems. Its nature and effectiveness will be explored as well as its adaptability to a changing environment.

P.Sc. 428-3. International Behavior. Presentation of alternative theoretical frameworks for the explanation of international processes. Theories of conflict behavior and social organization are applied to problems of war and peace.

P.Sc. 429-3. Alternative World Futures. This course 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.

P.Sc. 460-3. Governments of South Asia. The study of the political systems of India, Pakistan, Ceylon, and Nepal. The impact of British rule on the development of political institutions on the subcontinent as well as the problems of political development at all levels will be considered.

P.Sc. 461-3. The Government and Politics of Israel. Historical and contemporary responses by Jews to the conditions of diaspora and statehood are studied. Israel's political culture, governmental structure, processes, and political parties. Problems of integration, defense, and relations with the diaspora Jewish community.

P.Sc. 483-3. Problems in Latin American Politics. Analysis of selected political problems of specific countries. Focus will vary year to year. Emphasis on political change and conflict.
of civil-military relationships in Western and non-Western societies. Pkr., P Sc. 201 and 202, or consent of the instructor.

P Sc. 470-3. Europe in the International System. European and Atlantic realism. Discussion of such communities as the Council of Europe, NATO, EFTA, Conseco, and OECD, and a detailed examination of the European Common Market. Theories of integration, problems of partnership and interdependence, rival nationalisms and strategic doctrines.

P Sc. 472-3. Soviet Foreign Policy. Foreign policy of the Soviet Union, including the international Communist movement, its ideological basis, its impact on international politics, and its relations to domestic developments in the U.S.S.R.

P Sc. 473-3. The Middle East and World Affairs. Evolution and revolution in the Middle East. The character of nationalism in the area. Analysis of intraregional and international problems affecting the Middle East with special emphasis on the Arab-Israeli imbroglio.


P Sc. 476-3. International Relations of China, Japan, and Korea. Major developments in the modern relations of China, Japan, and Korea with each other and with other world regions. Analysis of selected issues in contemporary East Asian international politics.

P Sc. 479-3. Senior Seminar: International Affairs. An interdisciplinary course designed primarily to help majors in international affairs bring together, review, and apply what they have learned in their IA courses in the various disciplines and geographic areas. Emphasis on interrelation between fact and theory. For seniors only.

Theory

Lower Division

P Sc. 240-3. Introduction to Political Theory. Introduces the student to the main issues and concepts of both political philosophy/ethics and empirical theories as they try to deal with contemporary political realities.

Upper Division

P Sc. 300-3. Varieties of Political Analysis. A survey of the genesis and evolution of the discipline of political science. Analysis of the various approaches to the study of politics such as historical, institutional, normative, sociological, systemic, quantitative, etc. The environment of political inquiry and theory building.

P Sc. 436-3. Rationality, Democracy, and Policy. Philosophical and political approaches to understanding decision making; examination of the possibilities for choosing rational courses of action and of concrete problems of rational decision making.

P Sc. 439-3. History of Political Philosophy. Study of the main political philosophies and political issues of the Western culture, from antiquity to the 20th century.

P Sc. 440-3. Early Political Thought. Main currents of political thought in their historical setting from antiquity to the 17th century, with a critical evaluation of these elements of continuing worth.

P Sc. 441-3. Modern Political Thought. Main currents of political thought in their historical setting from the 17th century to the present. P Sc. 440 is not a prerequisite for P Sc. 441.

P Sc. 442-3. Politics and Literature. An examination of broadly political topics as they are presented in important literary works and an analysis of the problems involved in using the literary mode to present political teachings.

P Sc. 443-3. Jurisprudence. Development of different legal theories and their social significance. Special attention will be given to the modern jurisprudential concepts and to the political parameters of their formation.

P Sc. 444-3. Contemporary Culture and Politics.1

P Sc. 445-3. American Political Thought.1

P Sc. 490-3. Revolution and Political Violence. Study, discussion and evaluation of alternative frameworks for the analysis of revolution and political violence. Theoretical material will be firmly coupled in case situations such as Western, class, colonial, urban, international, historical, racial, religious, and intergenerational violence.


P Sc. 494-3. Quantitative Research Methods. Introduction to quantitative research methods used in political science. Basic tools of analysis: data collection, processing, and evaluation, with special attention to survey techniques. Elite and case study analyses. Aggregate, cluster, and content analysis. Use of computers in political research.

P Sc. 495-3. Predicting Politics. Presentation of the bases for the explanation and prediction of political activity. Similarities and differences between the natural and behavioral sciences are examined and illustrated with examples of research procedures and findings.

P Sc. 496-3. Research Practicum in Political Prediction. The application of systematic research methods to problems of political science inquiry. Students can define their own individual substantive areas of research concern or engage in a common project established by the class in consultation with the instructor. The types of research methods used and the speed of their introduction depend on the substantive problem areas chosen for research.

Other Courses in Political Science

P Sc. 101-3. Introduction to Political Science. Introduction to the study of politics. The political system and its environment. Course is designed to familiarize the student with basic concepts of political science, features of the political process, types of political institutions, and political behavior.

P Sc. 209-3. Introduction to Asian Politics. Survey of selected political systems of East, Southeast, and South Asia. Systematic examination of the nationalist era and political history; consideration of regional and international politics in the area and their effects on the domestic politics in the selected systems.

P Sc. 210-3. Introduction to Public Policy Analysis. A study of the policy-making processes in American government, the factors which shape public decision, and the issues and questions which are relevant to political inquiry.

P Sc. 246-3. Introduction to the Legal Process. Basic legal concepts and processes with emphasis on the American system. Special attention to the political functions of law. Recommended as preparation for P Sc. 447, 448, 449.

P Sc. 480-3 to 6. Internship in Government. Working individually under the guidance of a public official, students will be assigned to projects selected for their academic suitability as well as for their value to the official. A biweekly seminar will be held by the instructor to evaluate experiences, discuss relevant readings, or present project papers. Since prior approval by both the instructor and the public official is required, prospective students should make their interest known before early registration. Prereq., 15 hours of political science and consent of instructor.

P Sc. 481-3. Honors in Political Science Seminar. Writing and discussion of selected topics in political science. Critical review of the major methodological and conceptual features of the discipline. Students will prepare their honors papers in seminar.

P Sc. 940-1 to 3. Independent Study. Subjects are chosen and arrangements are made to suit the needs of such student. Primarily for seniors with good scholastic records. Prereq., 15 sem. hours in political science. Written permission of instructor and department chairman is required.

GRADUATE COURSES AND SEMINARS

Note: A course listed below is not necessarily offered every year.

American Government and Politics

P Sc. 501-3. Seminar: American Politics. Primarily for students who have taken an undergraduate course in American politics. Emphasis is on the preparation of research papers and of literature in the field. Prereq., graduate standing or consent of instructor. Everett, Marcellini.

P Sc. 504-3. Seminar: The Presidency. Intensive examination and preparation of research papers on the historical, functional, and con-

1Also listed under American.
Comparative Politics

P.Sc. 510-3. Seminar: Comparative Politics—Western Europe. Examination and writing of research papers on selected topics of industrial democracies, especially those of Western Europe. Focus on a comparative analysis of changes in political institutions and processes and their impact on macroeconomic policies, e.g., growth, unemployment, redistribution, and welfare. Feldman.

P.Sc. 511-3. Seminar: Political Development. Writing and discussion of research papers on selected aspects of political development within the non-Western world. Focus on the theory of political development and the heuristic value of this conceptual framework for the comparative study of non-Western polities. Everette, Pfaff.


P.Sc. 514-3. Seminar: Comparative Political Systems. Discussion of current literature on comparative politics, including theoretical and methodological issues. Oral seminar reports will be given on selected aspects of comparative politics and seminar papers will be required on contemporary issues in the subdiscipline or particular country studies. Busey. (Criminology Campus.)

P.Sc. 515-3. Seminar: Political Economy of Marxist Socialist States. Critical examination of variables which affect policy development in countries characterized by a state-owned, planned economy. Countries selected for study, degree to which the seminar focuses on one or more states, and allocation of work between common reading and individual research may vary with each offering. Eidelstein.

P.Sc. 517-3. Seminar: Problems in Totalitarian Dictatorship. Comparative problems of totalitarian dictatorship, primarily in Nazi Germany, Fascist Italy, and Soviet Russia. Issues to be treated will include meaning and essential characteristics of totalitarianism, stages of development, role of ideology, and instruments of power. Rozek.

P.Sc. 519-3. Seminar: Comparative Politics—Sub-Saharan Africa. Writing and discussion of analytical literature reviews and research papers on various aspects of political change in Sub-Saharan Africa. Stress on comparisons among African political systems as well as with other areas of the world, and on explanation of change. Scarr, Shumir.

P.Sc. 580-3. Seminar: Comparative Political Parties and Interest Groups. Critical examination of topics relating to political parties and groups. Analysis of concepts, theories, and case studies with particular emphasis on Western political systems. Party systems in comparison. The role of groups and the determinants of group politics. Everett, Safran.


P.Sc. 583-3. Seminar: The Middle East. Advanced comparative study and critical examination of the modern Middle East. Stress will be given to the analysis of political consequences of modernization, the Arab-Israeli problem, pan-Arabism, and petroleum politics. Seminar papers reflecting a research design will be required. Pfaff.

P.Sc. 588-3. Comparative Politics and Ideologies. Scholarly analysis and instruction on the contrast between contemporary totalitarianism and liberal democracy. Taught by outstanding professors from leading universities in the United States and abroad. Designed primarily for social science teachers, graduate students, and the general public. Newspapermen, clergymen, and radio and television commentators. Offered only during the summer as an institute. Rozek.

See also P.Sc. 523 listed under International Relations; 532, 558, and 556 listed under Public Administration; 545 listed under Political Philosophy; and 547 and 549 listed under Law and Politics.

Empirical Theory and Research Methodology


P.Sc. 591-3. Seminar: Science and Politics. Intensive reading and discussion of the impact of the scientific enterprise on the world of politics. The scientific and the political perspective; democracy and the technological society; science and the graduate students, scientists, and the general public. (Criminology Campus.)

P.Sc. 594-3. Seminar: Political Psychology. Role of personality variables in political attitudes, behavior, and system-maintenance and change; human nature as a parameter; political relevance of psychoanalytic, behavioral, existential, and social psychology; alienation, ethnocentrism, dogmatism, and aggression as political variables. Cummings. (Dever Campus.)


See also P.Sc. 549 listed under Law and Politics, 537 listed under Public Administration, and 553 listed under American Government and Politics.

International Relations


P.Sc. 527-3. Seminar: The Causes of International Violence. Systematic treatment of the causes of war from the perspective of recent findings in international relations. Historical and contemporary examples used in the analysis of warlike behavior. Models of war are applied to other conflict phenomena such as urban violence. Middelshy.

P.Sc. 528-3. Seminar: International Violence and Political Choice. A course which seeks to explore the relationships between knowledge and action about the problem of international violence.

P.Sc. 572-3. Soviet Foreign Policy. Seminar on the foreign policy of the Soviet Union, its relation to Marxism-Leninism and/or Russian nationalism, as well as to the international Communist movement. Special attention will be focused on the impact of domestic and foreign factors and science and technology on policy formation. Rozek.


See also P.Sc. 580 listed under Public Administration and 590 listed under Empirical Theory and Methodology.

Law and Politics


P.Sc. 549-3. Seminar: Behavioral Study of Public Law. Intensive, critical examination of theoretical and substantive literature dealing with the behavior of the primary actors in the legal system—police, lawyers, judges, and citizens. Emphasis will be on the empirical approach and quantitative methods. Research papers will be required. Stover.


Political Philosophy

P.Sc. 541-3. Seminar: Selected Political Theories. Selected political philosophies or theories in classical or modern political thought. Cummings, Mewes, Paul.

P.Sc. 545-3. 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. Prereq., P. Sc. 440, 441, or consent of instructor. Mewes.

P.Sc. 641-3. Seminar: Political Theory. Intensive research in and presentation of selected topics. Introduces the student to broad context within which political ideas arise. Deals with classical and modern thought. Prereq., P. Sc. 440, 441, or consent of instructor, Mewes, Paul.

See also P.Sc. 603 listed under American Government and Politics.

Public Administration

P.Sc. 531-3. Seminar: Public Personnel Administration. Intensive research into the issues of public personnel administration in national, state, and local governments; organization, functions, and policies; loyalty and security; human relations; the role of unions, recruitment and selection; compensation; and related topics. Prereq., introductory course in public administration (400 level). Buechner, Lorch, Patterson.

P.Sc. 532-3. Governmental Planning. Application of governmental planning to problems of the nation, the states, cities, and urban counties; organization, procedures, and problems of planning agencies. Emphasis is given to planning in cities. Winter.

P.Sc. 533-3. Seminar: Federal Administration. Examination and presentation of research papers on external demands placed on the federal bureaucracy by Congress, the president, clientele groups, and other administrative agencies, and the mechanisms developed by federal organizations to respond to these pressures in formulating public policies. Costain, Lorch.

P.Sc. 535-3. 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. McBride.

P.Sc. 536-3. Intergovernmental Relations. Investigation and analysis of American federal system, including its constitutional, political, and administrative characteristics. Problems considered include federal-state relations, state-local relations, regionalism, inter-state cooperation, and grants-in-aid. McBride.


P.Sc. 580-3. The Political System and Telecommunications. Introduction to roles played by political institutions in the utilization of telecommunications for the common good. Emphasis on American regulatory agencies, such as the Federal Communications Commission, and agencies of international cooperation, such as the International Telecommunication Union. Codding.

P.Sc. 581-3. Telecommunications in America: The Legal Structure. This course will explore, in a context of contemporary issues, the regulatory scheme and legal structure with regard to licensing, interconnection, pay TV, FCC rules, satellite ownership and control, and public representation. Codding.

P.Sc. 630-2 or 3. Internship in Public Policy. Students are assigned to projects where they will obtain a guided experience in dealing with a public policy problem in the area of their academic specialization. An analytical paper or research project report is required. Consent of instructor and departmental approval are required.

See also P.Sc. 509 and 553 listed under American Government and 526 listed under International Relations.

General Courses in Political Science

P.Sc. 599-1 to 3. Topics in Political Science. Not a free option; must be approved by the student's adviser and department chairman. Does not count as a seminar.

P.Sc. 699-1 to 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 adviser and chairman of the department. Does not count as
a seminar.

P.S. 800-30. Doctor's Dissertation. All doctoral students must
register for no fewer than 30 hours of dissertation credit as part of the
requirements for the degree. For a detailed discussion of doctoral disser-
tation credit refer to the Graduate School portion of the catalog
under Change in Requirements for Doctoral Degree.

PSYCHOLOGY

Psy. 100-4. General Psychology. Three hrs. lect. and one hr. rec. per
wk. Students are required to participate as subjects for several hours in
ongoing research. General one-semester survey of major topics in
psychology, including sensory and perceptual processes, human
development, personality, frustration and conflict, learning and
memory and the biological bases of behavior.

Psy. 205-3. Introduction to Biopsychology. Three hrs. lect. per wk.
A broad survey course in the physiological, endocrine, and genetic
bases of behavior. Topics to be covered include the biological bases of
learning, motivation, emotion, movement, comparative animal behavior,
sexual behavior, instinctive activity, instinctive behavior, neurobiology of
language and thought, neurophysiology, and neuroanatomy in relation to
behavior. Pre. Psy. 100.

Psy. 206-3. Nutrition and Behavior. A basic introduction to the
science of nutrition together with an examination of its relationship
to the biochemical and physiological foundations of behavior.

A relatively non-mathematical introduction to the essentials of ex-
perimental design and statistical reasoning. No mathematical
background is required. Emphasis will be on conceptual under-
standing and practical application. Partially fulfills the natural
science requirement. Pre. Psy. 100.

Three hrs. lect. and one 2-hr. lab per wk. Introduction to descriptive
and inferential statistics and to their roles in psychological research.
Topics include correlation, regression, t test, analysis of variance,
and selected nonparametric statistics. Required of psychology majors.
Pre. Psy. 100. College algebra is recommended.

Psy. 221-3. Human Sexuality. See A.S. 221.

upon the processes of normal psychological adjustment, with
emphasis upon using the concepts to understand common human
problems in personal growth and relationships with others. Pre.
Psy. 100.

social psychological aspects of a variety of social issues and
problems in contemporary society. Issues will be varied, rang-
ing from problems of poverty or minority status to topics such as
prejudice, drug use, student protest, and patterns of sexual behavior.
Psychological theory and research relevant to these areas will be con-
sidered as will be the processes involved in defining social behavior as
a "problem." Pre. Psy. 100.

Psy. 264-3. Child and Adolescent Psychology. Principles of
development in childhood and adolescence. Not recommended for
majors. Majors should take Psy. 468 in the junior or senior year.
Pre. Psy. 100.

Psy. 265-2. Child Psychology Practicum. Volunteer work with
children in local day-care centers, nursery schools, community youth
organizations, etc. Periodic training sessions and discussion group
meetings with agency and departmental staff. Pre. Psy. 100; Psy.
264 must be taken concurrently.

Psy. 270-3. Psychology of Contemporary American Women. A sur-
vey of psychological theory and research concerning contemporary
American women. The course deals with issues including the follow-
ing: masculine bias in American culture; sex differences in cognitive
functioning and personality; psychological conflict for women
between career and home; and, finally, specific areas pertaining to
women's mental health. Pre. Psy. 100.

Psy. 300-3. Honors Seminar. Fall. Discussion of current theoretical
issues and participation in research problems in psychology. Open
only to juniors and seniors who have been accepted into the psy-
chology department honors program. Consent of the psychology
honors director is required.

340.) Focuses on the relationship between sociocultural factors and
the perceptual, cognitive, and motivational development of the Mex-
ican American. Pre. Psy. 100.

Psy. 370-3. Culture, Racism, and Alienation. (Bl.St. 370.) This
course investigates the effects of racism on the individual personality
of the recipient and donor of practices evolving from participation in a
racial culture.

Psy. 400-3. Honors Seminar. Spring. Survey and integration of
general psychology for seniors majoring in psychology. Open only to
juniors and seniors who have been accepted into the psychology
department honors program. Consent of the psychology honors direc-
tor is required.

Psy. 411-1 to 6. Senior Thesis. Pre. 3.0 overall GPA, junior stand-
ing. An honors thesis consists of (1) a critical review of some
aspect of the psychological literature, (2) a scholarly analysis of a ma-
jor psychological issue, and/or (3) an empirical research project. See
psychology honors director for further information.

Psy. 403-4. Laboratory Computers in Psychology. Lect. and lab.
Programming of real-time computers as control and data collection
devices. Studies of applications of real-time computers in various
areas in psychology. Prerequisite, one or more courses in computer
science, or knowledge of Fortran programming language.

Psy. 405-4. Physiological and Biological Psychology. Fall, Spring.
An intensive survey of the morphological, biochemical, and
physiological aspects of behavior. One lab/disc. section per wk. re-
quired. Pre. Psy. 100, 5 hours of biology, or consent of instructor.

plies controlled system theory to behavioral and physiological
properties of nervous systems. Examples chosen from sensory, sen-
orimotor, housekeeping, motivational, and cognitive systems. Pre.
Psy. 405 or consent of instructor.

Psy. 409/509-3. Hormones and Behavior. This course represents the
application of endocrinological concepts and techniques to the
problems of motivation and behavior. Pre., junior standing and at
least one year of biology.

characteristics. Pre., one course in general psychology. Seniors who
have had this course may take Ps. 510.

Psy. 411-2. Behavioral Genetics Laboratory. Spring. Demonstrations
and experiments in behavioral genetics. Basic behavioral and
genetic techniques employed in studying the inheritance of behavior
in laboratory animals. Emphasis will be placed upon individual
projects. Enrollment limited. Pre. Psy. 410 and consent of instructor.

Psy. 412/512-3. Quantitative Genetics. Fall. Survey of the
principles of genetics of quantitative characteristics. Topics will include
gene frequencies, effects of mutation, migration, and selection; correla-
tions among relatives, heritability, inbreeding, crossbreeding, and
selective breeding. Pre., consent of instructor.

Psy. 413/513-3. Drugs and the Nervous System. The physiological
basis of drug action on the nervous system and behavior, with
emphasis on the use of drugs as analytic tools in the study of
behavior. This course is not concerned with the subjective, social,
or legal consequences of drug use. Part I: Chemical basis of conduction
and transmission in the nervous system. Part II: PK Pharmacology of
sleep, pain, addiction, dependence, appetite, anxiety, learning,

Covers the study of cognitive psychology: memory, conceptual
behavior, and thinking. Emphasis of the course will vary with the instructor. Pre.
Psy. 100 and 210, or consent of in-
tstructor.

Psy. 416-4. Psychology of Perception. An analysis of peripheral and
central mechanisms involved in the transduction and interpretation of
experience. Special attention will be given to vision and audition;
major theories in these areas will be discussed in terms of the research
they have inspired. One lab. per wk. Pre., Psy. 100 and 210 or con-
sent of instructor.

Psy. 420-4. Psychology of Learning. Fall, Spring. One lab. per wk.
Conditions of learning in animals and men as found in experimental
literature. Pre. Psy. 100 and 210 or consent of instructor.

Psy. 425-3. Oral Communication. An introduction to psycholinguistics, covering what the English language is and how its
characteristics influence one's ability to produce and understand words and sentences. Attention will be given to language as sound, as
a system of rules, as a medium for communicating, and as a biological and developmental process. Prer. Ps. 100 and 210.

Ps. 423-3. Psychology of Reading. Introduction to basic research on reading, plus educational implications of the research. Critical examination of underlying concepts, experimental designs, and interpretation of results, on both learning to read and reading comprehension. Prer. Ps. 100 and 210.

Ps. 424-3. Teaching of Psychology. Students will receive concrete experience in the teaching of general psychology under supervision of a psychology faculty member. Alternate pedagogical strategies will be discussed. Prer. 16 hrs. of psychology with grade of B or better plus instructor's consent.

Ps. 425-3. Comparative Psychology. Behavior of animals. Similarities and differences between animals. Principles of behavior in a variety of species. Prer. 8 hours of psychology or EPOB 101-102.

Ps. 430-3. Abnormal Psychology. Fall, Spring. Borderline disorders as extreme variants of the normal personality. Major functional and organic disorders. Theories of mental disorders and methods of psychotherapy. Not open for credit to those who have credit for Ps. 431. Prer. Ps. 100, or consent of instructor; not open to freshmen or sophomores.

Ps. 431-4. Psychopathology. Fall, Spring. One two-hr. rec. per wk. Intensive analysis of the major theories of personality and behavior disorders. Not open for credit to those who have credit for Ps. 430. Prer. Ps. 100 plus 6 hours of psychology. (Open to majors only.)

Ps. 438-3-3538-3. Advanced Animal Behavior. This course discusses behavior of representative members of each animal phylum. Emphasis is placed on ontogeny of behavior as well as on phylogeny. Prer. general psychology, general biology. Recommended: Ps. 420. Chinnar.

Ps. 439-2-539-2. Advanced Animal Behavior Laboratory. Students are required to execute three original research projects dealing with any aspect of animal behavior. Prer. general psychology, general biology, Ps. 240, statistics, and consent of instructor. Ps. 438 is a co- or prerequisite. Chinnar.

Ps. 440-3. Social Psychology. Fall, Spring. General psychological principles underlying social behavior. An overview and analysis of the major social psychological theories, methods, and topics, including attitudes, conformity, aggression, attraction, social perception, helping behavior, and group relations. Prer. at least 12 hrs. of psychology including Ps. 100 and 210.

Ps. 443-3. Human Judgment and Social Policy. Two lect., one lab. per wk. A systematic treatment of the problem of human judgment in relation to social policy and its application to social problems. Prer. junior standing and 9 hours of psychology.

Ps. 445-3. Psychology of Personality. Fall, Spring. The psychological study of the structure, organization, and development of the personality as a whole. Analysis of major theories, methods, and research dealing with personality, including topics such as emotion, motivation, temperament, inner experience, identity and the self, personality change, and the influence of the sociocultural context. Prer. 16 hours of psychology.

Ps. 448-3. Women in Cross-Cultural Perspective. The course will review the current theory and research on the psychology of women. The course material will be drawn from the fields of anthropology, social psychology, clinical psychology, and sociology. Prer. Ps. 100 and course in child development, psychology major, or consent of instructor.

Ps. 449-3. Cross-Cultural Psychology. Social factors in the development of personality. Social and cultural variations in mental illness. The psychology of cultural and social change, including revolutions, economic growth, etc. Prer. 12 semester hours of courses from psychology, sociology, and anthropology.

Ps. 450-550-4. Behavior of Zoo Animals. Summer. An intensive examination of behavior of animals conducted at zoos of the world. Emphasis will be placed on courtship and copulation, offspring development, socialization, intellectual processes, and animal communication. Classes and labs will be held at the Denver Zoo. Prer. EPOB 121-122, Ps. 100 and 210, 121-122.


Ps. 485-3. Special Topics in Developmental Psychology. Developmental psychology covers a wide range of content areas in human development: cognition, social knowledge and social behavior, language, perception, and a variety of special topics including reading. Prer. Ps. 100.

Ps. 488-3. Developmental Psychology. An overview of major theories concerning the development of knowledge in human children. Emphasis is on the contrast between empiricist, nativist, and constructivist viewpoints, as applied to the same content areas (e.g., perception, cognition, social development). Open only to juniors and seniors. Prer. Ps. 100.

Ps. 471-3. Survey of Clinical Psychology. Theories and practices relating to problems of ability and maladjustment. Diagnostic procedures and treatment for the development of emotional disorders. Open only to juniors and seniors. Prer. Ps. 100 and 431, or consent of instructor.

Ps. 472-3. Community Psychology and Mental Health. This course will focus on issues in the organization, financing and delivery of mental health services within the community, innovative techniques for the provision of mental health-related services, the role of community factors in the production of emotional disorder, and the technologies of community change. Prer. Ps. 490 or 421, or consent of instructor.


Note: 500-level courses are available to undergraduate and graduate students. Undergraduate students must obtain approval of instructor.

Ps. 503-4. Seminar: Laboratory Use of Computers. Theory and practice of computation in psychological research. Fall: introduces programming language, emphasizing basic skills; no prerequisites. Spring: control of experimental devices and collection of data in psychological research; prer. full section or knowledge of Fortran.

Ps. 506-2. Seminar: Physiological Psychology. Special topics concerning the biological bases of behavior.

Ps. 510-3. Concepts in Behavioral Genetics. Each term selected topics will be examined in greater detail than is possible in the comprehensive undergraduate course in behavioral genetics. (Ps. 410.) Topics covered may include the inheritance of behavioral characteristics from the perspectives of pharmacogenetics, transmission genetics, biochemical genetics, and evolutionary genetics. Course may be repeated. Prer. Ps. 410.

Ps. 515-3. Biological Bases of Learning and Memory. Fall. Intensive examination of theories, critical experiments, and methods of experimentation that have led to current conceptualizations of memory processes and their underlying mechanisms. Prer., graduate standing.

Ps. 520-3. Current Issues in Human Infancy. Examination of theoretical issues and experimental methods in the study of human infant behavior and development. Specific topics vary with current interests of students and instructor. Prer. consent of instructor.

Ps. 528-3. Mammalian Neuroanatomy. Topics covered include microscopic anatomy and functional brain regions. Emphasis on correlation between structure and function, particularly at cellular and synaptic level. Course includes brain dissection, description of neuroanatomical and neurohistological techniques, and an introduction to the ultrastructure of neurons. Prer. Ps. 406 or EPOB 420 or MCB 418 or consent of instructor. Fitkova.

Ps. 529-2. Current Research Issues in Perceptual Development. The first half of the semester will include background lecture on perception, physiology and philosophical questions of how man knows his world. The second half of the course will focus on current research in the development of perception, attention, and information processing capacities. Prer., consent of instructor. Oiian.

Ps. 530-3. Proseminar: Developmental Psychology—Theory and Issues. Fall. In-depth survey of issues in theoretical approaches to developmental psychology. Open to graduate students and senior undergraduate psychology majors with consent of instructor.

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PsY. 531-3. ProSeminar: Developmental Psychology—Sensory Development. An intensive coverage of selected topics in sensory development. Emphasis will be on the role of experience in the development of neural mechanisms of human sensory systems. Considerable attention will be given to understanding the historical foundations of current problems. Open to graduate students or senior undergraduate majors with consent of the instructor.

PsY. 532-3. ProSeminar: Developmental Psychology—Developmental Psychobiology. Fall. An intensive survey of topics concerned with experimental and physiological influences on behavioral development, primarily in the vertebrate animals. Emphasis is on methodology, theoretico-conceptual strategies, and empirical details. Students are expected to lead at least one seminar discussion on a topic of their choice during the second half of the semester.

PsY. 533-3. ProSeminar: Developmental Psychology—Perceptual Development. Spring. The development of human perception and information processing is considered from physiological and behavioral perspectives. Open to graduate students and senior undergraduate psychology majors with consent of instructor.

PsY. 534-3. ProSeminar: Developmental Psychology—Cognitive Development. Spring. Theoretically oriented survey of major approaches to cognitive development, with primary emphasis on Piaget's theory. Open to graduate students and senior undergraduate psychology majors with consent of instructor.

PsY. 560-2 to 565-2. ProSeminar: Social-Personality Psychology. Six topics providing a systematic introduction to the area of social-psychological theory. Two are offered each semester on a rotating basis. Topics are as follows: 560, organizational and small group processes; 561, cognitive social psychology; 562, social interaction; 563, advanced personality theory; 564, ethnic, sex, and cross-cultural perspectives in psychology; 565, social psychology of the individual.


PsY. 568-3, 569-3. ProSeminar: Advanced Experimental Psychology. Spring. An advanced and intensive survey of topics in experimental psychology. General areas will include sensation and perception, and history and theory.


Note: 600-level courses are available to graduate students only.


PsY. 603-2. Research Practicum.

PsY. 610-2. Seminar: Behavioral Genetics. Intensive study of selected topics in behavioral genetics. Emphasis will be on recent research, and attention will be given to both human and animal studies. Prer., consent of instructor.

PsY. 612-3. Experimental and Quasi-Experimental Methods in Social Psychology. The uses and limitation of experimental methodologies for the study of social behavior are examined. Alternative small-scale methodologies are considered including simulation, systematic observation and content analysis.

PsY. 620-2. Seminar: Learning. A detailed study of one or more important topics in the psychology of learning. Content of seminar varies from semester to semester.

PsY. 621-2. Seminar: Experimental Psychology. An advanced seminar dealing with different specialized topics, at the discretion of the instructor, in different years. The topics chosen are within the broad range of experimental psychology.

PsY. 622-2. Seminar: Psycholinguistics. Fall. An analysis of theoretical and experimental contributions by psychologists and linguists to the areas of first-language acquisition and grammatical correlates of verbal behavior. The role of language in association formation, thought, perception, and second-language learning are also considered. Crothers.

PsY. 649-3. Advanced Personality Theory. Consideration of foundation issues in the construction of theories of the person; appraisal of the structure and content of representative theories of personality; analysis of the implications for theory of various current areas of personality research.

PsY. 649-2. Developmental Psychopathology. Childhood psychopathology is presented as deviations from normal development. Both normal development and childhood psychopathology are reviewed from dynamic, cognitive, and behavioristic theoretical perspectives. Prer., PsY. 264 or 468 and 445, consent of instructor.

PsY. 652-2. History and Theory. An advanced seminar, briefly surveying the chronological development of psychology with emphasis on theories. The seminar also provides an opportunity for intensive examination of a few selected topics, which differ from year to year. Wertheimer.

PsY. 653-2. Seminar: Personality and Social Psychology. Selected topics in the area of social-personality psychology.

PsY. 654-2, 655-2. Seminar: Practicum in Community Social Psychology. The role and function of the community social psychologist will be discussed. Students will spend two hrs. in class and three hrs. per week in an agency setting. This is a two-semester course; the student must sign up for both semesters in order to receive credit.

PsY. 660-2. Practicum in Community Psychology. Direct field experience in community psychology and community mental health settings for Ph.D. candidates in clinical and social psychology only. Instructor consent.


PsY. 666-3. Language Acquisition. Fall. Examination of the psychological mechanisms that underlie the child's acquisition of his native language. Generative and associative models will be compared, with an emphasis on the former. Prer., graduate standing in psychology or consent of instructor. Bates.

PsY. 670-2, 673-2, 676-2. Seminar: Clinical Psychology. Selected topics in the area of clinical psychology.

PsY. 671-3. Practicum in Clinical Psychology. Direct clinical experience for Ph.D. candidates in clinical psychology only.


PsY. 574-2. Primary Prevention/Community Health. A survey of the factors at work in the United States that have culminated in the community mental health movement and of the current factors to be considered in future developments in the field.

PsY. 677-3. Clinical Study of the Individual. A focus upon the ideographic study of the attitudes, values, and personality characteristics of individuals using data obtained from personal interviews. The theory and practice of various interviewing approaches are also covered. Ph.D. candidates in clinical psychology only.

PsY. 678-2. Advanced Psychopathology. An intensive survey of the major theories, research findings, and behavioral characteristics associated with deviant reaction patterns.

PsY. 683-2. Practicum in Survey Research. Students learn to do survey research by working on an actual, large-scale research project. Lectures cover such standard survey research topics as survey design, sampling frame construction, questionnaire design, interviewing, editing and coding, computer analysis, budget preparation, and report writing.


PsY. 686-2. Objective Testing in Clinical Psychology. Course will focus on administering and interpreting objective test results commonly used in clinical psychology practice. Probable inventories to be used will be the MMPI, SCII, WISC, WAIS, plus other objective measures where relevant. Case study format will be used.

PsY. 690-2. Mathematical Theories in Psychology. Seminar on topics in mathematical theories of psychology. Specific topics vary depending on interests of students and instructors.
RELIGIOUS STUDIES

R.St. 162-3. Religious Dimension in Human Experience. A critical study of religion as individual experience and social phenomenon; varieties of religious language (symbol, myth, ritual, scripture, etc.); and varieties of religious experience: Asian, western, archaic.


R.St. 240-3. Prehistoric Religions. An examination of the beliefs, rituals, and world views of peoples who lived before writing and civilization during the long, global epoch of hunting, gathering, and archeaic cultivation. Palaeolithic burials, "Venus" figurines, cave art; Eskimo shamanism; Australian aboriginal religion; megalithic monuments.

R.St. 250-3. Science and the Sacred. An exploration of relations between religion and the sciences, with special attention to religious myth and scientific paradigm, as well as to current issues of religious significance in the sciences.

R.St. 260-3. World Religions: Western. An introduction to the literature, beliefs, practices, and institutions of Judaism, Christianity, and Islam, in historical perspective.


R.St. 264-3. Traditional African Religions. Traditional African philosophy and religion examined from the point of view of their functions in African society and also from the view of their important challenges to contemporary thought structures in American life.

R.St. 266-3. Mythic Visions of America. An examination and interpretation of mythic visions of America as a religious place and Americans as special human beings. Focus is on European, Anglo, Indian, Mexican, and Black visions of America.

R.St. 270-3. Aztec and Incan Indian Religions. An examination of the history and structure of three American Indian religions: Aztec, Amazonian, and Sioux.


R.St. 302-3. Hinduism. An in-depth study of the literature, beliefs, practices, theology, and institutions of Hinduism, in historical perspective. Prereq., R.St. 260 or consent of instructor.

R.St. 303-3. Indian Buddhism. An in-depth study of the literature, beliefs, practices, theology, and institutions of Theravada and Mahayana Buddhism, in historical perspective. Prereq., R.St. 260 or consent of instructor.


R.St. 345-3. Religions of Egypt. A historical and analytical survey of religious beliefs and practices in Egypt from ancient times to the present, including the Pharaonic, Jewish, Coptic Christian, Islamic, and folk traditions. Prereq., R.St. 260 or consent of instructor.

R.St. 350-3. Religion and the Arts (in the West). A cross-cultural, in-depth study of the religious dimension in art and the role of the arts in religion. Prereq., R.St. 162 or consent of instructor.


R.St. 360-3. Islam. Introduction to the Islamic beliefs and practices through an examination of the Qu’ran, Muhammad’s life, ritual practices, law and theology, mysticism, and social institutions. Prereq., R.St. 260 or consent of instructor.

R.St. 370-3. Zen. An enquiry into the history and meaning of one of the most powerful traditions of China and Japan, based on the interpretation of primary sources and leading into an appreciation of its influence on Chinese and Japanese cultures. Prereq., R.St. 340 or consent of instructor.

R.St. 380-3. Religion and Psychology. An examination of the relationship between religion and psychology in the understanding of human nature; religious methods (prayer, meditation, conversion, and mysticism), and the psychology of conviction as it is related to religious diversity. Prereq., R.St. 162 or consent of instructor.

R.St. 385-3. Chinese Religion. (Chin. 385.) A study of classical Confucianism, Taoism, Buddhism, and Neo-Confucianism within the historical context of Chinese culture. Prereq., R.St. 260 or consent of instructor.


R.St. 415-3. Topics in Jewish Thought. Intensive study of a selected topic in Jewish theology, philosophy, or mysticism in the post-Biblical period. Prereq., R.St. 260 or 310 or consent of instructor.

R.St. 420-3. Hindu Vedanta. A comparative study of the philosophies/theologies and spiritual practices of the major schools of Vedanta, with primary attention given to Shankara and Madhva, in relation to the major Upanishads and to non-Vedanta schools of Hindu thought. Prereq., R.St. 320 or consent of instructor.


R.St. 450-3. City and Symbol in American Indian Religions. An examination of the relationship between cosmic-magical thought and urban organization in Aztec, Maya, Inca civilizations. Prereq., R.St. 270 or consent of instructor.

R.St. 460-3. Crisis Cults and Millenarian Movements. An examination of crisis cults from the variety of perspectives which constitute millenarian studies. Focus will be on causes of charismatic leaders, millenarian visions, and the impact of prophecies that fall on cult members. Special emphasis will be given to the crisis in scholarship created by attempts to study these religious outbursts. Prereq., 6 hrs. R.St. courses.

R.St. 462-3. Topics in Christian Theology. An advanced study of a specific topic in Biblical, historical, or systematic theology. Prereq., R.St. 400 or consent of instructor.

R.St. 485-3. Taoism. (Chin. 485, Phil. 485.) The historical development and influence of the Taoist tradition in Chinese culture, focusing on classical philosophical Taoism, religious Taoism, and neo-Taoism. Prereq., R.St. 385 or consent of instructor.

R.St. 499-3. Sufism. An in-depth study of the origins and aims of Islamic mysticism, with a concentration on the thought and practice.
SOCIOLOGY

Sec. 112-3. Introduction to Social Research. An introductory survey of social research methodology, touching upon research design, measurement, sampling, interviewing, participant observation, elementary statistics, use of computer programs, and presentation of results. When possible, an actual research project is undertaken to provide practical experience in applying research methods.

Sec. 119-3. Deviance. Devoted to a consideration of the consequences of social deviance which conform to conventional norms with certain exceptions of the population while simultaneously producing and maintaining deviant forms against which conventional norms assume a moral meaning and significance.

Sec. 120-3. Asian-American Ethnic Communities. An examination of the experiences of Asian Americans from a sociological perspective. Emphasis will be on the analysis of Asian American ethnic communities and their histories, social institutions, activities, and social problems.

Sec. 128-3. Race and Minority Problems. Race and racism; facts and myths about great populations, including psychological, social, and cultural sources of bias and discrimination.

Sec. 191-3. Contemporary Social Issues. Introductory consideration of some 30 current social controversies, such as democracy, capitalism, race and ethnic groups, marriage, the family, crime, international tensions, and world order, designed to improve the student's ability to understand current debate and to formulate opinions for himself.

Sec. 192-3. Social Issues in Health and Medicine. A discussion of current moral and policy issues facing society in health and medicine. Topics will vary somewhat from semester to semester covering such topics as alcohol and drug abuse, organ transplantation and substitutes, genetic engineering, contraception and abortion, dental research, occupational safety, and health, death and euthanasia.

Sec. 200-3. Sociology of Death and Dying. The causes of death, who dies, the experience of dying (nursing homes, emergency rooms, intensive care, hospices), ethical and political issues: right to life, right to death, euthanasia, bioethics, genetic engineering, cryogenics, environmental and occupational health.


Sec. 210-3. Sex Roles and Stratification I. An examination of the causes and consequences of sex differentiation and sex stratification at the individual and societal levels. Emphasis on historical and cross-cultural context of sex roles and sex status. Major theories of sex stratification are reviewed.

Sec. 211-3. Introduction to Sociology I. General survey of the field of sociology. Sociology as a science; man and culture; social groups; social institutions; social interaction; social change.

Sec. 212-3. Introduction to Sociology II. Continuation of Sec. 211-3. Prer. Sec. 211 or consent of instructor.

Sec. 214-3. Social Inequality. Examines the distribution of power and rewards in American society and is concerned with three basic issues: how social inequality is structured, how such structures are maintained, and the consequences of social inequality.

Sec. 220-3. Introduction to Demography and Human Ecology: The Sociology of Survival. Examines the global issues such as overpopulation, poverty, pollution, and environmental degradation in terms of socioeconomic organization, technology, environment, and population dynamics.

Sec. 221-3. Elementary Population Studies. Elements of demography, natality, mortality, international and internal migration, population growth, population policy.

Sec. 222-3. Human Ecology. Ecological organization and processes in urban, rural, and regional areas.

Sec. 239-3. Mass Society. Social theory is applied in an analysis of structural features of modern society, entertaining the consequences of technology, bureaucracy, urban life, and mass communication systems, including theories of community, social disorganization, alienation, popular cultural solutions to problems of individual identity, and individual adaptations to mass societal conditions.

Sec. 246-3. Introduction to Social Psychology. A survey of the following varieties of social psychology: psychoanalysis, symbolic interactionism, culture and personality, structural-functionalism, and psychological social psychology. Topics are treated on the introductory level.

Sec. 248-3. Social Movements. The social bases and development features of modern social and political movements.

Sec. 260-3. Social Problems and Social Change. Deals with major theories of social change, change in major social institutions, and current social problems: distribution of power in society, unemployment, poverty, racism and sexism, the changing role of the family, sexual norms and behavior, drugs, and psychophysical methods of awareness.

Sec. 265-3. Analysis of Modern Society. An examination of various sociological views of modern society including those of Lunt, Talcott Parsons, Mills, Reisman, Goffman, Sorokin, and others.

Sec. 267-3. Social Construction of Reality: Sociology of Knowledge. The initial perspective will be that the foundations of knowledge are largely grounded in social determinants. Exploration of the parameters of this social process as well as evaluation of different social perspectives. The works of A. Maslow, C. Coasden, and J. Shovell will be considered.

Sec. 275-3. Sociology of Natural and Social Environments. A sociological interpretation of the increasingly traumatic interaction of ecological and social systems in the Rocky Mountain West, where natural environments are progressively impacted by recreational and energy resource development.

Sec. 277-3. Introduction to Radical Sociology. Intellectual foundations of contemporary radicalism: a critical analysis of contemporary American institutions: strategies for social change; alternative forms of social organization.

Sec. 315-3. History of Sociological Thought I. Major social theorists from early times to date including such writers as Aristotle, Plato, Machiavelli, Comte, and Spencer.

Sec. 316-3. History of Sociological Thought II. Continuation of Sec. 315. Prer. Sec. 315.


Sec. 320-4. Research Methods for Baccalaureate Studies. Methodology for baccalaureate studies, including theoretical and practical methods, questionnaire construction, interviewing procedures, coding, etc., and elementary statistics. How to conduct a survey in a Citrus population.

Sec. 325-3. Sociology of Nonviolence. What nonviolent social behaviors do societies invent in response to violence? Special attention given to social and economic justice movements, nonmilitary national defense, civil disobedience, and conscientious objection to war.

Sec. 331-3. The Sociology of Language. The record in languages of society and culture. The uses of language in social and cultural processes and involvement. The conveyance of meaning treated as the prime topic of sociological inquiry. Studies of conversations and of societal facts put into words.

Sec. 332-3. Applied Sociology of Language. This course is a continuation of Sec. 331 and deals with problems such as language planning and standardization, language maintenance and shift, problems of education and development which are language related, second-language learning, and selection and development of standard language varieties in third world countries and in underdeveloped areas of modern industrial states. Emphasis will be upon the application of sociolinguistic concepts and theories to both macro and micro sociological problems. Field work projects will be encouraged.
areas of the social structure; and population control and its political, social, and economic implications. Malthusian, neo-Malthusian, and Marxist perspectives will be examined.

**Soc. 342-3. Sociology and Perspectives on Alienation.** The course is offered to create the opportunity for the comparison of historical and contemporary conceptions of alienation in sociology, with other perspectives (literary, religious, and the arts) in an attempt to arrive at an evaluation of the cogency of the concept in the sociological task of understanding and explaining the historical and contemporary situation of man.

**Soc. 346-3. Self and Consciousness.** An exploration of inner space, drawing upon the relevant literature of East and West and revolving around the basic questions of man living in this complex society.

**Soc. 360-3. Social Relations.** The course has two aims: first, to improve the student's abilities to observe, analyze, and understand his own behavior and that of others in everyday interpersonal situations; and second, to improve his ability to see the small group as a social system. The student is expected to demonstrate his abilities by effective participation in his group as well as in periodic written analyses. Problems for analysis are drawn from events in the group. The class is designed as a self-analytic training group.

**Soc. 382-3. Transitional Societies.** Examination of the problems of over and under consumption in technologically developed and developing societies.

**Soc. 370-3. Women, Development, and Fertility.** An investigation of the consequences of social and economic development for women and the relationships of the status of women and fertility; fertility and development.

**Soc. 384-3. Environment and Behavior.** Focuses on the influence of both natural and man-made environments upon human behavior and social organization. Consideration is given both micro-environments and their influence on individuals as well as the impact of macro-environments on the organization of society.

**Soc. 402-3. Senior Honors Seminar.** Topics within the field of sociology. Prer., consent of instructor.

**Soc. 403/582-3. Third World Social Theory.** The purpose of the course is to introduce the student to Third World social theory. Our focus will be the ideas that have emerged to explain the social reality of oppressed peoples. Thus, the course will focus upon the following theorists: Fanon, Memmi, Freire, Che Guevara, and Mao Tse-Tung.

**Soc. 404-3. Social History of Women.** Sociological analysis of women's place in the mode of production and social organization. The course will focus upon the transition from feudalism to capitalism and the impact of capitalistic development upon the status of women in contemporary developed and third world nations.

**Soc. 405-3. Intergroup Relations.** (Comm. 429) A study of intergroup (race) relations at the small-group level. Includes analysis of a group that has been stratified into a majority number of white students and fixed number of minority students.

**Soc. 408-3. Sex Role and Sex Stratification.** Causes and consequences of sex stratification at the individual, group, and societal levels. Extent of empirically established sex differences. Review of biological, psychological, and sociological explanations for sex role differences; emphasis on the socialization processes.

**Soc. 408-3. Selected Topics on Asian Americans.** An intensive examination of a particular topic or issue concerning Asian Americans to be selected by the instructor. Examples of topics include the Japanese American evacuation during World War II, Asian American social movements, community institutions and organizations, and directed research in a particular area.

**Soc. 410-3. Twentieth-Century Social Theory.** A review of the major sociological theories of the 20th century. The course will consider briefly the major works of such pre-World War II writers as Emile Durkheim and Max Weber. It will then concentrate on the postwar work of Parsons, Goffman, and others.

**Soc. 419-3. Social Disorganization.** Major problems of social maladjustment from standpoint of the processes underlying social and individual disorganization, such as alcoholism, suicide, illegitimacy, and family disorganization.

**Soc. 420-6. Research Methods and Field Experience.** Comprised of two components: (1) survey research, statistics, and computer programming (students will be required to design a research project, collect and analyze data, and report findings), and (2) intensive interviewing and participant observation (students will be required to conceptualize a field work project which includes qualitative analysis of some ongoing social setting).

**Soc. 425/525-3. Theories and Problems of Development.** Course will be related to policy problems facing less-developed nations. Theories (institutional vs. instructional, economic vs. political and sociological, similarities of stages), case studies and cross-national empirical research will be included.

**Soc. 426-3. Urban Sociology.** The city in terms of its social structure, residential and institutional pattemings, processes of interaction, demographic processes, and patterns of growth and change.

**Soc. 428-3. Sociology of the Future.** A systematic analysis of future societies. Emphasis on examining a variety of possible social arrangements, and on assessing economic and political consequences of each, with computer simulation as an optional method.

**Soc. 429/589-3. Population Issues in Nonindustrial Countries.** Examination of the antecedents and consequences of demographic trends in the non-industrial nations of the world, particularly as those trends pertain to economic development, health, and social change.

**Soc. 430-3. Social Organization.** The social order among primitive peoples and in ancient high civilizations of the Mediterranean, the Orient, and the New World.

**Soc. 431-3. Social Organization.** Social structures of empires and feudal societies. Development of the social organization of great contemporary populations.

**Soc. 432/539-3. Education in Multilingual Communities.** Considers role of language in education and mechanisms of social stratification, i.e., inequality, particularly in communities where children enter school with differing mother tongues. Sociology of bilingual education: politics, pedagogy, and development. Field research encouraged.

**Soc. 433-3. Communities.** Review and appraisal of community studies.

**Soc. 435-3. Sociology of Health and Illness.** This course will analyze sociological theories of illness causation and differentiate them from the epidemiological and medical models. It will examine the relationship between belief systems and illness causation. The course will also examine the ways in which socioeconomic status and social statuses are related to disease. Deviant illness and the social role of the sick person will also be discussed. Finally, the course will examine how American society handles the ultimate outcome of illness; death.


**Soc. 437-3. Sociology of Health Institutions.** This course will examine health institutions in the general context of theories of social institutions and their relationships. It will examine how people learn health institutional roles, how they carry them out and the pattern of their relationships. The organizational context of health institutions will be discussed, particularly the hospital. Finally, patterns and problems in the restructuring of health institutions will be analyzed and various alternatives discussed.

**Soc. 438-3. Practicum in Sociolinquistics.** Approaches through language to the study of society and culture. The examination and appraisal of languages and of language productions as records and expressions of social facts. Field projects and documentary and laboratory investigations of language related to social and cultural formations. Sociological treatments of texts, accounts, and conversations.

**Soc. 439/536-3. Practicum in Ethnography.** Ethnographic investigations of contemporary settings. The ethnographic search for formal social features and the deviation of theoretical constructs from ethnographic accounts. Ethnography related to formal and experimental analysis and the testing and appraisal of ethnographic methods and findings. Ethnography informed by such outlooks and approaches as hermeneutics, phenomenology, and ethnomethodology.

**Soc. 440-3. Sociology of Adolescence.** Adolescence in primitive, traditional, and modern society, with special emphasis on the contemporary United States. The possible existence of a youth culture is investigated. The relationship between social climates and individual academic orientations, dating patterns, etc., is analyzed.

**Soc. 441/541-5. Group Structures and Behavior.** Collective behavior, personality, group, and culture. The problems of publics, crowds, social movements, and human relations of a changing dynamic nature.
Soc. 443/542-3. Technology and Modernization. A description and analysis of changing social structures and social relationships as a response to technological innovation and change. Emphasis also given to the role of technology in the development of selected countries outside the United States.

Soc. 444-3. Social Stratification. Status, social mobility, and class in selected societies; elites and leadership problems.


Soc. 449-3. Social Control. Informal and formal regulative processes in social behavior, with reference to techniques and processes of social control, such as propaganda, the political order, and other institutions.

Soc. 450-3. Social Problems: Advanced Analysis. Advanced sociological analysis of persistent social problems, such as poverty, discrimination, and social and political alienation; and of problems of the life cycle, such as those associated with adolescence, marriage and parenthood, and old age. Emphasis upon the application of sociological theory to the analysis of these problems and to the development of techniques and programs for intervention and control. Open only to senior sociology majors or by consent of instructor.


Soc. 453-3. Social Change. The process of change in Western society and its effects on the individual, the family, and economic and political institutions. Attention given to external stimuli, to the development of social institutions and to the role of values and beliefs in social change and control. Open to all sociology majors and can be repeated for credit.

Soc. 455-3. Sociology of the Family. The family as a social institution. Historical development and contemporary cross-cultural analysis with emphasis on the contemporary American family.

Soc. 456/556-3. Family and Society. It is the aim of this course to examine, from a sociological and historical perspective, the relationship between family structure and economic structure. Contemporary and historical trends will be studied in the context of the economic, political, and ideological basis of the family.


Soc. 463-3. Research Methods in Sociology. Teaches quantitative research methods, most particularly methods of survey research. Topics included will be sampling, measurement, interviewing, computer methods, and statistical analysis. Class will design and execute a survey research project from design to completion. Students will prepare a research paper on the basis of data collected in the project.

Soc. 464-4. Field Experience in Sociology. Emphasizes ethnographic techniques, intensive interviewing, direct observation, and participant observation. Students will conceptualize and execute a field research project including data collection, analysis, and a report on some ongoing social setting.

Soc. 465-3. Religion in American Society. Social, cultural, and historical foundations of American religious belief and the organization of the church. Relation of religious belief to other institutions, e.g., economy, politics. Analysis of contemporary social movements in the United States which are either explicitly religious or have a strong religious quality.

Soc. 468-3. Social Psychology. A basic course in social psychology viewed from a sociological perspective.

Soc. 467-3. Sociology of Education. Analysis of the school as a social institution, including the teaching process and control in the school; classroom organization and procedures and their relation to learning and personality development in children; roles of educators; and reciprocal relations of school and community.

Soc. 469/569-3. Sociology of Science. Science as a social institution; social factors in the development of science; the social organization of science; social processes in scientific discovery. The place of science in modern society and the social responsibilities of science.


Soc. 475-3. Political Sociology. Analysis of the political order by means of specific sociological theory and method to relate power to social contexts, structural forms, and behavioral patterns.


Soc. 479/573-3. Formal Theories of Conflict. The logic of bargaining, mediation, resolution, conflict, and war. Formulations such as those of Richardson, Bouwkamp, and the game theorists. Empirical research examples drawn from the fields of small groups, politics, and international relations.

Soc. 475-3. Sociological Analysis of Revolution. A comparative analysis of major revolutions with emphasis on causation, revolutionary process, and long-term consequences. Attention given to social stratification, political organization, economic processes, ideological systems, and international relations.


Soc. 481/581-3. Family Planning and Population Control: Social and Policy Issues. Effects of social factors on the development and implementation of population policies in various societies. Values and assumptions underlying such concepts as "free choice on family planning," "birth control," and "population control." Impact of various population policies on societal goals and also on the autonomy of the individuals and families comprising the society.

Soc. 482-3 or 5. Sociology of Peace-making. An analysis of the enabling institutions of war and of emerging forces countering them, such as transnational networks, nonviolent national defense strategies, and such collective actions as changing the family's behavior as peacebuilders.


Soc. 484/584-3. Population Studies: Migration and Distribution. Mortality and fertility rates decline, migration is becoming the main determinant of population growth and distribution, especially in the U.S. The course will cover theory and methods but concentrate on social issues related to migration.

Soc. 486-3. Sociology of Aging. The role of the aged in today's society; relationships of the aged to his family and community; problems in retirement and leisure, the economics and politics of aging, and problems in the health of the aged; and prospects for the aged in tomorrow's society.


Soc. 489-3. Senior Seminar. A seminar provided for senior sociology majors (only) in which topical concepts, issues, and problems in sociology are considered. Considerable responsibility is placed upon the student to participate in the determination of the topics and materials in the course.
Soc. 493-3. Social Issues in Health and Medicine. A discussion of current issues of concern to society in health and medicine. The following topics will be discussed in terms of their impact on society and on the individual: alcoholism, abortion, organ transplants, drug abuse, genetic engineering, health care delivery systems.

Soc. 494-3. Uses of Photography in Sociology. Designed to sharpen the student's observational skills by offering practice in still photography as a tool for discovering and interpreting social settings, conditions, and concepts. Surveys uses of photography in social research, explains basic camera techniques, how to design field studies, and ways of integrating visual and verbal texts. Each student will design and carry out a field project.


Soc. 497-3. Treatment of Offenders. Principles of treatment of offenders; application of social science principles to treatment of offenders; attitude formation and change; group dynamics; interviewing; guidance and counseling; social re-education. Prereq. Soc. 495 or 496, or consent of instructor.


Soc. 502-3. Research Methods I. Problems and procedures of research design and data processing in social research. Topics covered include role of theory in research, concept formation, design of proof and hypothesis testing, schedule construction, sampling, interviewing, scaling techniques, analysis procedure, and report preparation. Prereq. one course in statistics.

Soc. 503-3. Research Methods II. A second-semester seminar devoted to practical applications of research methods and statistical techniques that provide the student with experience in a wide variety of research settings. Prereq. Soc. 502.


Soc. 506-3. Research Practicum in Ethnographic Methods. Explores methods, problems, and potentials of field work research, utilizing primarily qualitative methods of gathering and analyzing data of social situations. Primary purpose of field work is to learn systematically observe people in situ, finding them where they are, study and with them the acceptance or rejection of the researcher's observations of their behavior, and reporting it in ways useful to social science but not harmful to those observed. Prereq. Soc. 502 and 503.

Soc. 507-3. Research Practicum in Dialectical and Historical Methods. An introduction to dialectical logic and methods for use in the analysis of historical data will be followed by the formulation of group and/or individual research projects to be completed during the semester. Practical experience in conducting historical research is emphasized. Prereq. required graduate theory course and a required graduate methods course.


Soc. 510-3. Assessment Research. The seminar will be concerned with methods of assessing the effectiveness of action programs conducted in various institutional sectors of the community. Basic principles of research design, measurement, and administration in the behavioral sciences will be applied to the situations likely to be encountered when social research is conducted in an action setting. Extensive case material will be utilized. Prereq. Soc. 502 and 503.

Soc. 513-3. Social Theory. Selected topics in sociological theory.

Soc. 518-3. Social Theory. Selected topics in sociological theory.

Soc. 519-3. Deviant Behavior. Examination of current theory and research on deviant behavior with emphasis on the relationship between deviance and patterns of social exclusion.

Soc. 525-3. Seminar: Urban Sociology. Intensive examination of the social and cultural organization of the urban complex. History, contemporary growth, and future of the city are major perspectives; cross-cultural aspects of urban development also are emphasized.


Soc. 535-3. Practicum in Sociolinguistics. Approaches through language to the study of society and culture. The examination and appraisal of languages and of language production as records and expressions of social facts. Field projects and laboratory investigations of language related to social and cultural formations. Sociological treatments of texts, accounts, and conversations. Open to advanced undergraduates with consent of the instructor.

Soc. 540-3. Small Group Processes. Empirical and theoretical analysis of basic forms of social interaction, including such processes as attraction, conformity, cooperation, competition, social exchange, etc. Emphasis on, but not limited to, small groups research. Some attention to relevant methodological issues.


Soc. 546-3. Social Change and Policy Planning. A course giving students experience in writing research proposals, journal articles, project reports, and the like. Students' writing efforts will be criticized from stylistic, scientific, and managerial perspectives. Emphasis will be placed upon efficient use of library materials, computerized searches of relevant literature, and writing for the appropriate audience.

Soc. 547-3. Social Psychology of Sex Differences. Examination of social psychological theories of sex differences in personality and behavior. The relation between these theories and sex stratification is stressed. Psychobiological and learning theories are considered in detail, and role-oriented vs. personality-oriented theories are contrasted. Empirical research on sex differences, stereotypes, and social interaction between sexes are examined.

Soc. 555-3. The Family. Recent trends in research and theory with emphasis on the American family.


Soc. 565-3. Language and Knowledge. A practicum for student-conducted field projects involving all the sequential steps from collection of original data through its analysis and evaluation. Perspectively, the sociology of knowledge and science are united with those from the sociology of language.


Soc. 576-3. Modern Marxist Social Theory. An exposition and analysis of recent Marxist social thought. Consideration is given to modern Marxist theories of class structure, political economy, alienation, culture, and the state. The work of Althusser, Debord, Gramsci, Lukacs, Mandel, and Marcuse is considered.

Soc. 577-3. Sociological Analysis of Organizations. An examination of theory and research in the field of formal organization. Special attention is given to problems of organizational change and to the difficulties a social scientist working in a bureaucratic organization might encounter.

Soc. 586-3. Comparative Race and Ethnic Relations. A rigorous examination of macrolevel theory in race-ethnic relations and its applicability both to race-ethnic relations case studies drawn from a number of societies and to the general topics of ethnic communities, protest and change, assimilation, prejudice-discrimination, and contemporary social policies.


Soc 595-3. Criminology. Theories of causation of crime as a social phenomenon; theories of punishment and disposition of cases.

Soc 599-3. Prevention and Control of Delinquency and Crime. Policies and programs that have been proposed or tried for prevention and control of delinquency and crime and theories underlying such programs. Examination and evaluation of specific programs. Principles involved in prevention and control.


Soc 611-3. Advanced Statistical Analysis. Principles of multivariate statistical analysis such as path analysis and factor analysis. Application to sets of available data through various computer programs.

Soc 614-3. Social Theory: Contemporary World Problems. Macro-level structural theories of underdevelopment, overpopulation, food scarcity, and resource depletion. Current policies attempting to cope with such problems will be critically assessed.

Soc 615-3. Advanced Social Theory. Selected topics in sociological theory.

Soc 618-3. Theory Construction. Analysis of the components of alternative explanatory paradigms in use in social sciences to understand the development of individual projects designed to integrate a body of findings in a particular content area into a middle range theory.

Soc 623-3. Human Fertility. Provides students with an opportunity to specialize in research on human fertility with social factors in fertility differentials being stressed.

Soc 626-3. Environmental and Social Planning. Focuses on qualitative and quantitative techniques for environmental and social planning. A conceptual framework is explored for the purposes of integrating common elements in different areas of planning. The process of planning with policy formulation is examined in both governmental and corporate settings, with emphasis on planning for social change and innovation. Pre,. Soc 602, 503, or permission of instructor.


Soc 688-3. Joint Problems of Psychiatry and Sociology. Research approaches in psychiatry and clinical psychology are compared with sociological research in the fields of sociology of medicine and mental health. Emphasis on theoretical outlooks of the several disciplines and on criticism that may be made by psychiatrists and psychologists of sociological approaches to mental health. One of several psychiatrists or clinical psychologists will be invited to participate in this program in cooperation with members of the sociology staff.


Soc 800-30. Doctor's Dissertation. All doctoral students must register for no fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.


Soc 940-variable credit. Independent Study in Sociology. Consent of instructor is required.


Soc 998-variable credit. Candidate for Degree.

SPANISH AND PORTUGUESE

Spanish

Span 101-5. Beginning Spanish. Fall, Spring. Course will offer students a firm command of Spanish grammar. Recitation sections will reinforce structures discussed in lecture. Grammar will be used as point of departure for development of oral skills. Reading, writing will be assessed to a lesser degree.


Span 303-3. Professional Spanish for Business I. Fall. Includes the study of terminology and techniques used in business transactions and the interpretation and understanding of the ideas expressed in business letters and simple documents. Prereq., Span 301, 302.

Span 304-3. Professional Spanish for Business II. Spring. A practical business course including writing, interpreting, and elementary translation. Some attention is given to the writing of resumes and application letters, as well as to the entire job-search process. Prereq., Span 303.


Span 315-3. Romance Literature in English Translation I. (Fr. 315, It. 316, Port. 316.) Fall. An interdepartmental course treating the major literary figures of Spanish, French, Italian, and Portuguese literature from the Middle Ages through the 16th century. (Does not count toward Spanish major.)

Span 316-3. Romance Literature in English Translation II. (Fr. 316, It. 316, Port. 316.) Spring. An interdepartmental course treating the major literary figures of Spanish, French, Italian, and Portuguese literature of the 19th and 20th centuries. (Does not count toward Spanish major.)

Span 391-3. Twentieth-Century Spanish Literature. A survey of the leading writers of Spain from 1889 until the present. In-depth studies of three or four narrative authors will balance the more superficial introduction to the works of other important authors. Prereq., Span 212 or equivalent.


Span 400/500-5. Mexican-American Culture of the Southwest. Spring. (Ch. St. 400.) (Does not count toward Spanish major.)

Span 401-3. Advanced Rhetoric and Composition I. Fall. Designed to improve written expression in Spanish. Detailed study of the nuances of grammar points most difficult for students. Attention will be given to errors in student compositions and to the various styles of written Spanish. Prereq., Span 302.

Span 402-3. Advanced Rhetoric and Composition II. Spring. A continuation of Span 401 with an emphasis on original work by students. Composition assignments will include the development of dialogues, syntheses of works by noted authors and original poems by students. Review of grammar when need is indicated. Prereq., Span 401.


Span. 407-3. Problems of Business Translation in Spanish II. Spring. Legal and commercial documents are studied, prepared and discussed to enable students to perform successfully in real translation situations. Prereq., Span. 406 or equivalent.


Span. 415-3. Masterpieces of Spanish Literature. Fall. A general survey of Spanish peninsular literature, including a study of the principal authors, works, and literary movements.


Span. 420-3. Hispanic Culture. (Ch. St. 420.)

Span. 421-3. Mexican American Folksong of the Southwest. (Ch. St. 411.)

Span. 422-3. Mexican Literature.


Span. 430-3. Generation of 1898. Thorough coverage of selected works by Unamuno, Baroja, Valle-Inclán, Azorín, and A. Machado. The significance of the generation's contribution to Hispanic literature will be made.

Span. 441-3. Modernism. A study of background, influences, tendencies, themes and style of modernism; its principal authors and works, including Spanish verification and form.


Span. 462-3. Don Quixote.

Span. 483-1 to 4. Languages Internship for Professions. Fall, Spring. Enrollment only with instructor's consent. Participants interested in public service or management-oriented careers in government or business will be able to work as interns in public sector agencies or in private industry, on campus or abroad.

Span. 495/595-3. Methods of Teaching Spanish. Fall, Spring. Course will familiarize students with current methodology and techniques in foreign language teaching. Peer-teaching coupled with opportunity to teach mini-lessons will provide students with actual teaching experience in the foreign language classroom. (Denver Campus only.)

Span. 532-3. Spanish Literature Since the Spanish Civil War. (Denver Campus only.)


Span. 613-3. Seminar: Critical Approaches to Hispanic Literature. Various topics and genres will be treated, each requiring a semester's study, as needs and resources indicate. Special attention will be given to theoretical and critical analysis of Hispanic literature with greatest emphasis placed on contemporary trends. Genres might include narrative, poetry, and theatre.

Span. 614-2 to 4. Seminar: Spanish Literature, Medieval Period. Study of medieval works, authors and themes. Principal influences from other literatures. Reading in Old Spanish.

Span. 620-2 to 4. Seminar: Spanish Literature, Renaissance and Baroque. Various topics will be treated, each requiring a semester's study, as needs and resources indicate. Special attention will be given to developing the historical and current theoretical and critical background of each topic. Representative topics might include Renaissance poetry in Spain, Cervantes, Don Quijote and Novelas ejemplares; picarque novel; and the Spanish comedy of the 17th century.

Span. 621-2 to 4. Seminar: Spanish Literature, 19th Century. Various topics will be treated, each requiring a semester's study, as needs and resources indicate. Special attention will be given to developing the historical and current theoretical and critical background of each topic. Representative topics might include romanticism prose, poetry, theatre, realism and naturalism (prose narrative), 19th-century poetry, 19th-century theatre.

Span. 622-2 to 4. Seminar: Spanish Literature, 20th Century. Various topics will be treated, each requiring a semester's study, as needs and resources indicate. Special attention will be given to developing the historical and current theoretical and critical background of each topic. Representative topics might include generation of 1898, poetry of the 20th century, theatre of the 20th century, pre-Civil War novel, and post-Civil War novel.

Span. 630-2 to 4. Seminar: Spanish American Literature, Colonial Period. Various topics, each requiring a semester's study, will be treated as needs and resources indicate. Special attention will be given to developing the historical and current theoretical and critical background of each topic. Representative topics might include pre-Columbian literature, colonial prose narrative, colonial poetry, and colonial theatre.

Span. 631-2 to 4. Seminar: Spanish American Literature, 19th Century. Various topics, each requiring a semester's study, will be treated as needs and resources indicate. Special attention will be given to developing the historical and current theoretical and critical background of each topic. Representative topics might include the romantic novel, the realist and naturalist novel and short story, 19th-century poetry, 19th-century theatre, 19th-century essay, and gaucho literature.

Span. 632-2 to 4. Seminar: Spanish American Literature, Modernism to World War II. Various topics, each requiring a semester's study, will be treated as needs and resources indicate. Special attention will be given to developing the historical and current theoretical and critical background of each topic. Representative topics might include modernism, theatre, the essay, the regional novel, and the novel of the Mexican Revolution.

Span. 633-2 to 4. Seminar: Spanish American Literature, World War II to the Present. Various topics, each requiring a semester's study, will be treated as needs and resources indicate. Special attention will be given to developing the historical and current theoretical and critical background of each topic. Representative topics might include the modern novel, the essay, contemporary theatre, contemporary poetry, and fantastic literature.

Span. 640-2 to 4. Seminar in Spanish Phonology. Topics within Spanish phonology will be treated, each requiring a semester's study, as needs and resources indicate. Special attention will be given to different schools and contemporary theoretical developments. Representative topics may include generative theory applied to Spanish, Spanish phonology for college teaching, and different schools of Spanish phonology.

Span. 641-2 to 4. Seminar in Spanish Syntax. Topics within Spanish syntax will be treated, each requiring a semester's study as needs and resources indicate. Special attention will be given to different schools and contemporary theoretical developments. Representative topics may include generative theory applied to Spanish, fundamental problems in Spanish syntax, different schools of Spanish syntax.

Span. 642-2 to 4. Seminar: History of the Spanish Language. Topics within the history of the Spanish language will be treated, each requiring a semester's study as needs and resources indicate. The linguistic evolution of Spanish from neo-Latin to its present status as a world language; important historic, linguistic, literary, and cultural currents. Representative topics may include a diachronic study of Spanish linguistic forms, the extension of Spanish to the New World, linguistic and literary texts in Old Spanish.

Span. 643-2 to 4. Seminar: Hispanic Linguistics. A major topic from an important area such as phonology, syntax, history of the Spanish language. Hispanic linguistics and literature or applied Hispanic linguistics will be announced. This topic will be studied in detail during the semester.

Span. 650-3. Seminar: Language Teaching and Learning. An in-depth study of one area of foreign/second language education or applied linguistics will be offered each term; the topic to be chosen by the instructor. Possible topics to be covered include teaching culture, media, individualized instruction, second language acquisition, etc.

Span. 651-3. Seminar: Language Testing. Provides an overview of foreign/second language testing including test theory, research, and item development, essential psychometrics, and commercially produced standardized tests of achievement, dominance, and proficiency.

Span. 800-30. Doctor's Dissertation. All doctoral students must register for at least 90 hours of dissertation credit as part of the fulfillment of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.

Span. 910-1 to 3. Independent Study.
Span. 940-1 to 3. Independent Study.
Span. 950-1 to 3. Independent Study.
Span. 960-1 to 3. Independent Study.

Portuguese

Port. 101-5. Beginning Portuguese. Fall.
Port. 211-3. Second-Year Portuguese Reading and Conversation. Fall. Prer., Port. 102 or its equivalent in proficiency.
Port. 315-3. Romance Literature in English Translation I. (Fr. 315, Ital. 315, Span. 315.) Fall. An interdepartmental course treating the major literary figures of Spanish, French, Italian, and Portuguese literature from the Middle Ages through the 18th century.
Port. 315-3. Romance Literature in English Translation II. (Fr. 315, Ital. 315, Span. 315.) Spring. An interdepartmental course treating the major literary figures of Spanish, French, Italian, and Portuguese literature of the 19th and 20th centuries.
Port. 403/503-3. Topics: Luso-Brazilian Civilization. Fall. Prer., two years of any other romance language.
Port. 452/552-3. Contemporary Brazilian Prose Fiction II. Spring. Prer., Port. 212 or consultation.
Port. 940-1 to 3. Independent Study.
Port. 950-1 to 3. Independent Study.

THEATRE AND DANCE

Theatre

Thtr. 270-3. Introduction to Theatre. Survey of theatre forms past and present, the development of the physical theatre, and staging techniques throughout the ages; readings, lectures, demonstrations.
Thtr. 273-3. Acting I. Theory and practice to enable the student to develop his techniques and to utilize these techniques in acting. Emphasis is placed on developing an awareness of the use of the voice and body as a means of expression. Special sections are available for theatre majors only.
Thtr. 321-1 to 3. Practicum in Costuming. Practical production projects within the designated area of theatre. Theatre majors may repeat course to a maximum of 8 credits with consent of departmental advisor.
Thtr. 322-1 to 3. Practicum in Technical Theatre. Practical production projects within the designated area of theatre. Theatre majors may repeat course to a maximum of 8 credits with consent of departmental advisor.
Thtr. 323-1 to 3. Practicum in Theatre Management. Practical production projects within the designated area of theatre. Theatre majors may repeat course to a maximum of 8 credits with consent of departmental advisor.
Thtr. 324-1 to 3. Practicum in Acting. Practical production projects within the designated area of theatre. Theatre majors may repeat course to a maximum of 8 credits with consent of departmental advisor.

Thtr. 325-1 to 3. Practicum in Playwriting. Practical production projects within the designated area of theatre. Theatre majors may repeat course to a maximum of 8 credits with consent of departmental advisor.
Thtr. 326-1 to 3. Practicum in Directing. Practical production projects within the designated area of theatre. Theatre majors may repeat course to a maximum of 8 credits with consent of departmental advisor.
Thtr. 327-1 to 3. Practicum in Theatrical Make-up. Practical production projects within the designated area of theatre. Theatre majors may repeat course to a maximum of 8 credits with consent of departmental advisor. Not offered every year. See Schedule of Courses.
Thtr. 373-3. Acting II. Theory and practice to enable the student to develop his techniques and to utilize these techniques in acting. Formal and informal performance of scenes throughout the semester.

Thtr. 377-3. Introduction to Costuming. Explores the element of dress as a part of the dramatic event. Theoretical and practical projects are used to understand the design and construction of costumes for the stage.
Thtr. 389-Variable Credit. Problems in Theatre. Study in problem areas in the field of theatre. Work that is basically investigative in character. Prer., consent of supervising instructor.
Thtr. 421-1 to 3. Advanced Practicum in Costuming. Advanced production projects within the designated area of theatre under close supervision of senior faculty. Theatre majors may repeat course to a maximum of 16 credits with consent of departmental advisor. Prer., Thtr. 321.
Thtr. 422-1 to 3. Advanced Practicum in Technical Theatre. Advanced production projects within the designated area of theatre under close supervision of senior faculty. Theatre majors may repeat course to a maximum of 16 credits with consent of departmental advisor. Prer., Thtr. 322.
Thtr. 423-1 to 3. Advanced Practicum in Theatre Management. Advanced production projects within the designated area of theatre under close supervision of senior faculty. Theatre majors may repeat course to a maximum of 16 credits with consent of departmental advisor. Prer., Thtr. 323.
Thtr. 424-1 to 3. Advanced Practicum in Acting. Advanced production projects within the designated area of theatre under close supervision of senior faculty. Theatre majors may repeat course to a maximum of 16 credits with consent of departmental advisor. Prer., Thtr. 324.

Thtr. 425-1 to 3. Advanced Practicum in Playwriting. Advanced production projects within the designated area of theatre under close supervision of senior faculty. Theatre majors may repeat course to a maximum of 16 credits with consent of departmental advisor. Prer., Thtr. 325.
Thtr. 426-1 to 3. Advanced Practicum in Directing. Advanced production projects within the designated area of theatre under close supervision of senior faculty. Theatre majors may repeat course to a maximum of 16 credits with consent of departmental advisor. Prer., Thtr. 326.
Thtr. 427-1 to 3. Advanced Practicum in Make-up. Advanced production projects within the designated area of theatre under close supervision of senior faculty. Prer., Thtr. 327. Not offered every year. See Schedule of Courses.

Thtr. 471-3. History of the Theatre 1. Study of theatres, methods of presentation, actors, and activities from primitive times to 1700, with some readings of plays to illustrate the points covered.
Thtr. 472-3. The Theatre of Asia. Survey of Asian theatre history, methods, content, and social function, with a special focus on India, China, and Japan. Prer., 6 hours of theatre or Asian studies.
Thtr. 475-3. Playwriting: The Short Form. Plays, radio, and television scripts. Prer., any course in drama or consent of instructor.
Thtr. 478-3. Scene Design. The study and practice of scenic design with an emphasis on the study of design theory, color, and space. Special emphasis is placed on two-dimensional and three-dimensional presentation of ideas.

Thtr. 477/577-3. Costume Design. Study and application of the principles of design as applied to stage costume with special emphasis on the two-dimensional presentation of ideas. Prer., Thtr. 377 or consent of instructor.


Thtr. 481-3. History of the Theatre II. Continuation of Thtr. 471. From 1700.


Thtr. 484/584-3. Acting IV. A concentrated study of one or two major styles of acting in the Oriental and Occidental theatres, such as Greek, Shakespearean, Restoration, Peking Opera, Kabuki, Noh, Classical Indian, etc. To be offered whenever a specialist of a particular acting style is in residence. Prer., Acting III or consent of instructor.


Thtr. 486-3. Stage Lighting Design. The study and practice of lighting and design with emphasis on the principles of electricity, optics, color theory, instrumentation, and their aesthetic application to the stage.

Thtr. 487/587-3. History of Costume II. Completion of Thtr. 482. A detailed study of the history of costume from the Renaissance to contemporary times, including fabrics, accessories of dress, and ornament.

Thtr. 489/589-1 to 4. Problems in Theatre. Opportunity for students to explore, upon consultation with the instructor, areas in theatre which the normal sequence of offerings will not allow. Prer., consent of instructor.


Thtr. 572-3. Problems in Asian Theatre. Survey of Asian theatre history, method, content, and social function with a special focus on India, China, and Japan. Prer., 6 hours of theatre or Asian studies. (Same as Thtr. 472 plus graduate paper.)

Thtr. 573-3. Acting III. Research, analysis preparation, and performance of roles in period and modern drama, emphasizing theories and techniques of historical and presentational styles. Course available by audition only.

Thtr. 574-3. Directing: Theory and Practice. Advanced study of theory and practice of play direction; observation of plays in the University Theatre; direction of a play and presentation before an audience under supervision of instructor. Prer., Thtr. 474 or consent of instructor.

Thtr. 576-3. Scene Design. (Same as Thtr. 476 plus graduate project.)


Thtr. 579-1 to 2. Theatre Practice. Participation in University Theatre productions. Credit hours to be arranged by director of the theatre.

Thtr. 585-3. Problems in Playwriting. (Same as Thtr. 485 plus graduate paper.)

Thtr. 586-3. Stage Lighting Design. (Same as Thtr. 486 plus graduate paper.)

Thtr. 587-3. History of Costuming II. (Same as Thtr. 487 plus graduate project.)

Thtr. 589-1 to 4. Problems in Theatre. Opportunity for students to explore, upon consultation with the instructor, areas in theatre which the normal sequence of offerings will not allow. Prer., consent of instructor.

Thtr. 603-3. Seminar: Theatre Aesthetics. Shared research into the relation of oriental and occidental aesthetics to theatre as an art form. Prer., undergraduate theatre major plus one course in aesthetics or consent of instructor.

Thtr. 670-2. Graduate Survey of Dramatic Literature. A reading survey of plays from the Greeks to the present day.


Thtr. 672-3. Seminar: Asian Theatre. In-depth study and research on major theatre forms in Asian countries, with a specific focus on dramatic and musical theatre of India, China, and Japan.


Thtr. 675-3. Seminar in Contemporary Theatre. Research and study of the contemporary theatre, its impulses, achievements, and trends. Such areas as scholarship, theory and criticism, playwriting, production arrangements, staging methods, and social effect or importance may be considered.

Thtr. 679-3. Problems in Developmental Theatre. Opportunity for students to explore, upon consultation with instructor, areas in theatre and dance which the normal sequence of offerings will not allow. Prer., consent of instructor.


Thtr. 685-variable credit. Problems in Developmental Theatre. Opportunity for students to explore, upon consultation with the instructor, areas in developmental theatre which the normal sequence of offerings will not allow. Prer., consent of instructor.

Thtr. 700-1 to 4. Master’s Thesis.

Thtr. 800-30. Doctor’s Dissertation. All doctoral students must register for not fewer than 30 hours of dissertation credit as part of the requirements for the degree. For a detailed discussion of doctoral dissertation credit refer to the Graduate School portion of the catalog under Change in Requirements for Doctoral Degree.

Thtr. 930-1 to 3. Independent Study. Prer., written consent of instructor.

Thtr. 940-1 to 3. Independent Study. Prer., written consent of instructor.

Thtr. 950-1 to 3. Independent Study. Prer., written consent of instructor.

Thtr. 960-1 to 3. Independent Study. Prer., written consent of instructor.

Thtr. 970-1 to 3. Independent Study. Prer., written consent of instructor.

Interpretation


Intr. 352-3. Voice. Intense concentration upon the understanding, training, and effective use of the vocal instrument.


Relationship of world view and dramatic style. Focus upon selected periods and playwrights, including Moliere, Shaw, and Chekhov.

Intp. 479/579-1 to 4. Interpretation Practice. Project in interpretation under supervision of senior faculty.

Intp. 489/589-1 to 3. Problems in Interpretation. Opportunity for students to explore, upon consultation with the instructor, areas in interpretation which the normal sequence of offerings will not allow. Prer., consent of instructor.

Intp. 598-1 to 3. Recital-Interpretation.

Intp. 650-3. Background Studies for Oral Interpretation. History and aesthetics of oral interpretation from the Greeks to the present.

Intp. 651-1. Recital. Open only to students completing graduate degrees in the Department of Theatre and Dance at the University of Colorado. Preparation for the final recital.

Intp. 679-1 to 3. Problems in Interpretation. Opportunity for students to explore, upon consultation with the instructor, areas in interpretation which the normal sequence of offerings will not allow. Prer., consent of instructor.

Intp. 700-1 to 4. Master's Thesis. Prer., written consent of instructor.

Intp. 930-1 to 3. Independent Study. Prer., written consent of instructor.

Intp. 940-1 to 3. Independent Study. Prer., written consent of instructor.

Intp. 950-1 to 3. Independent Study. Prer., written consent of instructor.

Intp. 960-1 to 3. Independent Study. Prer., written consent of instructor.

Intp. 970-1 to 3. Independent Study. Prer., written consent of instructor.

Dance

Dnce. 151-1, 152-1. Dance Techniques: Recreational Dance Forms. Open to dance, physical education, and recreation majors, and by consent of instructor.

Dnce. 181-2. Dance Techniques: Ballet. Fall. Open to dance majors and by consent of instructor.


Dnce. 183-2. Dance Techniques: Ballet. Fall. Open to dance majors and by consent of instructor.


Dnce. 185-2. Dance Techniques: Ballet. Fall. Open to dance majors and by consent of instructor.

Dnce. 186-2. Dance Techniques: Ballet. Spring. Open to dance majors and by consent of instructor.

Dnce. 187-2. Dance Techniques: Ballet. Fall. Open to dance majors and by consent of instructor.

Dnce. 188-2. Dance Techniques: Ballet. Spring. Open to dance majors and by consent of instructor.

Dnce. 191-2. Dance Techniques: Modern Dance. Fall. Open to dance majors and by consent of instructor.

Dnce. 192-2. Dance Techniques: Modern Dance. Spring. Open to dance majors and by consent of instructor.

Dnce. 193-2. Dance Techniques: Modern Dance. Fall. Open to dance majors and by consent of instructor.

Dnce. 194-2. Dance Techniques: Modern Dance. Spring. Open to dance majors and by consent of instructor.

Dnce. 195-2. Dance Techniques: Modern Dance. Fall. Open to dance majors and by consent of instructor.

Dnce. 196-2. Dance Techniques: Modern Dance. Spring. Open to dance majors and by consent of instructor.

Dnce. 197-2. Dance Techniques: Modern Dance. Fall. Open to dance majors and by consent of instructor.

Dnce. 198-2. Dance Techniques: Modern Dance. Spring. Open to dance majors and by consent of instructor.

Dnce. 214-2. Dance Improvisation. An opportunity for the student to explore movement problems resulting in an awareness of the self alone and in a group in various environments. An experience to sense dance improvisation as an authentic life experience and art form.

Dnce. 280-2. Theatre Dance Forms. Each class will begin with a dance warm-up designed to increase strength, flexibility, and coordination. This will be followed by dance sequences based on social dance forms of the 20th century and discussion of their use in musical theatre choreography.

Dnce. 290-3. Beginning Dance Composition. An understanding of the basic elements of dance composition through beginning studies, evolved from readings, discussion, and improvisation.


Dnce. 390-3. Intermediate Dance Composition. An opportunity for the student to extend knowledge and understanding of the elements of dance composition as they relate to group forms, theme, and development, and different performing spaces. Prer., Dnce. 290 or consent of instructor.


Dnce. 415-3. Methods of Teaching. Exploration and evaluation of dance for the secondary school student. The understanding of the value of creative movement exploration for the development of the individual. Clarification of the role of the teacher and the role of the student in secondary school. Methods, materials, and activities used to contribute to the student's original expression. Prer., Dnce. 214, 260, 314, 380, and basic understanding of anatomy.

Dnce. 479-1 to 3. Dance Practicum. Project in dance under supervision of senior faculty.

Dnce. 490/590-3. Advanced Dance Composition. An in-depth approach to composition with an emphasis on personal invention, solo and group forms; increasing technical range; styles based on historical art forms; exploration of the evaluative process. An awareness of the cerebral, emotional and physiological centers culminating in performance experience. Prer., Dnce. 290, 390, or consent of instructor.

Dnce. 491/591-3. History and Philosophy of Dance. The history and philosophy of dance from primitive times to 1900.


Dnce. 493/593-2. Performance Events. A theoretical study and practical exploration of contemporary modes of performance ranging from the traditional dance concert and lecture demonstration format to the more experimental forms such as happenings, rituals, activities, body works, theatre pieces, environmental and mixed media events. Prer., upper classmen only.

Dnce. 494-3. 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. Prer., admission through auditions.

Dnce. 499-1 to 3. Dance Practice.

Dnce. 599-2. Problems in Dance.


Dnce. 599-3. Dance Repertory. Same as Dnce. 494 except graduate students will be required to keep a log of learning process involved in repertory to document and analyze each work in terms of stylistic differences, musical/sound accompaniment, and subject matter.

Dnce. 599-2. Intermediate Dance Notation. Prer., Dnce. 497 or consent of instructor. Not offered each year. Check current Schedule of Courses.

Dnce. 598-1 to 3. Studio Concert. Prer., consent of instructor.


Dnce. 615-3. Seminar: Dance. Intensive study of selected topics related to the art of dance, dance criticism, research in dance and dance in relationship to the other arts (performing and visual) with an emphasis on the avant-garde.


Dnces 700-4. Master’s Thesis.
Dnces 900-1 to 3. Independent Study. Prereq., written consent of instructor.
Dnces 940-1 to 3. Independent Study. Prereq., written consent of instructor.
Dnces 950-1 to 3. Independent Study. Prereq., written consent of instructor.
Dnces 960-1 to 3. Independent Study. Prereq., written consent of instructor.

Nonmajor Dance Courses

Not offered every year. Check current Schedule of Courses.

Dnces 103-1, 104-1. Beginning Ballet.
Dnces 131-1, 132-1, 133-1, 134-1. Jazz Dance.
Dnces 141-1, 142-1. Beginning Modern Dance.
Dnces 143-2, 144-2. Intermediate Modern Dance.

Wm.St. 200-3. Women Studies. An introduction to women studies. The variety of women's roles and statuses is examined from an interdisciplinary and cross-cultural perspective with the goal of generating and evaluating various theoretical explanations for the differential access to power of women and men. Includes consideration of psychology and physiology, sex roles and socialization, marriage and the family, work and economics, and history and social change.

Wm.St. 201-3. Contemporary Issues. Examines current social, political, and economic issues related to women. Includes consideration of women of all social classes and ethnic backgrounds, primarily in the United States. Possible topics include violence against women, women in the labor force, reproductive freedom, women in poverty, sexuality, and women's movement.

Wm.St. 300-3. Women Studies Practicum. Students work on special projects in the community agencies serving women. Work in the agencies together with class discussions, lectures, and readings, provides an opportunity to integrate women studies theory with the practical experience of working with community women.

Wm.St. 400-3. Senior Seminar: Special Topics. Advanced interdisciplinary course, organized around a specific topic, problem, or issue relating to women in culture and society (such as women and public policy, women's role in world development, women and work). Course work includes discussions, reading, and written projects.

Wm.St. 402-3. Senior Research Seminar. Students work in groups on research projects related to women (such as oral history of women in management). Projects are designed to introduce students to basic research techniques, to develop research skills, and to contribute to knowledge of contemporary and historical women.

Wm.St. 940-Variable credit. Independent Study. Provides students with an opportunity to do interdisciplinary independent work in the area of women studies. For more information, contact the Women Studies office.

College of Business and Administration and Graduate School of Business Administration

Courses open to both undergraduate and graduate students are designated by slashes (e.g., Acct. 424/524).

ACCOUNTING


Acct. 442/542-3. Advanced Income Tax Accounting. Continuation of Acct. 441, with special emphasis on the income tax problems of partnerships, corporations, and estates and trusts. Consideration is also given to federal estate and gift taxes. Prereq., Acct. 441 or 541.


Acct. 462/562-3. Auditing. Generally accepted auditing standards and the philosophy supporting them; auditing techniques available to the independent public accountant. Pertinent publications of the AICPA reviewed. Prereq., Acct. 332.


Acct. 626-3. Seminar: Managerial Accounting. In-depth exploration of the broad professional field of managerial accounting, especially as it relates to organizational decision making, planning, and control. Development and current problems of the managerial accounting function are analyzed. Prereq., Acct. 332 or consent of instructor.


of accounting theory, with special emphasis on accepted research standards and procedures. Prer., Acc. 322 or 312; Acc. 330.
Acc. 635-637. Current Issues in Professional Accounting. In-depth analysis of current issues in the accounting profession, including ethics, development and validity of standards, and regulation. Prer., Acc. 628 or consent of instructor.
Acc. 542-543. Research Problems in Income Tax Accounting. A study of the methodologies used in tax research and in tax planning, focusing on the study of income tax aspects of tax administration and tax practice, and of some aspects of the current law and proposals for its revision. Prer., Acc. 441 or 551 or consent of instructor.
Acc. 852-853. Controllability. Functions of the modern corporate controller. Topics and problems demonstrating the integrative nature of the controller's role are investigated. Prer., Acc. 322, 332, and 454 or 554 or equivalent. Nonmajors on an instructor consent basis.
Acc. 882-883. Advanced Auditing Theory. Development of auditing as a profession, including evolution of standards and audit reports. Historical and contemporary literature in the field reviewed. Prer., Acc. 462 or 862.
Acc. 960-962. Independent Study. With the consent of instructor under whose direction the study is undertaken.
Acc. 760-762. Master's Thesis. Open only to doctoral students. Prer., Acc. 636, 672, and 682 or equivalent.
Acc. 800-802. Doctor's Thesis.

BUSINESS ENVIRONMENT AND POLICY

B.Ad. 100-3. Introduction to Business. Nature of business enterprise; role of business in our society; problems confronting business management. Career opportunities in business. Business students are advised to take this course during freshman year. Open only to freshmen and sophomores.
B.Ad. 410-3. Business and Government. Study of government regulation of the business system. Topics include regulation of business concentration and of the markets for labor, money, other resources, and final products. Prer., Econ. 201 and 202. Completion of P.Sc. 110 is recommended before taking this course.
B.Ad. 440-3. International Business Seminar. Examines the international business environment as it affects company policy and procedures. Integrates all the functions undertaken in international operations through depth analysis and comprehensive case studies. Prer., any two of the following: Econ. 441, Fin. 440, Mk. 490, Tr.Mg. 458.
B.Ad. 450-3. Cases and Concepts in Business Policy. Emphasis is on integrating the economic, market, social/political, technological, and competition components of the external environment with the internal characteristics of the firm and serving through analysis the appropriate interaction between the firm and its environment to facilitate accomplishment of the firm's objectives. Priority for enrollment will be given to business seniors in their final semester prior to graduation. Prer., Fin. 306, Mk. 300, Pr.Mg. 300, Or.Mg. 330, and Q.M. 201.
B.Ad. 451-3. Management Game and Cases in Business Policy. Computerized management simulation is used as a means of giving the student practical, simulated experience in developing and analyzing business problems and building a framework for decision making, policy formulation, and plans of action. Priority for enrollment will be given to business seniors in their final semester prior to graduation. Prer., Fin. 306, Mk. 300, Pr.Mg. 300, Or.Mg. 330, and Q.M. 201.
B.Ad. 452-3. Small Business Strategy, Policy, and Entrepreneurship. Emphasis is on planning, organizing, and operating small business firms. The role of the entrepreneur is examined in the context of organization, and development of firms. Extensive use is made of small business cases. Priority for enrollment will be given to business seniors in their final semester prior to graduation. Prer., Fin. 305, Mk. 300, Pr.Mg. 300, Or.Mg. 330, and Q.M. 201.
B.Ad. 470-3. Small Business—Management and Operation. Analysis of managerial problems of the small businessman. Case studies, outside speakers, and individual reports on local small business enterprises supplement class discussions. Students must have an understanding of elementary accounting, finance, and business law, or have experience in small business operation. Prer., senior standing.
B.Ad. 490-3. Honors Seminar: Business I. Social responsibilities of the business executive, business ethics, business-government relations. Open to seniors only. Students must have completed at least 30 semester hours of business courses, have obtained not less than a 3.3 grade-point average over those hours, and have received consent of instructor. Does not carry graduate credit.
B.Ad. 495-Variable credit. Topics in Business. Experimental course offered irregularly for purpose of presenting new subject matter in a particular business field. Pre-requisites vary depending upon topic covered.
B.Ad. 930 to 949-Variable credit. Independent Study. With the prior consent of the dean and instructor under whose direction study is undertaken. Intended only for exceptionally well-qualified business seniors.

The following graduate fundamentals courses (B.Ad. 500 to 507) do not carry graduate business degree credit, nor may they be used to satisfy requirements for the bachelor's degree in business. They are open only to graduate students admitted on a regular or provisional status. Qualified nonbusiness senior undergraduates who intend to pursue graduate study in business and special students who will be applying for graduate admission during the term in which they are enrolled for the course may be admitted with the written approval of the Office of Graduate Studies.

B.Ad. 500-1. Sources of Information and Research Methods. The objective of this course is to provide the M.B.A. student with the basic research techniques needed to locate, use, and evaluate secondary resource materials. The approach will be to emphasize techniques rather than actual data.
B.Ad. 503-3. Fundamentals of Marketing. Provides basic understanding of marketing essentials for graduate study of business.
B.Ad. 504-3. Fundamentals of Management and Organization. Provides basic understanding of organization theory, personnel management, labor relations, and organizational behavior essentials for graduate study in business.
B.Ad. 506-3. Legal Environment of Business. Provides understanding of the private and public law essentials for graduate study in business.
B.Ad. 507-3. Fundamentals of Management Science. A survey of the analytical methods of management science operations research as applied to decision problems in business. A major objective of the course is to develop an understanding of the power and the limitations of mathematical-statistical models and to develop skills in problem formulation. Prer., B.Ad. 502 or equivalent.
B.Ad. 540-3. Seminar: International Business. Examines the international business environment as it affects company policy and procedures. Integrates all the functions undertaken in international
operations through in-depth analysis and comprehensive case studies. Prereq., any two of the following: Econ. 441, Fin. 440 or 540, Mk. 480 or 590, and Or. Mg. 455 or 555.

B.A. 570-3. Small Business — Management and Operation. Analysis of managerial problems of the small businessman. Case studies, outside speakers, and student reports on small business enterprises. Credit cannot be earned for both B.A. 570 and 590. Students must have an understanding of elementary accounting, finance, and business law, or have experience in small business operation. Prereq., graduate standing.

B.A. 595-variable credit. Topics in Business. Experimental course offered irregularly for purpose of presenting new subject matter in a particular business field. Prerequisites will vary, depending upon topics covered.

The following graduate courses are open only to admitted graduate students. Any other students enrolling in these courses must have the written approval of the Office of Graduate Studies. Students should have completed all of the fundamental requirements or be currently registered for them before enrolling in any of the 600-level graduate courses.


B.A. 615-3. Business and Economic Analysis. A presentation of the concepts, tools, and methods of economic analysis relevant to a broad cross-section of decisions within the business firm. Particular attention will be given to market demand and the interrelationships between price, policy, costs, and production. Prereq. B.A. 502 and Introduction to Microeconomics.


B.A. 650-3. Business Policy. Emphasizes problem analysis and decision making at integrative-management level. Devoted to internal policy-making and emphasis on integrated use of research, analysis, and control in policy decisions. This course must be taken in the candidate's final term of the program. B.A. 650-level fundamentals, by course completion or waiver, are firm prerequisites.

B.A. 660-3. Business Conditions. Analysis of the American economy; its development and present condition. The state of the economy and the underlying factors affecting the economy will be analyzed. Prereq. 9 semester hours of economics.


B.A. 685-variable credit. Graduate Seminar: Business. Experimental seminar offered irregularly to provide opportunity for investigation of new frontiers in business knowledge. Prerequisites will vary, depending upon the topic to be covered.

B.A. 960-variable credit. Independent Study. With the consent of instructor under whose direction study is undertaken.


B.A. 760-3. Doctoral Seminar: Dissertation Research. A seminar designed to assist the doctoral student in integrating his coursework and fields of study in order to be able to apply knowledge and skills to problems in business. Special attention will be given to the development of thesis topics.

B.A. 800-16 to 24. Doctor's Thesis.

BUSINESS EDUCATION

Courses numbered 500 and above generally are offered only during summer sessions.

B.Ed. 500-3. Improvement of Instruction in Business Education. This course is intended to update experienced teachers from both high schools and colleges in current materials and methods in the skills as well as general areas of business.

B.Ed. 630-2. Foundations of Business Education. Philosophy and objectives of business education; problems of curriculum and curriculum evaluation; contribution of business education to general education; business and economic history and trends.

B.Ed. 651-2. Problems in Business Education. General problems of current importance to the business teacher in high school or college.

B.Ed. 661-2. Seminar: Business Education. Basic business understanding necessary in an economic society; how this may be included in the high school curriculum in business education: Resource materials.

B.Ed. 900-variable credit. Independent Study. With the consent of instructor under whose direction the study is undertaken.

BUSINESS LAW


FINANCE

Fin. 305-3. Basic Finance. Includes a study of the monetary system and the various institutions comprising the money and capital markets. Also includes a study of the financial manager's role in business. The investment of capital in assets and financing the asset requirements of business firms. Prereq. Econ. 201 and 202. Or. Acor. 200.

Fin. 321-3. Personal Finance. Problems of personal financial management: use of credit, personal budgets, insurance, annuities, investments in securities, buying a home, creating an estate, providing for old age, and making a will. Intended for nonbusiness students. No credit given toward business degree requirements.

Fin. 333-3. Investments. Study of the basic problems concerning development and implementation of a personal investment program. Includes analysis of investment risks, alternative investment media, designing and executing an investment program. No credit given toward business degree for finance majors. Prereq. Fin. 305. Students may not receive credit for both Fin. 333 and 433.

Fin. 355-3. Financial Markets. Discusses major operating characteristics and problems of money and capital markets, both national and international. Emphasizes the sources and availability of money and capital for financing business and the market structure for the employment of savings. No credit given toward business degree for finance majors. Students may not receive credit for both Fin. 355 and 450. Prereq., Fin. 305.

given primary emphasis. Prereq. Fin 305, Acct 202 (formerly Acct 214).

Fin 402-3. Business Finance II. Develops analytical and decision-making skills of students, in relation to problems that confront financial management. Areas include planning, control, and financing of current operations and long-term capital commitments; management of income; evaluation of income-producing property; and expansion. Case method of instruction. Prereq. Fin 401.

Fin 413-3. Investment and Portfolio Management. Discusses investment problems and policies and the methodology for implementing them. Includes portfolio analysis, selection of investment media, and measurement of performance. Prereq. Fin 401 and 455; coreq. Fin 402. Students may not receive credit for both Fin 333 and 413.


Fin 453-3/459-3. Bank Management. An analysis of structure, markets, regulation, and chartering commercial banks. Problems and policies of the internal management of funds, loan practices and procedures, investment behavior, deposit and capital adequacy, liquidity, and solvency. Analytical methodology for these problems is developed. Prereq., Fin. 401 or 601.

Fin 455-3. Monetary and Fiscal Policy. Analyzes the theoretical and practical problems concerning the use of monetary and fiscal devices for controlling national and international economic relationships. Emphasizes the major theories and analytical models for current monetary and fiscal policies. Prereq., Fin. 305. Students may not receive credit for both Fin. 355 and 455.


Fin 633-3. Investment Management and Analysis. The theory of investment management and security values; portfolio management including the analysis of investment risks and constraints on investment policies and objectives; the analysis and use of investment information; and the development and application of the tools for determining values. Prereq. Fin. 601; coreq. Fin. 602.

Fin 655-3. Business Fluctuations and Monetary Policy. Theoretical and empirical study of forces governing business fluctuations in the U.S. and the effectiveness of monetary and fiscal policies. Develops the analytical tools essential for understanding business cycles and the various policy alternatives to maintain stable economic goals and objectives. Prereq., B. Ad. 305.

Fin 960-variable credit. Independent Study. With the consent of instructor under whose direction the study is undertaken.


Fin 733-3. Doctoral Seminar: Investments. Advanced study and research in contemporary investment problems, including security markets. Prereq., Fin. 633 or equivalent.


Fin 800-16 to 24. Doctor's Thesis.

INFORMATION SYSTEMS


I.S. 465/565-3. Systems Analysis and Design. Basic system analysis tools: defining logical system requirements; steps in analysis; preliminary investigation, general feasibility study, general system proposal; detailed analysis, and specification of output methods and form; physical design (of files, programs, and procedures); system life cycle management. Prereq., I.S. 215 or I.S. 465 or consent of instructor.

I.S. 470/570-3. Computerware. Contrast systems for data processing applications; equipment selection and systems configuration with emphasis on economic consideration in an uncertain economic and technological environment. Prereq., I.S. 350, 465/565, or consent of instructor.

I.S. 645-3. Information Systems and Management. Information processing, the analysis and design of information systems, management query systems, and data base design and management.


I.S. 890-3. Selected Topics in Information Science. This course will vary from semester to semester, treating topics such as advanced concepts and research in information sciences, digital simulation and simulation languages, and other topics. May be repeated when topic changes. Prereq., specified each semester.

INSURANCE

Ins. 484/584-3. Principles of Insurance. Fundamental principles of insurance and their application in life, disability, property, and liability insurance. Provides the basic knowledge for intelligent solution of personal and business insurance problems as well as for further specialized study of insurance. Prereq., Ins. 305 or B. Ad. 305.


MANAGEMENT SCIENCE


Mg.Sc. 685-3. Selected Topics in Decision Science. This course will vary from semester to semester, treating topics such as algorithmic developments in mathematical programming, decision analysis, stochastic processes, and other topics. May be repeated if topic changes. Prereq., to be specified each semester.

Mg.Sc. 860-3. Independent Study. With the consent of instructor under whose direction the study is undertaken.
MARKETING

Mk. 300 or B.Ad. 503 or an equivalent course in marketing is a prerequisite for all other marketing courses except Mk. 310.

Mk. 300-5. Principles of Marketing. Analytical survey of problems encountered in distributing goods and services. Takes a marketing-management approach in attacking problems related to product planning, channels of distribution, pricing, advertising, and selling. Emphasizes role of consumer and the social responsibility of marketer.

Mk. 310-3. Salesmanship. Principles and methods of personal salesmanship with attention to development and demonstration of effective sales presentation techniques.


Mk. 350-3. Principles of Advertising. Analysis of principles and practices in advertising from executive's viewpoint. Considers whether a firm should advertise; product and market analysis as planning phase of advertising program; media; survey of creation and production of advertisements; advertising budgets, copy testing, and organization. Prer., Mk. 300.

Mk. 360-3. Research Design and Experimental Methods in Marketing. Advanced course in marketing research. Stresses design of marketing research projects and application of statistical techniques. Collection, analysis, and interpretation of marketing information. Techniques of experimental design and application as basis for decision-making in marketing. Design and management of a planned research project within the framework of an individual firm. Qualitative market analysis, social, ethical, and economic evaluation of the role of promotional activities in American economy. Prer., Mk. 350.

Mk. 370-3. Industrial Marketing. Activities involved in marketing of industrial goods. Analysis of market structures; habits and motives of purchasers; types of industrial products; pricing problems; distribution channels. Problems in selling to agencies of government. Oriented to engineers and others entering the fields of industrial selling or marketing. Prer., Mk. 300.

Mk. 400-5. Sales Management. Problems involved in managing a sales force. Includes sales organization, operating a sales force (recruiting, selection, training, compensation, supervision, stimulation), sales planning (forecasting, budgeting, territories), sales analysis and control. Prer., Mk. 300 or B.Ad. 503.


Mk. 450-3. Marketing Policies and Strategies. Detailed consideration of process of formulating and implementing marketing policies. Major emphasis on markets, distribution channels, and product analysis. Problem approach utilized to develop student's analytical ability and to integrate all major areas of marketing. Prer., Mk. 300, and 6 additional hours in marketing.

Mk. 480-3. Physical Distribution Management. Investigation and analysis of logistics of distribution systems for firms engaged in manufacturing and marketing. Component parts of each system are studied and analytical tools are presented for selecting alternatives which will attain distribution goals of the firm. Prer., Mk. 300.

Mk. 490-590-3. International Marketing. Studies managerial marketing policies and practices of firms marketing their products and services in foreign countries. An analytical survey of institutions, functions, policies, and practices in international marketing. Relates marketing activities to the market structure and marketing environment in the firm. Prer., Mk. 300.

Mk. 600-3. Marketing Management. An in-depth inquiry into marketing decision making. Emphasis is placed on strategic planning and analytical procedures for marketing decisions. The course integrates all areas of marketing management and relates marketing activities to the other functional areas of the firm. Prer., Mk. 300 or B.Ad. 503.

Mk. 605-3. M.B.A. Seminar: Marketing. Comprehensive survey of current problems and issues in marketing from the perspective of firm. Analysis of firm's process of adjustment to market changes. (Required of all M.B.A. students with an area of emphasis in marketing.) Prer., Mk. 600.


Mk. 630-3. Qualitative Methods in Marketing. Fundamental techniques and applications of qualitative market analysis. Includes study of market and sales potentials; sales forecasts; analysis of sales volume, distribution costs; and application of operations research, linear programming, and other techniques to the solution of certain marketing problems. Prer., Mk. 300 or B.Ad. 503 and Q.M. 201 or B.Ad. 502.

Mk. 640-3. Seminar: Channel Policy and Structure. Analytical study and evaluation of structure and evolution of marketing channels. Relationship of channel to business policies is stressed. Cost and effectiveness of alternative distribution policies and practices are considered, and the relationship of channel policy to physical distribution is studied. Prer., 6 semester hours of marketing courses.


Mk. 660-3. Marketing Field Problem. Participants functioning as a research group are presented with opportunity of analyzing and making recommendations regarding a practical marketing problem presented by a cooperating business firm. Special emphasis placed upon developing effective methodology for problem-solving processes in marketing. Prer., Mk. 600.

Mk. 960. Variable credit. Independent Study. With the consent of instructor under whose direction the study is undertaken. Mk. 700-4 to 6. Master's Thesis.

Mk. 700-3. Doctoral Seminar: Marketing Management. Consideration of current problems and issues in marketing from the perspective of the individual firm. Analysis of the adjustment process of the firm in meeting changes in the market and marketing environment. New developments in techniques and procedures analyzed and evaluated. Prer., Mk. 600.

Mk. 720-3. Doctoral Seminar: Marketing Theory. Investigation of development and current state of theoretical and conceptual aspects of marketing principles, institutions, and processes. Course develops an understanding of functioning, measurement, and efficiency of total distribution process. Frontiers of marketing thought will be analyzed and evaluated. Prer., Mk. 710.

Mk. 300-16 to 24. Doctor's Thesis.

Course Descriptions / 299
MINERALS LAND MANAGEMENT

M.L.Mg. 485-3. Minerals Landman Administration. A thorough examination of the range of administrative duties performed by the minerals landman. Leasing, property rights, easements, participating interests, taxation, and pay-out schedules are included. Emphasis is on the interpretation of titles and private agreements. Typically includes federal, state, and local private lands; and the rights and duties of owners and developers. Prereq: completion of 90 semester hours of work toward the major, including all lower division requirements.

M.L.Mg. 485-3. Oil-Gas and Mineral Law. A review and examination of the legal relationships associated with mineral rights and properties. Topics include oil and gas; regulations governing federal, state, and private lands; and the rights and duties of owners and developers. Prereq: completion of 90 semester hours of work toward the major, including all lower division requirements.

OFFICE ADMINISTRATION


ORGANIZATION MANAGEMENT

Or Mg. 330-3. Introduction to Management and Organization. An introductory study of management fundamentals and organizational behavior. How individuals adapt to organizations; how managers motivate and lead in work situations; how organizations are designed and managed. Students are urged to complete Psych. 100 and Soc. 211 before taking this course.

Or Mg. 335-3. Managing Individuals and Work Groups. Examines leadership and supervision in small work groups in organizations. Focuses on groups in which individuals act as they do in interpersonal relations and in small groups. Develops interpersonal and small group skills.

Or Mg. 437-3. Managing Complex Organizations. From the perspective of a general manager, the course explores organizational design and management processes for effective organizational performance.

Or Mg. 438-3. Individual Behavior in Work Organizations. Explores the impact of key management and behavioral science theories, concepts, and practices on individual productivity, satisfaction, growth, and development. Prereq: B. Ad. 640 or equivalent.

Or Mg. 632-3. Managing Behavior in Task Groups. A study of interpersonal competence in organizations. Topics include group formation and development, leadership, power, conflict, conformity, cohesiveness and group dynamics. Prereq: B. Ad. 640 or equivalent.


Or Mg. 699-variable credit. Independent Study. With the consent of instructor under whose direction the study is undertaken.

Or Mg. 700-4 to 6. Master's Thesis.

PERSONNEL HUMAN RESOURCES

PhR 434/534-3. Labor and Employee Relations. Analysis of legal, political, social, and managerial aspects of collective bargaining and employee relations. Prereq: Or Mg. 330 or B. Ad. 504.

PhR 438/538-3. Personnel Administration: Employment. Study of the development and implementation of personnel systems; with emphasis on job analysis, selection, and performance appraisal. Prereq: Q.M. 201 and Or Mg. 330 or B. Ad. 504.

PhR 439/539-3. Personnel Administration: Legal and Social Issues. Study of legal issues related to equal employment opportunity, affirmative action, occupational safety and health, and compensation, with emphasis on program implementation and evaluation. Reviews legal questions, guidelines and procedures, and regulatory agencies. It is recommended that students take PhR 434 and 438 before this course. Prereq: Or Mg. 330 or B. Ad. 504.


PhR 534-3. Seminar: Labor and Employee Relations. Issues in all areas of industrial, labor, and employee relations. Emphasis on research findings in industrial, labor, and employee relations through applied problems. NLRB and court decisions, arbitration cases, and conflict management models. Prereq: PhR 534 or B. Ad. 640.

PhR 538-3. Seminar: Personnel Administration. Issues in all areas of personnel administration. Emphasis on research findings on human resources applications through applied models, survey methods, and other applied behavioral concepts. Prereq: PhR 538 or B. Ad. 640.

PRODUCTION AND OPERATIONS MANAGEMENT

Pr Mg. 300-3. Production and Operations Management. An introduction to the design and analysis of production systems in manufacturing, service, and public organizations. Topics include demand forecasting, capacity planning and master scheduling, inventory management, material requirements planning, and shop floor controls. Organizations studied include manufacturing, service (including urban services), and government. It is recommended that graduate students take Pr Mg. 540 in lieu of this course. Prereq: Pr Mg. 300 or B. Ad. 502 and 507.

Pr Mg. 444/544-3. Work Design, Measurement, and Productivity Management. Study of the design of jobs in manufacturing, service, and public organizations. Topics include job specialization versus job enlargement, work measurement and planning, determining job standards, job health and safety, the impact of automation on job design, and productivity measurement and management systems. Prereq: Pr Mg. 300 and Or Mg. 330 or B. Ad. 504.

Pr Mg. 447/547-3. Policy Analysis in Production and Operations Management. Study of production and operations management formulation and analysis. Emphasis is on developing decision-making skills through the use of case analysis, field study, consulting with local organizations, and other experiential activities. It is recommended that graduate students take Pr Mg. 647 in lieu of this course.

Pr Mg. 460/560-3. Purchasing and Materials Management. Study of the purchasing function in manufacturing, service, and public organizations. Topics include source selection, make-buy analysis, inventory control, warehousing, material quality standards and specifications, transportation alternatives, bid systems, and legal aspects.

Pr Mg. 640-3. Logistics, Production, and Inventory Management. Study of the total flow of resources and through the production process to the ultimate consumer. Topics include integrated production, inventory, and logistics systems in manufacturing, service, and public organizations; demand forecasting; capacity planning; inventory management; material requirements planning (MRP); facility scheduling and control; and physical distribution management. Prereq: B. Ad. 502 and B. Ad. 507 or equivalent.

Pr Mg. 647-3. Policy Analysis in Production and Operating Systems. Advanced study of policy formulation and analysis in manufacturing, service, and public organizations. Emphasis is placed on developing decision-making skills through the use of case study, field study, consulting with local organizations, and production/operations-oriented simulation exercises. Prereq: B. Ad. 602 and B. Ad. 507, or equivalent.

Pr Mg. 960-variable credit. Independent Study. With the consent of instructor under whose direction the study is undertaken.
PUBLIC AGENCY ADMINISTRATION

The program will encompass the subject areas of budgeting, personnel management, administration, and quantitative methods. For additional information refer to public agency administration area of emphasis.

QUANTITATIVE METHODS


Q.M. 620-3. Multivariate Analysis. Topics in multivariate data analysis of particular interest to those engaged in business research. Includes techniques such as multivariate discriminate analysis, factor analysis, and multiple regression, and the use of standard multivariate statistical packages such as the SPSS package. Prer., B.Ad. 502.

REAL ESTATE

All courses numbered 400 and above may be limited to real estate majors.


R.Es. 401/501-3. Property Development. The nature of urban real estate and the market forces affecting its utilization. Prer., R.Es. 300.

R.Es. 430/530-3. Residential and Income Property Appraising. (Formerly Real Estate Appraising). Principles and techniques of estimating the value of land, residences, and income property are studied. Principles and techniques are applied by a field problem in appraising. Prer., R.Es. 300.

R.Es. 433/533-3. Real Estate Investments. Emphasizes problems and methodology for making the real estate investment decision. Includes real estate versus other investments; real estate user and investor requirements; decision models; tax factors and syndication. Prer., R.Es. 300 and Fin. 305 for undergraduates; R.Es. 300 or equivalent and Fin. 305 or equivalent for graduate students.

R.Es. 454/554-3. Real Estate Finance. Functions and practices of various real estate financing institutions. Embraces mortgage lending, servicing, and mortgage banking relative to all types and uses of real estate. Prer., R.Es. 300, Fin. 305 or B.Ad. 505.

R.Es. 473/573-3. Legal Aspects of Real Estate Transactions. Business and legal aspects. Estates in land, purchase and sales contracts, conveyances, mortgage and trust deed transactions, property taxes, landlord and tenant, wills and inheritance. Prer., B.Law. 300 and R.Es. 300; or B.Ad. 506 and R.Es. 300.

SMALL BUSINESS MANAGEMENT AND ENTREPRENEURSHIP

B.Ad. 470/570-3. Small Business—Management and Operation. Analysis of managerial problems of the small businessman. Case studies, outside speakers, and individual reports on local small business enterprises supplement class discussions. Student must have an understanding of elementary accounting, finance, and business law, or have experience in small business operation. Prer., senior standing; for 570, graduate standing.


B.Ad. 960-variable credit. Independent Study. With the consent of instructor under whose direction the study is undertaken.

TRANSPORTATION AND TRAFFIC MANAGEMENT


Tr.Mg. 458/556-3. Air Transportation. Particular reference to operating costs and methods, passenger and cargo rates, air routes, schedules, safety, regulation, and airport management. Prer., senior standing or graduate standing.


Tr.Mg. 458/559-3. International Transportation. Analysis of international transportation (primarily sea and air) in the world economy. Detailed study of cargo documentation and freight rate patterns. Included are liability patterns, logistics, economics, and national policies of transportation.

Tr.Mg. 650-3. Seminar: Domestic and Urban Transportation: Policy and Practice. The ways in which transportation and transit systems initiate, develop, and support 20th century urbanized society. Particular emphasis is given to the ways in which transport and transit systems have fostered urbanization and the role of transport and transit systems in the further development of modern society. Prer., graduate standing in College of Business or Engineering, or economics or public administration major.

Tr.Mg. 960-variable credit. Independent Study. With consent of instructor under whose direction the study is undertaken.

School of Education

UNDERGRADUATE TEACHER EDUCATION

T.Ed. 200-3. Writing for Your Profession. This course is designed to help individuals in business and the professions improve their writing. Special attention is given to report writing and correspondence.


T.Ed. 308-2. Foundations of American Education: Elementary. A study of American education in its cultural setting; its nature, role and function in society, including political, historical, philosophical, sociological, economic, religious, multicultural, and other foundation aspects. Concurrent lab, experience in educational media.
T.Ed. 310-2. Educational Psychology for Elementary School. Psychological bases of teaching and learning with applications at the elementary school level. Concurrent lab experience in schools.


T.Ed. 320-1 to 3. Expressive Arts in the Elementary School. An exploration of the expressive arts for the consumer and the place of art, music, health, and physical education in the elementary school classroom.


T.Ed. 403-3. Methods and Materials in Bilingual Education. A survey of the current methods and materials being used in bilingual programs.

T.Ed. 410-3. Foundations of American Education. A study of American education in its cultural setting and its nature, role, and function in society, including political, historical, philosophical, sociological, economic, religious, multicultural, and other foundation aspects. Includes school-based tutorial experience.


T.Ed. 412-3. Principles and Methods of Secondary Education. Emphasis on objectives, functions, modern philosophy, curriculum, discipline, planning, learning styles, educational media, etc. For junior and senior high school levels. Concurrent experience in schools required. Admission to Teacher Education required.


T.Ed. 422-2. Methods in Elementary Reading. Understanding and acquisition of basic methods in the teaching of reading at the elementary school level. Content includes the understanding and teaching procedures in basic reading programs, language experience, and individualized reading instructions. Required of all students in elementary program. Prer., for student teaching.


T.Ed. 424-2. Methods in Elementary Social Studies. Familiarization with the elementary social studies curriculum as it pertains to elementary public schools. Emphasis on organization (lesson plans and units), new trends, textbooks, new programs and materials, concepts in teaching the social sciences. Required of all students in elementary program. Prer., for student teaching.

T.Ed. 425-2. Children's Literature. Reading and evaluation of books for children; children's interest in reading; important authors and illustrators; poetry, folk literature, and trends. Required of all students in elementary program. Prer., for student teaching.


T.Ed. 441-3. Teaching Reading and Writing in the Content Areas. Presents diagnostic, remedial, and developmental techniques in reading and composition especially adapted to use in subject matter areas. Primarily for students preparing to teach in the secondary schools.

T.Ed. 442-3. Developing Reading Skills in the Junior and Senior High School. Format variations from content area to content area, materials, equipment, readiness of content materials, vocabulary, variations in comprehension, and variations in study procedures.


T.Ed. 446-2 to 3. Teaching Exceptional Children in the Regular Classroom. Develops knowledge about exceptional children and the ways they are served in the public schools; appropriate attitudes toward human variability and individual differences; and appropriate instructional methods and strategies necessary for meeting the special needs of children with visual, auditory, and physical impairments; mental retardation; learning disabilities; emotional disturbance; and giftedness.

T.Ed. 447-2. Teachers, Materials, and Learning. Provides elementary and preschool teachers and aides with an opportunity to become involved with a range of concrete materials in science, environmental studies, language arts, and music, and to consider the implications of their own learning for their work in schools.


T.Ed. 460-4. Instructional Assistant Laboratory—Elementary. A variety of experiences and assignments in the public schools.

T.Ed. 470-4 or 8. Student Teaching—Elementary School. Kindergarten and grades one through six.

T.Ed. 471-4 or 8. Student Teaching—Secondary School. Student teacher attends a senior or junior high school in Boulder-Denver metropolitan area.

T.Ed. 472-4. Elective Assignment, Secondary. This is the final experience in the secondary professional year. It involves a wide number of possibilities for the students, and arrangements are made on an individual student basis. Prer., admission to secondary professional year.

T.Ed. 482-1 to 4. Workshop in Curricular and Instructional Development. Consideration given to current trends in curriculum development and in organization for instruction. Depth study of one or more specific plans for classroom procedure.

T.Ed. 483-1 to 4. Instructional Workshop. Current instructional approaches are considered. Focus is upon classroom applications with in-depth study of selected topics. Advanced-level work but credited toward graduate degrees only as a minor.

T.Ed. 490-1 to 8. Independent Study.

EDUCATION

Educ. 500-3. Social Foundations of Education. An evaluation of the social values and forces in American society that shape or influence the aims, philosophies, methods, content, issues, and problems of the American educational enterprise.

Educ. 501-3. Psychological Foundations of Education. A survey of the results of psychological inquiry with emphasis on applications to educational practices. Major topics include motivation, behavior, learning, development, and individual differences.


Educ. 503-3. Basic Statistical Methods. Introduction to descriptive statistics including graphic presentation of data, measures of central tendency and variability; correlation and prediction; and basic inferential statistics, including the t-test and one-factor analysis of variance.

Educ. 504-3. Introduction to Disciplined Inquiry. Consideration of various research approaches and methodologies including experimental and quasi-experimental methods, anthropological and case study methods, evaluative research and field studies, correlational and ex post facto research, and sociological, historical, and philosophical research. Topics will include information retrieval and library
research, the role of the computer, research criticism, and proposal writing.

Educ. 505-3. Contemporary Teaching Tactics. Research, preparation, and practical application of teacher tactics used in classes at all levels of instruction (elementary, secondary, and college). Students select, prepare, and present strategies such as valuing, interaction analysis, inquiry, simulations, role playing, questioning techniques, etc., as agreed upon by the class.


Educ. 507-3. Elementary School Curriculum. An integrating course dealing with the history, development, problems, and practices of the curriculum of the elementary school.


Educ. 510-3. Curriculum Materials Analysis. Strategies for critical analyses of social studies curriculum materials will be the focus of this course. Students will learn a variety of analysis systems and will engage in practical applications of these systems.


Educ. 513-3. The Student in Higher Education. Consideration of research and theory pertaining to the college student as a learner and the effects of environmental differences on changing behavior of the student.

Educ. 514-3. 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. 517-2 or 3. Current Literature for Children. Current books and media material in children’s literature. This course is for people who have not had a course in this area within the past five years. Prereq., course in children’s literature or consent of instructor.


Educ. 519-3. Elementary Mathematics Curriculum. An in-depth study of curriculum building in mathematics at the elementary school level (K-9). Particular attention will be given to selection of instructional materials, establishment of content, and evaluation of programs.


Educ. 521-3. Advanced Science in Elementary Schools. Emphasis on experimental programs and implementation of these newer programs. Supervision and curriculum development considered.

Educ. 522-3. Advanced Language Arts in Elementary School. Current thought, as determined by research findings, in the various areas of the language arts; oral and written communication, spelling, handwriting, usage, grammar, foreign languages, and bilingual education.

Educ. 523-3. Teaching Reading in Content Areas at the Secondary Level. Format varied, from content area to content area, materials, equipment, readability of content materials, vocabulary, variations in comprehension, and variations in study procedures.

Educ. 524-3. Processes Involved in Reading. Concepts needed for understanding and critically evaluating the competencies involved in learning how to read. Examining and dealing with child and adolescent development and linguistic orientation.

Educ. 525-3. Improvement of Reading Instruction in the Elementary and Middle School. Comparative analysis of current and emerging philosophies, programs, and instructional practices for teaching reading in the elementary and middle school. Examination and evaluation of basal textbook, individualized, programmed, and hard-bound reading programs.

Educ. 526-3. Developing Reading Skills in the Junior and Senior High School. Teaching techniques to improve reading skills and efficiency among junior and senior high school students.

Educ. 527-3. Diagnostic and Remedial Techniques of Reading. Causes of low reading ability and techniques employed in teaching the poor reader; diagnosis, motivation, and skills.

Educ. 528-1 or 2. Reading Conference. Visiting authorities in reading, lectures, demonstrations, discussion groups, films, exhibits, field trips, etc.

Educ. 529-3. Teachers, Materials, and Learning. Provides experience in educational and preschool teachers with an opportunity to become involved, at an advanced adult level, with a range of concrete materials in sciences, arts, and social studies, and to discuss the implications of their own learning for their work in schools.


Educ. 531-3. Pro-Seminar in Reading, English, and Language Arts, K-12. With a different focus each semester, this course may be taken more than once by M.A. students who wish to study various aspects of reading, children’s literature, adolescent literature, language skills, and oral and written composition.


Educ. 533-3. Pro-Seminar in Teaching Written Composition. This advanced-level course provides opportunities for inquiry into processes of written composition. Special topics: rhetoric, style, language, evaluation, and assessment, invention, grouping techniques, editing techniques, and individual teaching/learning analysis.


Educ. 535-3. Advanced Methods in Social Studies Education. Designed to meet the needs of experienced teachers and of those who will teach in public schools. Recent developments in theory and materials in the social studies examined and present practices analyzed for their contribution to general goals of social studies education. Appropriate for teachers in grades 7-12, but also profitable for elementary teachers with a specialization in social studies.


Educ. 537-3. Advanced Methods and Strategies in Secondary Mathematics. In-depth investigation of specific methods and strategies suitable for teaching mathematics from the middle school through senior high school levels. Participants actively involved in the process of instruction by utilizing methods and strategies being considered.


Educ. 539-3. Simulation Games for Education. Alternate years. An introduction to the use of simulation games as they pertain to social studies instruction in the public schools. Introduction to available simulations and attention to various types of game design. Students required to attempt game design for particular social studies courses.
Educ. 540-3. Special Topics. Designed to meet needs of graduate students with topics of pertinent interest.

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Educ. 543-3. Skill Development in Experiential Education. A field-based course designed to upgrade the outdoor skills and the ability to use alternative living environments for the outdoor educator, the traditional classroom teacher, and the alternative educator. Colorado's mountains, rivers, and urban environment are utilized in the class.

Educ. 544-3. Theory and Practice of Experiential Education. An introduction to the theoretical underpinnings in philosophy, psychology, and the natural and social sciences of the experiential and alternative education movements. Practical applications in schools and public and private agencies are observed and analyzed.

Educ. 545-3. Bilingual and Multicultural Education. Includes various components of bilingual education curricula methodology. It includes various bilingual education models for non-English speaking children as well as provision for the development of fluency in bilingualism among all children.


Educ. 547-3. Preschool Through College Curriculum for Bilingual/Multicultural Education. An analysis of curriculum and the application of principles and innovation for the education of ethnic-racial students at all levels of school.

Educ. 548-3. The Teaching of Reading in Bilingual and Multicultural Education. Comparative analysis of current and emerging philosophies, processes, materials, and instructional practices for the teaching of reading in the bilingual classroom.

Educ. 549-3. Research and Evaluation in Social and Multicultural Foundations. A course designed to meet the research needs of practicing educators, with an emphasis on statistical and naturalistic observational techniques, and designing and constructing evaluation instruments. It is specifically geared to the needs of those working in such nontraditional settings as the bilingual classroom, alternative school, outdoor educational environment, in addition to the needs of the traditional classroom teacher.

Educ. 551-3. Foundations of Personnel Services. An introduction to the field of guidance and personnel services. Topics include objectives of guidance and counseling, theoretical bases of counseling, roles and functions of counselors, measurement techniques, and ethics.

Educ. 552-3. Laboratory in Personnel Appraisal. Taken in conjunction with Educ. 551, this course provides the student with experience designed to stimulate self-appraisal of personal field of guidance. Focused field experiences will be employed in addition to group interaction.


Educ. 554-3. Advanced Theory and Techniques of Counseling. The application of counseling techniques in specific circumstances including group counseling and classroom situations. Emphasis on application approaches such as transactional analysis, Gestalt techniques, and others. Twenty hours of participation in intensive group experience required in addition to classroom instruction. Prereq. Educ. 551, 552, and 553.

Educ. 555-3. Professional Seminar: Guidance. Provides in-depth attention to a limited number of special interest topics to be determined by the interests of the students and instructor. Prereq. completion of Educ. 551, 552, and 553, and either concurrent or concurrent enrollment in Educ. 551 and instructor consent.

Educ. 556-3. Counseling Strategies in Agency Settings. Explores the role and function of the counselor in agency settings with emphasis on the underlying historical and theoretical concepts.


Educ. 558-3. Introduction to Educational Technology. First course in program. Its purpose is to give students knowledge, skills, and motivation to integrate people, materials, equipment, and facilities into the school curriculum.

Educ. 559-3. Production of Educational Materials. Design and production of instructional materials for use by school library media specialists and teachers in educational situations. Projected and nonprojected materials are produced, including graphics, photography, tape recordings, and overhead transparencies.

Educ. 560-3. Photography in Education. A course utilizing the photographic tools of visual literacy in organized instruction and communication. Included are elements of message design, photographic skills, visual message implementation, and evaluation. Photographic systems employed are primarily 35mm still photography and super 8mm motion pictures.

Educ. 561-3. Television in Education. Examines the application of telecommunication programs and goals in education. Stresses ways and means by which television can become a significant part of the educational process at all levels. Provides students an opportunity to produce and evaluate instructional TV programs.

Educ. 562-3. Administration of Education Technology Programs. Administrative problems related to all the common educational media programs are studied. Primary emphasis is placed on the organization and administration of educational media services that support and extend opportunities for teaching and learning in the public schools.

Educ. 563-3. Research in Educational Technology. Analysis, evaluation, and interpretation of published library media research with examples of studies using the analytical, historical, descriptive, or experimental methods and the application of appropriate research methodology to a problem in the library media field.

Educ. 564-3. Computers in Education. Designed to provide educators, preservice and in-service with literacy in modern educational computing technology. Content will focus upon instructional and administrative computing applications with hands-on experiences stressed.

Educ. 565-3. Survey of Exceptional Children. Types of physically, mentally, and socially handicapped children; methods of diagnosis; suggested educational adjustments; and teaching techniques.

Educ. 566-3. Introduction to the Gifted Student. Assists the teacher in identifying, understanding, and challenging children with unusual abilities.

Educ. 567-3. Teaching Exceptional Children in the Regular Classroom. Develops knowledge about exceptional children and the ways they are served in the public schools; appropriate attitudes toward human variability and individual differences; and appropriate instructional methods and strategies necessary for meeting the special needs of children with visual, auditory, and physical impairments; mental retardation; learning disabilities; emotional disturbance; and giftedness. For graduate students and certified educators.


Educ. 569-3. Introduction to Educating Emotionally Disturbed Children. Focuses on developing understandings about children and adolescents with emotional or behavioral disturbances and knowledge of educational approaches developed for these children. Surveys current research, theory, and school practices in the field of emotional disturbances; addresses major issues of identification and treatment. Two 2-hr. lab. per wk. requiring observations in various school programs.

Educ. 570-3. Introduction to Learning Disabilities. One two-hr. lab. per wk. Survey of current theory and practice in the area of learning disabilities. Emphasis is on developing a systems model for diagnosis, programming, and remediation. Observation and tutoring required.

Educ. 572-3. Methods for the Emotionally Disturbed Child. Emphasizes developing skills for teaching emotionally or behaviorally disordered children, designing a classroom and curriculum, applying a variety of behavior management and crisis intervention strategies, and using affective materials for socio-emotional behavior change. One 2-hr. lab. per wk. requiring a practicum in a classroom for emotionally disturbed children.

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Edu. 573-3. Research and Evaluation in Special Education. One two- hr. lab. per wk. Students critique research and evaluation studies in special education. Prer., consent of instructor.

Edu. 574-3. Diagnostic Testing in Special Education. Preparation for the diagnostic-prescriptive facet of the special educator's role. Includes test and measurement concepts, demonstration and administration of tests, staffing and the IEP process, major issues, and critical review. Prer., consent of the instructor.


Edu. 576-3. Consulting with Preservice Student Teachers. Working with and supervising preservice education student teachers who are doing case studies with mildly handicapped learners.

Edu. 577-3. International and Comparative Education. A comparative study of education in other countries, with an emphasis on the role of education in developing nations. Political, social, and economic policies and ideologies are analyzed for their relevance to the development process.


Edu. 582-3. Images of the Future. A study of the future: implications for global society, for U.S. society, and for education; dealing with several ways of imagining the future, with value dimensions, with schools and curriculum of the future, and with future studies and global studies as school subjects.

Edu. 583-3. Sociological Perspectives of Education. A sociological appraisal of the school in American society with reference to the status, role, activities, and relationships within the school, and of the school to other social institutions.


Edu. 585-3. Introduction to Educational Administration. Responsibilities of boards of education and administrators; nature of administrative leadership, and introductory considerations of finance and public relations. State, local, and federal relationships in education.

Edu. 586-3. School Law. Recent developments including administrative implications of significant court decisions pertaining to school operations generally. For superintendents, principals, school board members, and prospective administrators.


Edu. 590-3. Administration of Special Programs. A course designed to meet the needs of persons administering special programs in such areas as bilingual education, experiential/alternative and outdoor institutions, and special education.


Note: The five workshop numbers below are designed to provide areas where the unique needs and interests of teachers and educational leaders may be presented.

The length of the workshop may vary from one to five weeks.

Edu. 593-1-4. Workshop in Educational Administration, Supervision, and Curriculum.


Edu. 595-1-4. Workshop in Instruction and Curriculum in Content Areas.


Edu. 600-3. Intermediate Statistical Methods. Sampling theory and inferential statistics; advanced applications for the testing of hypotheses regarding central tendency, variability, proportion, correlation, and normality; Chi-square and the analysis of frequency data; multiple regression and prediction; introduction to the analysis of variance; and related computer programs for statistical analysis. Required of all doctoral candidates. Prer., Edu. 504.

Edu. 601-3. Experimental Design and Analysis I. Required of all Ph.D. candidates. Experimental and quasi-experimental designs in educational research; selecting an appropriate statistical test; power and statistical power 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. Prer., Edu. 600.

Edu. 602-3. Experimental Design and Analysis II. Offered alternate years. Intensive study of advanced experimental design and analysis. Topics include general linear model; fixed, random, and mixed effects analysis of variance (ANOVA) models; multiple comparisons techniques; ANOVA robustness; analysis of covariance; nested and hierarchical designs. Prer., Edu. 601; some proficiency in matrix algebra and a background in mathematical statistics desirable.

Edu. 603-3. 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. Prer., Edu. 600 or consent of instructor.

Edu. 604-3. Methods of Naturalistic Research. Psychological and philosophical basis of naturalistic inquiry (i.e., ethnography, case study, field work) in educational research. Methods of observation, in-depth interviewing, documentary analysis, data analysis, confirmation and narration. Reading of exemplary works. Prer., Edu. 600 or consent of instructor.


Edu. 606-3. Psycho-Educational Diagnostics II. Personal appraisal of the individual with emphasis upon educational application of projective personality data. Prer., consent of instructor.


Edu. 608-3. Educational Evaluation. Study of models and methods for the evaluation of educational programs. Evaluation models proposed by curriculum and instructional research are examined. Application of methods of measurement and experimentation to evaluation problems is studied. Exemplary evaluation projects are studied in detail. Prer., Edu. 502, 504 or consent of instructor.

Edu. 609-3. Time Series and Multivariate Analysis. Offered alternate years. An introduction to the theory of advanced multivariate statistical techniques and their application in educational research. Topics include the analysis of time-series experiments, multivariate ANOVA, canonical correlation, discriminant function analysis, and multiple regression.

include generalizability theory, factor analysis applied to test development, unidimensional and multidimensional scaling.

Edu. 612-3. Junior High School/Middle School Education. Stimulation and direction of constructive activities of adolescent boys and girls. Problems of management, curriculum, school life, guidance, and community relations.

Edu. 613-2. Problems in Junior High School/Middle School Education. Case studies and seminar approach to theory and practice on an advanced level.

Edu. 614-2. Student Activities Curriculum. Principles, problems, and procedures for improvement of extra-curricular activities, student councils, home rooms in the secondary school, etc.


Edu. 616-3. Processes and Materials in Curriculum Appraisal. Designed to provide curriculum workers with skills in the process of assessment of curricular programs and skill in the appraisal of curricular materials. Includes work in the theory of evaluation, the methodology of evaluation, and practice in evaluation of curricula. Prereq., one course in curriculum.

Edu. 617-4. Teaching Methods—Counselor Education.


Edu. 619-3, 620-3, 621-3. Special Topics. Designed to meet needs of graduate students with topics of pertinent interest.

Edu. 622-3. Research Analysis in Reading, English, and Language Arts. Required of all doctoral candidates. Critical analysis and evaluation of published research studies in reading, English, and language arts; principles of internal and external validity; and preparation of critique abstracts.

Edu. 623-3. Information Storage and Retrieval. Examination of the various types of retrieval systems for use in school media programs. Several approaches to information retrieval include manual information retrieval systems, whole document retrieval systems, and computer-based retrieval systems.

Edu. 624-3. Computer-Assisted Instruction (for Teachers). Examination of and experimentation with various trends in computer-assisted instruction. Design strategies and intrinsic programming techniques are applied within an existing CAL language.

Edu. 625-3. Fundamentals of Instructional Development. Provides students with instructional development skills. Several instructional development models are studied. Students will develop instructional development models with curricular content.

Edu. 628-3. Design of Mediated Instruction. Provides students with the skills necessary to analyze instructional problems, select teaching strategies, design mediated programs, and evaluate their effectiveness in teaching and learning.

Edu. 627-3. Educational Media Research and Evaluation. Surveys the basic research done since 1963 in the audiovisual and instructional telecommunication fields. Implications of that traditional body of research will be applied toward the more modern ideas of constructive evaluation as a means to continually improve learning systems.

Edu. 628-3. History and Philosophy of Education. Traces the development of educational theory and practice from ancient times to the present day with an emphasis on contemporary philosophies and trends.

Edu. 629-3. Research in Social and Multicultural Foundations. An analysis of research in the social and multicultural foundations, with an emphasis on bilingual, multicultural, sociological, experiential, and philosophical research.

Edu. 630-3. Teaching Internship in Social, Multicultural, and Bilingual Foundations. A one-semester teaching internship in undergraduate or graduate foundations course. For social foundations doctoral students only.

Edu. 631-3. Advanced Practicum in Counseling. Supervised counseling experience, report writing, and case staffing procedures with emphasis on professional staff collaboration.


Edu. 633-3. Organization and Administration of Guidance and Personnel Services. Advanced professional course dealing with problems of program organization, development, and management; implementation of guidance strategies; and principles of organizational behavior.


Edu. 635-2. Elementary Principalsship Intensive. Offered even summers only. Two-week in-depth examination of the elementary school principalship. Required for Type D administrative certification, elementary school. Consent of instructor required.


Edu. 637-3. Administration and Supervision of Middle Level and Secondary Schools. Current administrative principles and practices essential to effective organization and management, with emphasis on the educational leadership of the principal.

Edu. 638-2. Theory of Educational Administration. Study of organizational models, theories, and communication patterns; leadership roles and behavior; and organizational change. Attention to recent research in administrative theory.


Edu. 641-3. Educational Facilities Planning. Alternate years. Determination of school plant needs; relation of educational and architectural services; criteria of adequate school plants, site development, building operation and management; financial problems.

Edu. 642-2. Personnel Administration. Personnel problems in the administration of public and private school systems. Policies affecting personnel, rights and responsibilities of teachers, salary schedules, retirement, sick leave, collective negotiations, etc.

Edu. 643-2. School and Community Relations. Principles, practices, materials, and techniques used in public relations in sections of the country. Students may develop materials for own use.


Edu. 646-3. Topics in Higher Education. Analysis of specific current issues in areas other than governance. Prereq., consent of instructor.

Edu. 648-4. Planning and Budgeting in Higher Education. Principles and practices in the application of modern management concepts and administrative tools including data base, student flow information, output measurement, PPBS, lectures, discussion, simulations, student projects. Prereq., instructor consent.


Edu. 650-3. Career Development. Provides students with competencies in career development and career counseling. Topics include theories of career development, information systems, decision making, and awareness of self and the world of work.

Edu. 651-3. Measurement and Appraisal. Helps the student gain competence in the basic fundamentals of tests and measurement. Topics include standardization, correlation, reliability, validity, norms, scoring, standard error of measurement, and restriction of range.

Edu. 653-2. Pro-Seminar in Research in Instruction and Curriculum. Weekly discussion of current research.

Edu. 654-3. Research Seminar for Doctoral Candidates. The development of the thesis prospectus, including problem development, hypothesis formulation, literature review, research design,
statistical analysis, related measurement, and computer considerations. Prer., Educ. 300.


Educ 656-2. Seminar: Elementary Education. Students work on individual topics and report orally and in writing. Prer., Instructor consent.

Educ 657-2. Seminar: Education of Teachers. Alternate years. This seminar is concerned with an in-depth study of the theoretical base for the education of teachers. A critical study of the literature concerned with the education of teachers will be conducted from both historical and contemporary perspectives. Special attention will be paid to recent research in the field with the intent of promoting better research. Seminar activities will include assigned reading, discussion, projects, research, oral reports, and critical analysis of research proposals.


Educ 659-2. Seminar: Science Education. For advanced students in this subject area. Individual topics and research. Prer., Educ. 521 or 537 and teaching experience.

Educ 660-2. Seminar: Mathematics Education. For advanced students with a mathematics background. Recent literature and research in mathematics education; new programs in mathematics. Individual topics and research plans. Prer., T.Ed. 456 or Educ. 520 or 535 and teaching experience.


Educ 663-2. Seminar: Junior and Senior High School Education. For advanced students. Problems, theories, and trends in secondary education. Includes field work and individual projects.

Educ 664-3. Seminar in Bilingual and Multicultural Education. A study of selected American ethnic-racial groups and their history, culture, and social conflicts planned to help teachers develop an awareness and sensitivity to these groups. Ethnic groups will include Mexican-Americans, Blacks, Native Americans, and others. Students will cover basic units for selected groups and will also complete an independent project or study of their choice.

Educ 665-3. Seminar in Experiential Education. A seminar for advanced students, analyzing current theories and practices in experiential programs in traditional public and alternative school settings.

Note: Prerequisite for enrollment in Educ. 667, 668, 669, 670, 671, and 672, is admission to a doctoral program in the School of Education.


Educ 676-3. Seminar: Special Education. Examination of issues in consultation, working with parents, interdisciplinarity cooperation, program design and management in relationship to practical experience with educationally handicapped children.

Educ 677-2. Seminar: Higher Education. Analysis of specific problems and practices in the field of higher education. Open only to students with previous course work or experience in higher education. (May be taken twice for 2 semester hours' credit each enrollment.) Prer., consent of instructor.


Educ 680-3. Seminar: Social Foundations of Education. This course is designed for doctoral students in any specialization in education and focuses on social science perspectives or education (e.g., sociology, anthropology, political science, economics).

Educ 681-3. Advanced Seminar: School Law. An in-depth examination of the American legal process as it pertains to administration, planning, and delivery of educational programs. Includes self-selected research followed by individual or group presentations.


Educ 683-2. Doctoral Seminar: Junior High School/Middle School Education. For advanced students. Problems, theories, and trends in secondary education. Includes field work and individual projects.


Educ 685-2. Seminar: Educational Leadership. Seminar dealing with processes and patterns of educational leadership in the schools. Graduate students from various specialties interact with faculty members in preparing for leadership roles. May be taken more than one semester for credit with advisor's approval.


Educ 750-1 to 4. Readings in Administration, Supervision, and Curriculum.

Educ 751-1 to 4. Readings in Research and Evaluation Methodology.

Educ 752-1 to 4. Readings in Instruction and Curriculum in Content Areas.

Educ 753-1 to 4. Readings in Social, Multicultural, and Bilingual Foundations.

Educ 754-1 to 4. Readings in Educational and Psychological Studies.

Educ 755-1 to 4. Practicum in Administration, Supervision, and Curriculum.

Educ 756-1 to 4. Practicum in Research and Evaluation Methodology.

Educ 757-1 to 4. Practicum in Instruction and Curriculum in Content Areas.

Educ 758-1 to 4. Practicum in Social, Multicultural, and Bilingual Foundations.

Educ 759-1 to 4. Practicum in Educational and Psychological Studies.

Educ 760-1 to 4. Educ. 761-1 to 4. Practicum I and II: The Educationally Handicapped. Supervised field experiences with learning-disordered children (emotionally disturbed and/or learning disabled). Full time for eight weeks, minimum 320 clock hours. Prer., consent of instructor.

Note: Prerequisite for enrollment in Educ. 762, 763, and 764 is the completion of Educ. 551, 552, and 553

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and either completion or concurrent enrollment in Educ. 504 and instructor consent.

Educ. 762-3. Field Work in Guidance. Primary emphasis is directed observational experience in various counseling and personnel service settings. The experiences will help students familiarize themselves with the counseling techniques used in those settings. Ten hours in field setting in addition to class sessions.

Educ. 763-3. Field Work in Agency Counseling. Directed observational experience in a variety of agency counseling settings, including rehabilitation agencies, employment services, mental health clinics, etc. Helps students familiarize themselves with the techniques used in agencies. Ten hours in field setting in addition to class sessions.

Educ. 764-3. Field Work in College Student Personnel. Orientation experiences in each of several student personnel services including financial aid, admissions, career development and placement, and veterans’ advising. Ten hours in field setting in addition to class sessions.

Educ. 765-4, 766-4. Reading Clinic Procedures I, II. Supervised diagnosis of reading problems; evaluation instruments; pertinent research; case study approach. Prer., Educ. 527 or consent of instructor.


Educ. 800-1 to 10. Doctor’s Thesis.


Educ. 950-1 to 4. Independent Study.

Educ. 951-1 to 4. Independent Study in Administration, Supervision, and Curriculum—Doctor’s.

Educ. 952-1 to 4. Independent Study in Instruction and Curriculum in Content Areas—Doctor’s.

Educ. 953-1 to 4. Independent Study in Social, Multicultural, and Bilingual Foundations—Doctor’s.

Educ. 954-1 to 4. Independent Study in Educational and Psychological Studies—Doctor’s.

Educ. 955-1 to 4. Independent Study.

Educ. 961-1 to 4. Independent Study in Administration, Supervision, and Curriculum—Doctor’s.

Educ. 962-1 to 4. Independent Study in Research and Evaluation Methodology—Doctor’s.

Educ. 963-1 to 4. Independent Study in Instruction and Curriculum in Content Areas—Doctor’s.

Educ. 964-1 to 4. Independent Study in Social, Multicultural, and Bilingual Foundations—Doctor’s.

Educ. 965-1 to 4. Independent Study in Educational and Psychological Studies—Doctor’s. Prer., permission of instructor required on all internships.

Educ. 980-1 to 4. Internship in Administration and Supervision.

Educ. 981-1 to 4. Internship in Research and Evaluation Methodology.

Educ. 982-1 to 4. Internship in Instruction and Curriculum in Content Areas.

Educ. 983-1 to 4. Internship in Social, Multicultural, and Bilingual Foundations.

Educ. 984-1 to 4. Internship in Educational and Psychological Studies.

Educ. 985-1 to 4. Internship in Curriculum.

Educ. 990-0. Candidacy for Degree.

College of Engineering and Applied Science

AEROSPACE ENGINEERING SCIENCES

Note: Courses not having a semester designated may be offered in alternate years.


Aero. 195-1 to 3. Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the lower division level. Course content will be indicated in Schedule of Courses and on the transcripts of those taking the course. Prer., variable.


Aero. 295 to 299-1 to 3. Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the lower division level. Course content will be indicated in Schedule of Courses and on the transcripts of those taking the course. Prer., variable.


Aero. 342-3. Systems Analysis II. (M.E. 372.) Mathematical theory of control with applications to mechanical, electrical, and hydraulic systems; modeling; feedback design, specifications; stability tests; root loci methods; and frequency response. Prer., Aero. 341 or M.E. 371.


Aero. 395 to 399-1 to 3. Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper division level. Course content will be indicated in Schedule of Courses and on the transcripts of those taking the course. Prer., variable.

Aero. 400-1 to 6. Independent Study.


Aero. 430-3. Nuclear Energy Systems. (M.E. 450.) Foundations of nuclear energy systems; review of reactor theory; design and operation; nuclear electric power plants; systems for nuclear auxiliary power; analysis of nuclear energy systems for various applications. Prereq., senior standing.


Aero. 460-0. Senior Seminar. Fall. Discussion of problems an engineer will face during a job and what is expected of him by his employer. Prereq., senior standing.

Aero. 461-1 to 3. Undergraduate Research. Fall. Assignment of a research problem on an individual basis.

Aero. 462-1 to 3. Undergraduate Research. Spring. Assignment of a research problem on an individual basis.

Aero. 495-1 to 3. Special Topics. Specialized aspects of the aerospace engineering sciences or innovative treatment of required subject matter at the upper class level. Course content will be indicated in Schedule of Courses and on the transcripts of those taking the course. Prereq., variable.

Aero. 500-1 to 6. Independent Study. Study of special projects.

Aero. 501-3. Atmospheric Entry. Atmospheric effects on satellites; atmospheric entry from orbit using several classical theories; the entry corridor; orbit contraction due to atmospheric drag; flight path control during and after entry. Prereq., Aero. 403 and 406 or 505 or consent of instructor.

Aero. 505-3. Space Flight Dynamics. Celestial mechanics, space navigation, orbit determination; trajectory design and mission analysis trajectory requirements; orbit transfer and rendezvous. Prereq., Aero. 406 or consent of instructor.


Aero. 512-3. Viscous Flow. (M.E. 334.) Low Reynolds number flows, incompressible and compressible laminar boundary layer theory; similarity theory; separation, transition, and turbulent boundary layers. Prereq., Aero. 517 or equivalent, or consent of instructor.

Aero. 513-3. Compressible Fluids. Dynamics of nonviscous, compressible, subsonic, and supersonic fluid flow; theory of characteristics, shock waves; slender body and wing theory. Prereq., Aero. 413.

Aero. 514-3. Introduction to Turbulence. Physical properties of turbulence, shear layers, heat transfer, homogenous turbulence, diffusion and turbulence in compressible and electrically conducting fluids. Prereq., Aero. 517 or equivalent of consent of instructor.

Aero. 517-3. Macroscopic Physics of Fluids. (M.E. 532.) 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, acoustic, stability, and potential flows. Coreq., M.E. 521, M.E. 575, or equivalent.


Aero. 525-3. Air Pollution. Effect of air pollution on materials, plants, animals, humans, and ecological changes. Sources of air pollution. Chemistry, diffusion, and dispersal of pollutants. Prereq., graduate standing or consent of instructor.

Aero. 527-3. Noise Pollution and Abatement. Advanced course in the basic physics and physiology of sound. Study of determinants of sound leading to noise. Identification of noise sources and characteristics of the detrimental physiological effects of such noise. Promotion of principles governing noise control and the application of such controls. Prereq., Aero. 363 or Arch.E. 363 or consent of instructor.

Aero. 535-3. 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., Aero. 413 or consent of instructor.


Aero. 548-3. Advanced Computational Fluid Mechanics. Continuation of Aero. 447/547. Advanced computational methods are introduced for solving fluid mechanics problems on the computer, with emphasis on nonlinear flow phenomena. Prereq., Aero. 447/547 or consent of instructor.

Aero. 556-3. Spacecraft Design. A systems approach to the design of an unmanned spacecraft, including guest lectures from specialists in each of the disciplines which make up a spacecraft design team. Topics include mission design, payload, launch systems, tracking and spacecraft systems, communications, structures, guidance and control. Prereq., Aero. 505 or consent of instructor.


Aero. 566-3. 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, man-made applications and natural phenomena. Prereq., graduate standing or consent of instructor.

Aero. 572-3. The Sun. (A.G. 533.) Physical processes of the sun, including the interior, photosphere, chromosphere, and corona. Topics covered include properties of the electromagnetic spectrum (X-ray, UV, visible and radio wave-lengths), magnetic fields, velocity fields, and flare phenomena and interpretation. Prereq., graduate standing or consent of instructor.

Aero. 573-3. Introduction to Magnetospheres. (A.G. 530.) Introduction to solar and stellar winds, planetary and stellar magnetospheres. Guiding center theory for particle motion, magnetospheric topology, convection, radiation belts, magnetic storms and substorms, auroras. Prereq., graduate standing or consent of instructor.


Aero. 581-3. Bioengineering II—Neurophysiology. Fall. Review of the organization and cell morphology of nervous tissue; electrical and physiological properties of cell membranes; intracellular recordings from single nerve cells; transmission at synapses; muscle contraction; receptor mechanisms; the human nervous system; central and autonomic systems. Prereq., Aero. 380.

Aero. 582-3. Neural Control Systems. Spring. Survey course dealing with behavioral, neurophysiological, and biochemical controls manifested by the central nervous system. Biological background material prerequisite to application of formal control theory. Prereq., Aero. 380 or consent of instructor.
Aero. 583-3. Membrane Transport: Biological and Artificial. Fall. The dynamics of membranes in regulating the chemical environment of biological systems, energy use associated with biological membranes, transport characteristics of organic and inorganic substances, theoretical and physical membrane models, and integration of membrane transport with other biological functions. Prereq., Aero. 380 or consent of instructor.

Aero. 585-3. Mammalian Neuroanatomy. (Psych. 508.) Covers the structure of the mammalian CNS with respect to functional organization and emphasis on symptomatology. Includes description of neuroanatomical and neurobiotechnological sites and an introduction to CNS ultrastructure with demonstration of electron micrographs. Prereq., Psych. 409 or Aero. 580, or consent of instructor.

Aero. 591-1. Seminar. Fall. Required of all aerospace engineering sciences graduate students. Provides reports on research activities and special current topics. Prereq., graduate standing.

Aero. 592-1. Seminar. Spring. Required of all aerospace engineering sciences graduate students. Provides reports on research activities and special current topics. Prereq., graduate standing.

Aero. 595-599.0 to 3. Selected Topics in Aerospace Engineering Sciences. Treatment of specialized aspects of the aerospace engineering sciences by staff or visiting lecturers. Course content will be indicated in Schedule of Courses and on transcripts of those taking the course. Prereq., variable.

Aero. 600-1 to 6. Independent Study. Study of special projects agreed upon by student and instructor.

Aero. 608-3. Advanced Space Flight Dynamics. Continuation of Aero. 506. The course includes perturbations of orbital motion due to the sphericity of gravitational field, third bodies, solar radiation pressures, and atmospheric drag; classical orbit determination from angles-only observation; modern orbit determination using range and range-rate data; orbit transfer using impulses or continuous thrust; others to be chosen. Prereq., Aero. 606 or consent of instructor.

Aero. 609-3. Mathematical Theory of Hydrodynamic Stability. Mathematical and physical study of laminar flow instability. Topics include derivation of general disturbance equation, study of linear disturbance equations for curved and parallel viscous and inviscid flows, and nonlinear theory. Prereq., Math. 431 and Aero. 512 or consent of instructor.


Aero. 695-599.0 to 3. Selected Topics in Aerospace Engineering Sciences. Treatment of specialized aspects of the aerospace engineering sciences by staff or visiting lecturers. Course content will be indicated in Schedule of Courses and on transcripts of those taking the course. Prereq., variable.


The following courses, now inactive, may be offered on demand: Aero. 408 (Aerodynamic Heating), Aero. 425 (Structures II), Aero. 458 (Rocket Vehicle Design), Aero. 521 (Aeroelasticity), Aero. 522 (Advanced Aerospace Materials), Aero. 544 (Optical Control), Aero. 545 (Advanced Linear Control Systems), Aero. 546 (Theory of Automata), Aero. 549 (Numerical and Simulation Techniques Applicable to Guidance and Control System Design), Aero. 563 (Stochastic Processes), Aero. 576 (Atmospheric Turbulence), Aero. 584 (Selected Topics in Macromolecular Biophysics); Aero. 606 (Optimal Trajectories in Space Flight), Aero. 611 (Plasma Spectroscopy), Aero. 614 (Hypersonic Aerodynamics), Aero. 615 (Quantum Fluid Dynamics), Aero. 617/618 (Statistical Thermodynamics), Aero. 618 (Dynamics of Real Gases), Aero. 621/622 (Structural Thermomechanics I, II), Aero. 622 (Aeronautical Heat Transfer), Aero. 641 (Guidance Systems), Aero. 644 (Advanced Nonlinear Stability Theory), and Aero. 674 (Cosmic Gasdynamics).


**APPLIED MATHEMATICS**

A.Math. 135-4. Calculus for Engineers I. Selected topics in analytical geometry and calculus. Rates of change of functions, limits, derivatives of algebraic functions, applications of derivatives, and integration. Prereq., two years of high school algebra, one year of geometry, and one-half year of trigonometry, or equivalent, and an acceptable score on the mathematics placement test for the College of Engineering and Applied Science.


Math. 335-3. Advanced Mathematics for Engineers I. Selected topics in ordinary differential equations, including linear equations with constant coefficients, matrix methods, power series solutions, Bessel functions, Legendre functions, and Laplace transforms. Prereq., A.Math. 236. Will not apply toward the B.A. degree in mathematics; may be used toward the B.S. (A.Math.) degree.

Math. 338-3. Advanced Mathematics for Engineers II. Selected topics in partial differential equations and complex variables; the divergence theorem in two and three dimensions, Fourier series, eigenfunction expansions, and the method of separation of variables. Prereq., A.Math. 236. Will not apply toward the B.A. degree in mathematics; may be used toward the B.S. (A.Math.) degree.

**ARCHITECTURAL ENGINEERING**

Arch.E. 102-2. Descriptive Geometry. Two lectures, two 3-hr. labs per week. Orthographic projection: point, line, and plane problems; angle problems, intersection, developments, perspective, shades and shadows and graphic statics. Prereq., Engr. 101 or equivalent.

Arch.E. 110-2. Introduction to Architectural Engineering. A survey of the broad subject area of architectural engineering designed to assist the student in selecting a subject area specialty. A sequence of presentations by different faculty members describing their own particular interests culminates in a group project or term paper on an appropriate topic of the student's choice.

Arch.E. 240-3. Building Materials and Construction. Three lectures, four laboratories per week. A study of construction methods and techniques including foundations and structural framing concepts, and particularly materials, components, and systems applications in building construction.


Arch.E. 334-3. Illumination. Three lectures. A study of the fundamentals of illumination and the application of these principles to the illumination of buildings. Prereq., E.Phys. 112. (For Arch.E. students only except by consent of instructor.)

Arch.E. 382-3. Mechanical Systems for Buildings. Three lectures, recitations, three laboratories per week. Environmental comfort—heat loss and gain, principles...
of heating and cooling, HVAC systems, principles of water supply and waste, fire protection. Prereq., Phys. 202 or E. Phys. 112.


Arch. E. 400-1 to 5. Independent Study.


Arch. E. 404-2. Structures II. (Arch. 553.) Two lect. per wk. Analysis of basic structural systems. Shear and moment diagrams, design of beams and columns. Introduction to statically indeterminate structures. Prereq., Arch. E. 403.


Arch. E. 441-3. Construction Costs, Estimating, and Prices. Three lect. per wk. Introduction to building construction cost accounting and controls, analysis of direct and indirect cost fundamentals and collecting systems, methods engineering and value engineering. Also included is a study of the types of estimates, quantity take-off techniques and pricing applications, and the preparation of a detailed estimate for a building project including all cost analyses, a complete quantity survey, development of unit prices, and the final assembly of the bid proposal. Prereq., Arch. E. 240, senior standing, or consent of instructor.

Arch. E. 446-3. Construction Planning and Scheduling. (C. E. 523.) Three lect. per wk. A comprehensive study of construction management including the contractor's role in pre-construction activities; the construction contract; bonds and insurance; purchasing and subcontracts; contractor's central office and job organization; plant, tools, and equipment; methods engineering; value engineering; labor relations and hiring; and the particular application of CPM/PERT techniques to the planning, scheduling, and control of a construction project. Prereq., Arch. E. 441.


CHEMICAL ENGINEERING

Ch. E. 130-2. Introduction to Chemical Engineering. Develops principles for use concepts of chemistry and physics to conceive feasible processes for chemical change. Introduction to the chemical engineering profession. Prereq., high school chemistry or equivalent.

Ch. E. 200-1 to 6. Independent Study. Available to freshmen and sophomores with approval of chemical engineering department. Subjects arranged to fit needs of the particular student. Prereq., at least 2.75 grade-point average.

Ch. E. 201-3. Introduction to Chemical Engineering Calculations. An introduction to computation of chemical engineering problems. Emphasis is placed on use of digital computers to solve numerical tasks and in the treatment of engineering data. The FORTRAN language is introduced and used as a major programming tool. Prereq., C. S. 210.

Ch. E. 210-4. Physical and Chemical Properties of Matter. Three lect. and two rec. per wk. Emphasis is on the principles of chemistry as they relate to engineering materials and systems. (Not for Ch. E. majors.) Prereq., high school chemistry.


Ch. E. 241-2. Chemical Engineering Materials and Industrial Chemicals. Two lect. rec. hrs., three to six field (plant inspection) trips, introduction to the chemical process industry. The production, economics, and use of the top fifty industrial chemicals. Prereq., Chem. 105 or 108 or equivalent; coreq. Chem. 331 or equivalent.

Ch. E. 321-4. Chemical Engineering Principles I. Three lect. and two rec. or calc. hrs. per wk. Study of the theory and application of the principles of heat and momentum transfer in chemical engineering systems. Prereq., A. Math. 235 or Math. 240, and Ch. E. 212.

Ch. E. 322-4. Chemical Engineering Principles II. Three lect. and two rec. or calc. hrs. per wk. Study of the mechanisms of mass transfer including molecular diffusion, eddy diffusion, and convective mass transfer. Application of the theory of mass transfer to the design of chemical equipment. Prereq., Ch. E. 321.

Ch. E. 351-3. Engineering Statistics. (EDDE 351.) Two lect. and one comp. hr. per wk. Introduction to probability and statistics with emphasis on engineering applications. Frequency distributions, statistical hypotheses and estimation; linear regression and correlation; non-linear and multiple regression; analysis of variance. Prereq., A. Math. 235 or Math. 240 or equivalent.

Ch. E. 370-3. Animal Engineering. An introduction to molecular biophysics dealing principally with questions related to the structure and function of biological macromolecules. The course concludes by considering a variety of biological systems that interface between the physical and engineering sciences. Prereq., MCD B 106, Chem. 332, and consent of instructor.

Ch. E. 400-1 to 6. Independent Study.

Ch. E. 403-4. Chemical Engineering Laboratory. Experimental work and reports in unit operations. Planning and analysis of chemical engineering experiments. Heavy emphasis on preparation of formal technical reports. One lect.-rec. and two 4-hr. labs. per wk. Prereq., Ch. E. 322 and Ch. E. 351 or EDDE 351.


Ch. E. 442-3. Organic and Polymeric Technology. Three rec. per wk. Manufacturing operations of the more important organic chemical and plastics industries with emphasis on the properties and applications of plastics. Prereq., organic chemistry: Chem. 352 or 356.

Ch. E. 452-4. Chemical Process Synthesis. Two lect., two rec. or calc. hr. per wk. Solution of selected comprehensive problems dealing with development, equipment, process design, process control systems, materials, product allocations, and chemical process optimization. Prereq., Ch. E. 322, 432, and 433.


Ch. E. 490 to 499-1 to 4. Selected Topics in Chemical Engineering. Senior selected topics courses to be offered upon demand. Prereq., senior standing or consent of instructor.

1Arch. E. 430 and 440, are for non-engineering students and are not acceptable for credit toward a degree in engineering.
Ch. E. 500-1 to 6. Independent Study. Available only by approval of
graduate adviser. Subjects arranged to fit needs of the individual
student.

Ch. E. 501-3. Environmental Modelling. Mathematical modeling of
the natural and man-made environment as an aid in making rational
decisions which are politically enforceable, socially accepted,
economically feasible, and technically possible. Prer., C.S. 201, E. E.
201, or Ch. E. 201.

Ch. E. 502. Thermal Assessment. An introduction to indi-
vidual, group, and computer methodologies for developing technical
options to deal with current problems, and to evaluate their econo-
sic, social, and political implications.

Ch. E. 529-3. Statistical Thermodynamics. (M.E. 514.) Introduction
to the molecular interpretation and calculation of thermodynamic
properties of matter. Thermodynamic probability, distribution func-
tions, Schrödinger wave equation and solutions, and ensemble
theory. Applications to ideal and real gases, solids, liquids, radiation,
conduction electrons, and chemical equilibrium. Prer., M.E. 313 or
equivalent.

Ch. E. 536-3. Catalysis and Kinetics. Study of the principles of
chemical kinetics and catalytic reactions, with emphasis on
heterogeneous catalysis. Coreq., Ch. E. 432, or prer., Chem. 433
and consent of instructor, or graduate standing in Ch. E. or Chem.

Ch. E. 537-3. Intermediate Chemical Engineering Thermody-
namics. Review of the fundamentals of thermodynamics. Application
to pure fluids and mixtures. Physical equilibrium and changes of
state. The equation of state and computation of fluid properties for
pure fluids, mixtures, and solutions. Relations between thermody-
namics and statistical mechanics. Prer., undergraduate thermody-
namics (Ch. E. 432 or equivalent).

Ch. E. 538-3. Macroscopic Thermodynamics. (M.E. 513.) Ax-
iomatic presentation of fundamentals of chemical thermodynamics.
Energy, heat, work and the first law. Equilibrium, reversible and ir-
reversible processes, entropy production, and the second law. Ap-
lications to stability, phase equilibrium, electric and magnetic
work. Irreversible thermodynamics and the Onsager Reciprocal Rela-
tions. Prer., M.E. 313 or equivalent.

Ch. E. 538-3. Reaction Kinetics. Advanced study of ideal and non-
ideal chemical reactors including steady state behavior, mixing ef-
effects, reactor stability, residence time distribution, and modeling
of nonideal reactions. Additional topics covered include fluidized beds,
diffusion in porous catalysts and chemical kinetics. Prer., under-
graduate reaction kinetics and consent of instructor.

Ch. E. 542-3. The Physical Chemistry and Fluid Mechanics of
Interfaces. The principal topics covered in this course are the thermo-
tension measurement; adsorption at liquid-gas, liquid-liquid, and
solid-gas interfaces; monolayers; conservation equations for a fluid
interface; Navier-Stokes equations; conservation equations for a
fluid interface; rheology of interfaces; surface tension driven
flows; contact angle and wettability; double layer phenomena. Prer.,
Ch. E. 321 or equivalent.

Ch. E. 549-3. Chemical Technology of High Polyers. Engineering
aspects of preparation, fabrication, and utilization of natural and
synthetic polymers. Prer., organic chemistry; Ch. E. 392 or 599.

Ch. E. 557-3. Computer-Aided Control System Design. The design
of controllers for multivariable systems is studied. Computer aids in-
cluding graphic displays are utilized. Primary emphasis is on the
frequency-based techniques of the inverse Nyquist array and mul-
tivariable root locus. Prer., Ch. E. 457 or E. E. 413.

Ch. E. 558-3. Optimization and Control of Chemical Processes.
Optimization and control of chemical processes using differential
calculier, calculus of variations, and Pontryagin's minimum prin-
ciple. Mini-computer and real-time programming covered for on-line
implementation of optimal control policies. Prer., senior or graduate
standing.

Ch. E. 559-2. Cryogenic Engineering I. Modern thermodynamics
of cryogenic systems and processes; thermodynamic and transport
properties of cryogenic fluids including experimental methods and
construction of thermodynamic diagrams and tables; fluid transfer;
production of low temperatures; refrigeration and liquefaction;
separation and purification of gases; phase equilibria; safety. Prer.,
Engr. 303 or Ch. E. 303.

Ch. E. 557-2. Cryogenic Engineering II. Heat transfer at low
temperatures: thermal insulation systems, including high vacuum
technology; insulation types and application to storage and transfer
equipment. Low temperature properties of the solid state such as
mechanical properties, specific heat, electrical and thermal conduc-
tivity; thermal expansion galvano- and thermomechanical effects, and
superconductivity. Cryogenic instrumentation. Prer., Engr. 552 or

Ch. E. 568-3. Industrial Air Pollution Control. This course treats the
chemical and physical basis of industrial pollution and the methods
currently available for controlling air pollution from stationary
sources. Emphasis will be placed on the design and performance of
industrial air pollution control equipment. Prer., senior standing in
chemical engineering or consent of instructor.

Ch. E. 569-3. Industrial Water and Solid Waste Pollution Control.
The chemical and physical nature of water pollutants and solid
wastes from industrial processes. Methods of reducing pollutant
generation and treatment for disposal. Prer., senior standing in Ch. E.
and consent of instructor.

Ch. E. 570-3. Biomedical Engineering. Mathematical analysis of
biomedical systems via material, energy, and momentum balances.
Systems to be studied include neural transduction, renal function,
circulation, and special senses. Solutions of mathematical models
will be obtained via MIMIC programming. Prer., consent of instruc-
tor.

Ch. E. 571-3. Molecular Basis of Behavior. A problems approach to
neurobiology. A variety of model behavior systems will be discussed,
unecellular and multicellular, in an attempt to trace the molecular
deads that occurred during the evolution of simple behavioral systems
to more complex ones. Prer., Ch. E. 570, Chem. 532, and Chem. 493.

Ch. E. 572-3. Neural Modelling. An integrated introductory survey of
physiological theories of brain function: bioelectric processes, and
models of the electrical operations of nervous systems. The physical
basis of neuroelectric signals and information processing in neur-
ons and neural networks are discussed. Prer., consent of instructor and
senior or graduate standing.

Ch. E. 573/578. 597-3. Brain/Mind Modelling. A critical survey of
theories of brain function developed from various engineering
sciences, and discussion of principles of brain modelling. Includes
laboratory workshop on simulation and neuroelectric recording
techniques for graduate students. Prer., senior or graduate standing
in psychology or engineering.

Ch. E. 574-3. Advanced Chemical Engineering Calculations.
Analysis and design of equipment and processes for chemical
manufacturing based on the application of advanced mathematical
techniques. Prer., consent of instructor.

Ch. E. 575-3. Transport Phenomena. Fundamental relationships for
transfer of heat, mass, and momentum, and their application
to engineering problems. Prer., senior or graduate standing.

course dealing with animal locomotion. In general all animals either
swim, fly or run. Each of these modes presents a unique physical
situation to the biological system in terms of physiology, analytical
mechanics, and fluid mechanics. Prer., Ch. E. 370 or consent of
instructor.

Ch. E. 590-0. Seminar in Chemical Engineering. Required of all
chemic engineering graduate students. Reports on research ac-
ivities and on special current topics.

Ch. E. 591-599 to 3. Selected Topics. Credit and subject matter to
be arranged.

Ch. E. 800-1 to 6. Independent Study. Available only through ap-
proval of the graduate adviser. Subjects arranged to fit needs of the
particular student.

governing transport of heat by conduction and radiation. Analytical
and numerical solution of boundary value problems representative
of heat conduction in solids. Radiation properties of solids, liquids,
and gases and transport of heat by radiation. Prer., M.E. 592 or
equivalent.

Ch. E. 828-3. Heat Transfer II. (M.E. 594.) Review of equations
governing transport of heat in fluids in motion. Description of heat
transfer in free and forced convection including laminar and turbu-
ulent flow. Dimensional analysis and heat transfer correlations,
numerical methods, combined heat transfer mechanisms. Prer.,
M.E. 592 or consent of instructor.

Ch. E. 829-3. Advanced Reaction Kinetics. Fundamental laws pertai-
ning to chemical reaction rates and their application to industrial
operations. Prer., Ch. E. 539 or equivalent.

Ch. E. 840-3. Advanced Fluid Dynamics. Conservation equations and
similarity. Navier-Stokes equations and solutions for small and

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large Reynolds numbers. Boundary layer flow and transition phenomena. Phenomenological theories of turbulent flow. Prer., Ch.E. 575 or equivalent.

Ch.E. 657-3. Optimal Control of Chemical Processes. Study of stability and optimal control as applied to chemical processes. Topics to be discussed include Liapunov stability, application of the maximum principle and variational calculus to the control of linear and nonlinear chemical systems. Prer., Ch.E. 558 or equivalent.

Ch.E. 691-699-3. Selected Topics. Credit and subject matter to be arranged.

Ch.E. 700-variable credit. Master’s Thesis.

Ch.E. 800-0 to 8. (16 to 24 maximum). Doctor’s Thesis.

CIVIL, ENVIRONMENTAL, AND ARCHITECTURAL ENGINEERING

C.E. 130-2. Introduction to Civil Engineering. Two lect., per wk. A survey of the broad subject area coverage of civil, environmental, and architectural engineering designed to assist the student in selecting his subject area specialty.

C.E. 212-3. Analytical Mechanics I. Three lect., per wk. A vector treatment of force systems and their resultants; equilibrium of frames and machines, including internal forces and three-dimensional configurations; static friction; properties of surfaces, including first and second moments; hydrostatics; minimum potential energy and stability. Prer. or coreq., A.Math. 236, E.Phys. 111.

C.E. 221-3. Plane Surveying. Two lect., one 3-hr. lab. per wk. Observation, analysis, and evaluation of plane, angular, baseline, triangulation, and line measurements common to civil engineering endeavor. Prer., A.Math. 135 or equivalent.


C.E. 241-3. Introduction to Environmental Engineering. Three lect., per wk. The many aspects of water, air, and land pollution including the special topics of noise, radiation, pesticides, thermal, and mercury pollution.

C.E. 311-3. Analytical Mechanics II. Three lect., per wk. A vector treatment of dynamics of particles and rigid bodies including rectilinear translation, central-force, free and forced vibration, and general motion of particles; kinematics of rigid bodies; the inertia tensor; Euler’s equations of motion; energy and momentum methods for particles, systems of particles, and rigid bodies. Prer., C.E. 212, coreq., A.Math. 236.


C.E. 313-3. Applied Mechanics. Three lect., per wk. A limited study of particle and rigid body mechanics for those disciplines in which a broader background is not required. Subject coverage includes an introduction to vector concepts of force, moment, and equilibrium, then concentrates upon kinematics and kinetics of a particle including oscillatory and orbital motion, energy and momentum methods, and finally discusses rigid bodies by introducing the inertia tensor and appropriate kinematics and kinetics leading to simple applications of Euler’s equations of motion. Intended for electrical engineering majors but open to others upon request. Coreq., A.Math. 236.

C.E. 314-2. Engineering Materials Laboratory. One lect.-rec. and one 3-hr. lab. per wk. The lecture sessions will be devoted to development and explanation of the necessary background and operations required to conduct the materials testing experiments in the lab. Lab sessions devoted to hands-on performance of a sequence of experiments which determine properties of materials, verify principles of mechanics of materials, or incorporate the requirements of ASTM Standards. Prer., C.E. 312.

C.E. 315-2. Engineering Materials Laboratory—Water Quality. One lect. and one 3-hr. lab. per wk. Discussing techniques and making measurements of water quality and pollution parameters. Prer. or coreq., C.E. 241 or permission of instructor.


C.E. 323-3. Photogrammetry and Control Surveys. Two lect., one 3-hr. lab. per wk. Characteristics of aerial photographs; measuring and interpreting from aerial photos for planimetric, topographic, hydrological, soil, and land use surveys; analysis and presentation of field measurements over extensive reaches. Prer., C.E. 222.


C.E. 340-2. City Planning. Two lect. per wk. 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 will be included. Prer., junior standing.


C.E. 360-3. Transportation Engineering. Three lect. per wk. Introduction to the technology, operating characteristics, and relative merits of highway, airway, waterway, railroad, pipeline, and conveyor transportation systems. Evaluation of urban transportation systems. Recent transportation system innovations. Prer., consent of instructor.


C.E. 400-1 to 6. Independent Study.

C.E. 434-3. Open Channel Hydraulics. Three lect. per wk. Study of flow in open channels both natural and man-made. Topics include application of energy equation and momentum relationships, traction force on erodible boundaries, water surface profiles theory and calculations, design of transitions. Prer., C.E. 331.

C.E. 442-3. Municipal Design Projects. Two lect. and one 3-hr. lab. per wk. Analysis and design of municipal public works, including: street systems; drainage and flood control systems; water pumping and distribution systems; sewage collection and treatment systems. The interplay between these systems and their correlation with land characteristics and use. Prer., C.E. 241.


C.E. 457-3. Design of Steel Structures. Two lect., one 3-hr. lab. per wk. Methods used in design of structural steel members and their connections. Introduction to plastic design of steel frames. Prer., C.E. 350.


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C.E. 543-3. Advanced Water Supply. Three lect. per wk. Advanced studies on theory and operation of domestic and industrial water supplies. Prereq., graduate standing or consent of instructor.

C.E. 543-3. Advanced Waste Treatment. Three lect. per wk. Advanced studies on theory and operation of wastewater treatment works. Prereq., C.E. 241 and graduate standing or consent of instructor.

C.E. 544-3. Advanced Sanitary Engineering Design. One lect., two design labs per wk. Applications of theory to the design of water and wastewater systems. Prereq., C.E. 543; coreq., C.E. 542 or consent of instructor.

C.E. 545-3. Administration of Public Works. (P. Ad. 545.) Three lect. per wk. A descriptive course concerned with the administration of engineering and planning aspects of urban public works and with listing and comparing modern methodologies. Prereq., graduate standing in civil engineering, public administration, or consent of instructor.


C.E. 548-3. Processing and Disposal of Wastewater Concentrates. Three lect. per wk. Principles and methods of stabilization, dewatering and disposal of sludges generated from the removal of pollutants from water and wastewater treatment. Prereq., graduate standing or consent of instructor.


C.E. 555-3. Advanced Topics in Reinforced Concrete. Three lect. per wk. 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., C.E. 458 or equivalent.


C.E. 562-3. Urban Transportation Planning. Three lect. per wk. Definition of the urban transportation problem, sociology of urban regions, history of urban growth, models of urban growth, population forecasts, land use surveys and planning, trip generation, characteristics, distribution and assignment, modal split, system evaluation, CBD transportation planning. Prereq., C.E. 561.

C.E. 583-3. Airport Planning and Design. Three lect. per wk. National airport system plan, air travel demand, geometric design of airport facilities, design of airport pavement and drainage structures, airport capacity, coordination with other modes, airport environmental impact. Prereq., consent of instructor.

C.E. 564-3. Urban Traffic—Characteristics. Three lect. per wk. Human and vehicular characteristics, speed and volume studies, origin and destination studies, traffic flow theory, stream characteristics, intersection characteristics, signalized intersections, accident characteristics, parking characteristics, highway lighting, and miscellaneous topics. Prereq., C.E. 360 or consent of instructor.


C.E. 568-3. Pavement Design. Three lect. per wk. Design of flexible and rigid pavements for highways and airports; stress analysis in flexible and rigid pavements; design of joints and reinforcing steel for rigid pavements; principles of subgrade stabilization. Prereq., C.E. 360 and 481.


C.E. 570-3. Specification of Visual Stimuli. Three lect. per wk. Principles of photometry, colorimetry; study of visual stimuli and apparatus to control parameters such as intensity, spectral composition, and retinal location; calibration and practical application of apparatus. Prereq., graduate or advanced standing or consent of instructor.

C.E. 572-3. Visual System Anatomy—Eye and Orbit. Three lect. per wk. Gross anatomy of the head and neck with emphasis on the eye and orbit; visual pathway organization, and embryology of the eye and associated structures. Prereq., graduate or advanced standing or consent of instructor.


C.E. 581-3. Engineering Properties of Soils. Three lect. per wk. Study of the interrelationship of applied stresses, pore pressures, permeability, strain, and shear strength of soils. Determination of these interrelationships in the laboratory. Prereq. or coreq., C.E. 580 or consent of instructor.


C.E. 585-3. Mechanics of Multiphase Media. Three lect. per wk. Development of the general relationships governing load-deformation-time response of multiphase media. Three-dimensional consolidation theory including thermal, electrical, and chemical effects. Interrelationship of theory of mixtures and theory of consolidation. Applications to geotechnical problems; the analysis of loaded clay layers; the influence of pore pressure diffusion on laboratory and field test results; the application of three-dimensional consolidation theory to laboratory and field tests and to predictions of the magnitude and progress of deformation. Prereq., C.E. 580 or consent of instructor.


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physical models in geological engineering, in-situ tests of deformability and strength in-situ stresses and deformations, rock hydraulics. Prereq. C.E. 380 or consent of instructor.


C.E. 588-3. Selected Advanced Topics in Geotechnical Engineering. Three lectures per wk. Selected advanced topics in soil mechanics, rock mechanics, and geotechnical engineering. Coverage depends on the curriculum needs of that year. Such topics as seepage, clay mineralogy, finite elements, analysis of geotechnical problems, rheology of soils, plasticity applied to soil mechanics, soil consolidation, computational methods in geotechnical engineering, etc. are possible choices. This course can be taken more than once. Prereq., C.E. 580 or consent of instructor.

C.E. 589-3. Dynamics of Soils and Foundations. Principles of vibrations and wave propagation in elastic, homogeneous, isotropic media; in-situ and laboratory determinations of dynamic engineering properties of soils; applications of these principles and properties in design of foundations subjected to dynamic loads generated by machinery, earthquake, or blast. Prereq., C.E. 380 or either C.E. 581 or consent of instructor.


C.E. 592-1. Graduate Environmental Research Seminar. One lecture per wk. A seminar in environmental engineering research methods with emphasis on conducting studies and preparing presentations and publications. Prereq., graduate status in environmental engineering.

C.E. 595-599-0 to 3. Selected Topics. Credit and subject matter to be arranged.

C.E. 600-1 to 5. Independent Study. Available only through the approval of the graduate advisor. Subjects arranged to fit needs of particular student.


C.E. 651-3. Advanced Theory of Structures. Three lectures per wk. Generalized approaches to the analysis of civil engineering and continuous elastic structures (such as plates and plane stress bodies) by force and displacement methods. Emphasis is on formulation by finite elements and solution by matrix methods. Prereq., C.E. 551 and basic knowledge of computer programming.

C.E. 656-3. Inelastic Theory of Structures. Three lectures per wk. Inelastic behavior of civil engineering structures. Calculation of ultimate limit states 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 members. Prereq., C.E. 680-3. Selected Topics in Analytical Soil Mechanics. Three lectures per wk. Advanced topics in soil mechanics and geotechnical engineering. Coverage depends on the curriculum needs of that year. Such topics as seepage, clay mineralogy, finite element analysis of geotechnical problems, rheology of soils, plasticity applied to soil mechanics, soil dynamics; computational methods in geotechnical engineering, etc., are possible choices. This course may be taken more than once for additional credit. Prereq., C.E. 650 or consent of instructor.

C.E. 695-699-0 to 3. Selected Topics. Credit and subject matter to be arranged. Prereq., consent of instructor.


COMPUTER SCIENCE


C.S. 210-3. Fundamentals of Computing I. An elementary course in computing, covering the capabilities of a computer, the elements of a programming language, and the basic techniques for designing algorithms to solve practical problems. The programming language PASCAL is used as a vehicle for expressing these concepts. Prereq., three years of high school mathematics, including trigonometry, or Math. 110 or 112, or consent of department.

C.S. 250-3. Honors Fundamentals of Computing. Honors version of C.S. 210 for students with strong aptitude or prior experience in computer science. Consists of an accelerated version of C.S. 210 with more challenging programming assignments (2/3 semester) followed by a selection of important topics from C.S. 310 including Fortran programming, use of the operating system, and non-numerical and numerical algorithms. Students who perform sufficiently well in C.S. 250 may be exempted from taking C.S. 310. Prereq., same as C.S. 210 plus consent of the department.


C.S. 453-3. Assembly Language Programming. (E.E. 483.) A laboratory course in programming at the machine code level. Lectures deal with the organization of the machine, its effect on the order code, techniques for programming in Assembly Language. Primary emphasis on preparing and running programs. Prereq., C.S. 310, E.E. 351, or consent of the instructor.

C.S. 459-3. Computer Organization. (E.E. 459.) This course is concerned with computer arithmetic units, memory systems, control systems, and input-output systems. The emphasis is completely on logic structure rather than electrical circuitry. Prereq., E.E. 287 or equivalent.


C.S. 553-3. Fundamental Concepts in Programming Languages. (E.E. 553.) A study of the concepts which underlie the design of a programming language: elementary operators, operators, and formation rules. Examples are drawn from contemporary languages such as FORTRAN, COBOL, ALGOL, LISP, SNOBOL, and PASCAL. The relationship between programs, hardware, and applications is studied in the light of the underlying concepts. Prer., C.S. 401 and C.S. 453.


C.S. 557-3. Operating Systems. (E.E. 557.) A study of the supervisory programs within a computer system which interact most closely with the hardware, and which allow efficient and shared access to the computer. Topics covered include processes (communication implementation, synchronization), memory management (storage allocation, virtual memory), and processor management (multiprogramming, timesharing, scheduling). Prer., C.S. 401 or C.S. 553, C.S. 445, C.S. 583, or E.E. 651, consent of instructor.

C.S. 558-3. Artificial Intelligence. (E.E. 558.) The design of machines and systems that have been created to perform tasks that are considered to require intelligence. Prer., C.S. 210 and 401.


problems in computer science. Prer., admission to the Ph.D. program.

C.S. 800-1 to 10. Doctoral Research. An investigation in some specialized field of computer science. Approved and supervised by faculty members.

C.S. 920-1 to 3. Lower Division Undergraduate Level Independent Study. Selected topics at the elementary level for students who have had little or no prior computer experience.

C.S. 940-1 to 6. Upper Division Undergraduate Level Independent Study. This course provides opportunities for independent study, work on a small research problem, or tutoring of lower division computer science students. Prer., C.S. 210.

C.S. 950-1 to 6. Graduate Level Independent Study in Computer Science. This course provides opportunities for independent study, work on a small research problem, or tutoring of lower division computer science students.

**ELECTRICAL ENGINEERING**

E.E. 130-2. Introduction to Logic Circuits. A first course for electrical engineering students in the study of Boolean algebra and its application to the synthesis of logical circuits from logical elements such as and-gates, or-gates, not-gates, nand-gates, nor-gates, delay elements, and memory elements.


E.E. 210-3. Fundamentals of Computing I (C.S. 210) A first course in computing for those who will specialize in computers, covering the capabilities of the computer, the elements of a programming language, and the basic techniques for designing algorithms to solve practical problems. The programming language PASCAL is used as a vehicle for expressing these concepts (lecture and recitation). Prer., three years of high school mathematics including trigonometry, or Math. 110 or 102, or consent of department.


E.E. 257-2. Logic Circuits. A study of Boolean algebra and its application to the synthesis of logical circuits from logical elements such as and-gates, or-gates, not-gates, nand-gates, nor-gates, delay elements, and memory elements.


E.E. 313-3. Electromagnetic Fields I. Maxwell's equations postulated for free space and developed for material regions together with boundary conditions. Vector analysis concepts including gradient, divergence, and curl are developed as needed. Static and quasi-static electric and magnetic fields and energy are treated, with applications to capacitive, inductive, and resistive elements of circuit theory. Uniform plane waves in free space and lossy regions exemplify dynamic field problems. Prer., A.Math. 235.


E.E. 322-3. Electronics II. Transistor model at high frequencies; multi-stage amplifiers; frequency response of amplifiers; feedback; operational amplifiers; large signal amplifiers and distortion. Prer., E.E. 321 and 323.


E.E. 343-1. Electrical Laboratory I. For students not majoring in electrical engineering. Cathode-ray oscilloscope; electric circuits and measurements; electrical transients; introduction to the transformer and rotating electrical machinery. Coreq., E.E. 303.


E.E. 361-2. Electronics Laboratory II. Experimental investigations of the characteristics of semiconductor devices and their applications. Prer. or coreq., E.E. 321.


E.E. 401-3. Survey of Programming Languages. A variety of programming language features are studied from the point of view of the language user. Students explore these features by writing programs in PASCAL, ALGOL 60, FORTRAN, COBOL, LISP, and SNOBOL. Prer., C.S. 310, E.E. 351, or consent of instructor.


E.E. 415-3. Nonlinear Control Systems. The analysis and design of nonlinear feedback control systems; types and characteristics of
equilibrium states; limit cycle phenomena; the behavior of non-linearities such as hysteresis, saturation, and dead zone; phase space, describing function analysis. Lyapunov and Popov stability will be introduced. Prereq., E.E. 413.


E.E. 424-3. (D) Logic Circuit Design. Introduction to principles of modern communication theory and signal processing. Random processes will be introduced and used to compare the noise performance of AM, FM, and various digital modulation systems. Definition of information and channel capacity. Introduction to error correcting codes and further topics in modern communication theory. Prereq., E.E. 381 and 383.


E.E. 443-1. Elements of Electronics Laboratory. For students not majoring in electrical engineering. Prereq., E.E. 303 and 345 (or for physics and engineering physics majors only, Phys. 351 and 317); coreq., E.E. 403.

E.E. 450-3. (S) Analog Computer Simulation. Analog computing techniques including time and amplitude scaling, programming of linear and nonlinear differential equations. Applications of these techniques to simulate dynamic systems including an introduction to iterative analog computing. Some laboratory work on an analog computer and with digital simulation languages will be required. Prereq., A.Math., 236 and background in basic Laplace transforms and matrix operations.


E.E. 452-2. (P) Power Systems Laboratory. Emphasis is placed upon analysis and operation of power systems and interactions of power equipment under dynamic conditions. Transient phenomena of rotating machines. Prereq., E.E. 316 and 354 or consent of instructor.

E.E. 453-3. (D) Assembly Language Programming. (C.S. 453.) A laboratory course in programming at the machine language level. Lectures will deal with the organization of the machine, its effect on the order code, and techniques for programming in assembly language. Primary emphasis will be on preparing and running programs. Prereq., C.S. 310, E.E. 351 or consent of instructor.

E.E. 454-3. (S) Control Systems Laboratory. Experimental analyses of elementary control systems are considered. Measurements of steady-state and transient characteristics of feedback control systems are performed. Prereq., E.E. 413.

E.E. 456-3. (D) Computer Organization. (C.S. 450.) This course is concerned with computer architecture units, including the actual wiring of electronic logic circuits and with investigation of the properties and characteristics of those circuits. Circuits will be built from solid state gates, memory elements, and medium scale integrated circuits. Computer, control, communication, and data processing systems are studied. Prereq., E.E. 254 and 130/257.

E.E. 459-3. (D) Computer Organization. (C.S. 459.) This course is concerned with computer architecture units, including the actual wiring of electronic logic circuits and with investigation of the properties and characteristics of those circuits. Circuits will be built from solid state gates, memory elements, and medium scale integrated circuits. Computer, control, communication, and data processing systems are studied. Prereq., E.E. 130/257.

E.E. 460-2. (D) Computer Laboratory. This course will provide laboratory experience both with digital computer subsystems and with complete computer systems. The student will construct small subsystems and work with actual subsystems of a full digital computer. Prereq., E.E. 130/257, 458, and 459.

E.E. 461-2. (E) Electronics Laboratory III. Experimental work with oscillators, counters, switching circuits, r-f amplifiers, AM and FM modulators and demodulators, the superheterodyne receiver. Prereq., E.E. 362.

E.E. 462-2. (F) Transmission Laboratory. Experiments verifying and extending concepts learned in E.E. 314. Applications of coaxial transmission line and waveguide to slotted-line measurement of impedance, stub impedance matching, antenna patterns, and the microwave superheterodyne receiver, making use of electronic and solid-state generators, crystal detectors and frequency converters, bolometer power bridge, cavity frequency meter, etc. Studies of the low-frequency artificial line for power and telephone transmission, time-domain reflectometer, hybrid tee, and ferrite devices. Prereq., E.E. 314 or equivalent.


E.E. 465-2. (C) Communication Laboratory. Laboratory experiments demonstrating material taught in E.E. 424. Use is made of spectrum analysis to study baseband signals and signal processors. Topics include noise, AM, FM, sampling, TDM, digital modulation, errors, equalizers, and a complete communication system. Prereq., E.E. 331.

E.E. 491 to 499-1 to 3. Special Topics. Credit and subject matter to be arranged. Prereq., variable.

To register for 500-level courses, an undergraduate student must have a B average or must petition and have the consent of instructor. The courses listed below are in general offered once per year with the exception of courses marked with an asterisk, which are offered occasionally or on demand.


E.E. 503-3. (M) Physical Properties of Crystals. Utilizing the symmetry properties of crystals, a number of their physical properties will be studied. Tensor analysis will be developed and used to study paramagnetic and diamagnetic susceptibility, electric polarization, stress and strain tensor, piezoelectricity, elasticity, thermal and electrical conductivity, thermoelectricity, refraction, and optical activity.


E.E. 509-3. (M) Laboratory In Solid State Physics. (C.S. Phys. 509.) Experimental investigation on significant experiments in solid state physics. Short lectures in basic theories and experimental techniques. Experiments include x-ray, thermal, and various.
optical and magneto-optical effects, liquid crystals, semiconductor parameters, and others. Measurement techniques use cryogenic fluids, laser light, spectroscopy, high pressure apparatus and other special instruments. Prer. or coreq., E.E. 454 or E. Phys. 440 or consent of instructor.

E.E. 511-3. (F) Waveguides and Transmission Lines. An intermediate-level course dealing with guided-wave systems at HF, microwave and optical frequencies. Modern waveguiding structures, including circular metallic waveguides, microstrip transmission lines, and optical waveguides are treated. Additional material may include waveguide losses, excitation of waveguides, microwave network theory, coupled-mode theory, resonators, Gaussian beams, pulse propagation in waveguides. Prer. E.E. 514 or equivalent.

E.E. 513-3. (F) Electromagnetic Radiation. Incoherent radiation, including the basic body radiation law, is studied first, concluding with derivations of some of the fundamental equations. Radiation from electrical charge in motion is considered next. Then these concepts are specialized to broadly applicable formulations for radiation from coherent current sources. Concludes with a study of the radiation and impedance characteristics of several types of antennas and antenna systems. Prer. E.E. 514 or equivalent.


E.E. 519-2 (F) Radio Meteorology. Application of electromagnetic field concepts plus some atmospheric physics to the problem of propagation of radio waves through the lower atmosphere. Problems in radio communication and atmospheric sensing are considered. Prer. E.E. 513 or consent of instructor.

E.E. 521-3. Analytical Processes in Engineering. Develops analytical skills in areas of concern in engineering applications. Teaching will be by example rather than by course content but will include integration, differentiation, summation of series, approximations, and manipulation of trigonometrical expressions. Prer. fluency in elementary mathematical operations, A. Math 255 or equivalent.


E.E. 531-3. Telecommunications Systems. The telecommunication systems currently in use and some of the basic technical concepts of their operation are treated in this course. The systems treated include telephone systems (voice, data, and facsimile); coaxial cable and waveguide systems; microwave relay systems (surface and satellite); low-frequency radio systems (communication, instrumentation, and navigation); medium-frequency radio systems (broadcast); high-frequency radio systems (broadcast, including AM and TV; point-to-point, including tropo-scatter and meteor scatter; instrumentation; and navigation); and radar. The basic technical concepts treated include signal transmission theory (including the propagation of guided and unguided electromagnetic waves) and interrelations between channel capacity, traffic theory, information measurement, bandwidth, signal power, and noise power. For persons with engineering background. Prer. calculus and some engineering background.

E.E. 532-3. Telecommunications Systems Theory. This course is concerned with three principal topics: operations management (operations research, communication theory, and future trends in communication systems information handling capabilities). The mathematical fundamentals for study of these topics will be covered, but the student will be assumed to have a knowledge of elementary mathematical probability theory and statistics. Prer. E.E. 531 and 534 or equivalent.

E.E. 534-3. Introduction to Telecommunication Systems Theory. Formulates telecommunications problems in terms of guiding and unguided electromagnetic fields and waves, probability, wave propagation, and information theory for persons without a previous technical background. Designed especially for those participating in the communication curriculum whose undergraduate major was in a non-technical field.


E.E. 537-2. Telecommunications Laboratory. Laboratory experiments demonstrating and verifying material taught in E.E. 531. Use is made of spectrum analysis to study signal processors. Topics include noise, AM, FM, PM, TDM, FDM, and data communication. Prer. or coreq. E.E. 531.

E.E. 539-Variable credit. Telecommunication Project. Supervised study project.


E.E. 544-3. (S) Introduction to Modern Control Theory. State space concepts, state space representation of automatic control systems; state transition matrices and state transition function; stability of linear systems, controllability and observability; state-feedback control, realization of system transfer matrices; state estimator and design of feedback systems. Prer. E.E. 531 or 413.

E.E. 545-3. (S) sampled-Data and Digital Control Systems I. A study of the analysis and synthesis of control systems characterized by the transmission of control signals by means of periodic pulses; z-transform theory and pulse transfer functions are introduced with applications to digital computers. Prer. E.E. 412.


E.E. 583-3. (D) Fundamental Concepts of Programming Languages. (C.S. 563.) In-depth study of semantics and pragmatics of programming languages: primitives, composition, states and lifetimes, and more. Examples are drawn from FORTRAN, PASCAL, ALGOL, COBOL, LISP, SNOBOL, and PL/I. Relationship of language to hardware. Prer. E.E. 401 and 453 or consent of instructor.

E.E. 584-3. (D) Numerical Methods for Digital Computers. (C.S. 554.) This is a survey of topics in the border line area between
numerical analysis and computer systems programming and design. A knowledge of assembly language and some familiarity with computer architecture are necessary for the course. Some topics covered are computer round-off error, floating point arithmetic, the generation of random numbers, and parallelism in numerical calculations. Prereq., ECE 401 and numerical analysis.

E.E. 555-3. (D) Nonnumerical Techniques for Digital Computers. (C.S. 555.) A study of the methods used in implementing processors for nonnumerical problems; dynamic storage allocation, list processing, recursive programming and string manipulation. Several special purpose languages and their implementations will be studied in detail. Prereq., ECE 403 and 401 or equivalent.

E.E. 556-3. (D) Translation of Programming Languages. (C.S. 556.) A study of practical techniques for translating text generated by humans into programs understood by machines: lexical, syntactic and semantic analysis, code generation, assembly and optimization, error reporting and recovery. Students write and run their own compilers. Prereq., ECE 553 or consent of instructor.

E.E. 557-3. (D) Operating Systems. (C.S. 557.) A study of the means by which programming systems are integrated into the overall operation of a computing facility. Program segmentation and loading, filing systems, resource allocation. Prereq., ECE 401 and 463.

E.E. 559-3. (D) Artificial Intelligence. (C.S. 559.) The design of machines and systems that have been created to perform tasks that are considered to be intelligent. Prereq., ECE 401.

E.E. 559-3. (D) Advanced Computer Architecture. A broad scope treatment of the important concepts in the structural design of computer systems. A large number of actual computers will be studied in depth. Prereq., ECE 469 or consent of instructor.


E.E. 562-3. (C) Information Theory and Coding. (C.S. 562.) Information and entropy. Markov chains, combined systems, continuous systems, coding and channel capacity, modulation, applications to communication engineering. Prereq., ECE 381 or consent of instructor.

E.E. 563-3. (C) Theory and Application of Digital Filtering. The use of digital and discrete time systems in engineering has been increasing due to the widespread use of digital computers and because of the ease of manufacture of digital components. This course is an introduction into the techniques that are used to analyze such systems. The primary emphasis is on study of linear time systems that are used to perform operations on random sequences for the purposes of signal detection, prediction, and signal enhancement. The course will cover such topics as linear difference equations, z-transforms, characterization of discrete-time systems by state variables, random sequences, deconvolution filters, discrete-time matched filters and Wiener filters, discrete-time filters in estimation and detection, properties of discrete stochastic processes. Prereq., ECE 381 or Math. 481 and 381.

E.E. 585-3. (C) Detection and Extraction of Signals From Noise.* (C.S. 555) This course is an introduction into detection and extraction methods used in signal processing and includes such subjects as detection theory, detection of known and random signals, optimum received design, and evaluation, estimation theory, estimation of parameters, Wiener filtering, Kalman-Bucy filtering, applications to problems in communication theory. Prereq., ECE 381 or equivalent.

E.E. 586-3. Optimization Techniques. An introduction to problems involving optimization in the presence of uncertainty and a survey of computational methods for obtaining solutions. Introductory material includes necessary conditions for solutions to unconstrained and constrained minimization problems (Kuhn-Tucker conditions, convex programming, singular and multiple-minima search) are given, including direct and gradient methods. Applications may include linear programming and game theory, decision theory, pattern recognition, dynamic programming, sequential decision theory, Markov chains with decision rules, and optimization of dynamical systems. Prereq., ECE 381 or equivalent.

E.E. 590-3. (S) Queueing Theory. Queueing theory, particularly applied to communication traffic; component reliability, environmental reliability, system reliability, standby redundancy, parallel redundancy, repair and preventive maintenance, system availability. Prereq., ECE 381.

E.E. 598-3. (C) Optical Communication Systems. Analysis and design of communication systems which use light as the information carrier. Faser-space, fiber-optic, turbulent atmospheric, and scattering channels; statistical channel characterization; spatial aspects of optical channels; modulation, propagation, and detection of random fields. Communication and incoherent sources: modulation methods; spatial modulation. Modeling and statistical analysis of quantum photodetectors; laser and related processes; thermal and shot noise. Direct and heterodyne detection; analog and digital transmission; signal-to-noise ratios, error probabilities. System optimization. Prereq., ECE 391 and 381 or consent of instructor.

E.E. 599-3. (C) and (D) Optical and Spatial Information Processing.* Two dimensional processing of two- and three-dimensional spatial information. The scalar diffraction theory necessary to describe the information-bearing wavefront is developed and wavefront reconstruction, modulation, and reconstruction are described. Topics include holography, Fourier transform properties of lenses, two-dimensional convolution and correlation, pattern recognition, optical information processing, and data storage. Prereq., ECE 314 and 381 or equivalent.

E.E. 670-3. (P) The Nature of Polyphase Induction Motors.* Operational behavior of induction motors and the effect of design on performance characteristics are studied. The effect of unbalanced supply voltages and of unbalanced design is investigated. The effect of variable frequency supplies and application of inverters to induction machines are considered. Prereq., ECE 315.

E.E. 671-5. (P) Energy Systems Analysis I. Transmission line constant, including details of X/R and U/I and effect. Analysis of balanced and unbalanced line using distributed parameters, energy flow from circle diagram approach, traveling-wave phenomena, stability. Prereq., ECE 313 and 316. (Also available via ACE TV.)

E.E. 672-3. (P) Energy Systems Analysis II. Application of symmetrical components to faults on transmission systems, determination of system constants, introduction to calculating board and network analyzers, measurement of sequence quantities, relaying philosophies, power-flow studies. Prereq., ECE 316. (Also available via ACE TV.)

E.E. 673-3. (P) Tensor Analysis of Electric Energy Systems.* The application of matrix and tensor methods to the analysis of energy systems and subsystems; energy transfer, load prediction and system design. Introduction to Frobenius’ method of Diakoptics. Prereq., ECE 416 or equivalent.


E.E. 676-3. (P) Power Distribution Systems. Use of per unit methods to find transient and steady-state behavior of industrial power systems due to motor starting, spot welders, etc. System and device responses due to series and shunt capacitors and problems of subharmonic and over-excitation on induction motors. Prereq., ECE 213, 214, 316, 331. (Also available via ACE TV.)

E.E. 677-3. (P) Power System Protection. Concepts of power system operation and the use of R-X diagrams in selection of protection needs. Comparison of electromechanical and static protection systems. Review of problem areas such as system stability, loss-ofexcitation and /EHV line protection. Prereq., ECE 213, 214, 316, 333. (Also available via ACE TV.)


E.E. 683-3. Biomedical Systems Analysis. Quantitative modeling of biological processes aided by computer simulation. Typical systems studied will be mammalian cardiovascular and respiratory systems, skeletal and cardiac muscle, eye tracking mechanisms, and ecological models. Necessary biological background will be presented. Prereq., A.Math. 236 or 236.

E.E. 685-3. (S) Electroacoustics. Derivation of the acoustic wave equation; plane waves; solutions in closed and open pipes, acoustic compliance, incidence, and resistance; signal flow graphs for electromechanical systems; electro-acoustic signal flow graphs; time-sequential digital computer algorithms for finite element matrix inversion. Prereq., ECE 214, 314, or consent of instructor.

E.E. 686-3. (S) Loudspeaker Synthesis. Continuation of E.E. 586. Closed and vented box direct radiator drivers, eigenvalues for loudspeakers; closed box loudspeaker analysis; Thiele alignment of
vented box loudspeakers; filter assisted alignments; Small's synthesis of acoustic and mechanical parameters; limitations of presently marketed systems; power handling considerations; cross-over network theory. Prereq., E.E. 585.


E.E. 590-3. Graduate Seminar. Meetings of staff members, visiting speakers, and graduate students to discuss recent advances in electrical engineering research.

E.E. 591 to 599-0 to 3. Special Topics. Intermediate courses of variable title and variable credit, usually offered once by guest lecturers. See current departmental notices for details.


E.E. 601-3. Solid State Electronics I. Introduction to the quantum theory of solids: free electron theory of metals; crystal lattices; energy band theory of crystals (particularly semiconductors); electron dynamics in perfect crystals (including tunneling); Fermi statistics; electron-photon interactions; lattice vibrations; electron transport in real crystals; elementary theories of ferromagnetism and of superconductivity. Prereq., E.E. 588 and consent of instructor.


E.E. 608-0 to 6. Advanced Topics in Physical Electronics. Seminar with discussion of topics of current interest. Most lectures are presented by the participants. Each participant registered for credit will present at least one lecture per semester. Prereq., consent of instructor.


E.E. 621-3. Mathematical Functions for Engineering. Derivation and manipulation of important functional properties as required in engineering applications. Emphasis on those properties that have been found important in engineering. Functions examined include gamma, Bessel, Legendre, elliptic, hypergeometric, and others. Prereq., E.E. 521 or M.E. 522.

E.E. 627-3. Mathematical Methods of Field Theory I. Study and application of some of the mathematical methods needed in solving certain boundary-value problems in electromagnetic fields and in quantum mechanics. The material will be chosen from a wide area including the following: Wiener-Hopf and other transform methods; singular integral equations; variational calculus; mode expansions; Green's theorems; quasi-static methods; asymptotic, steepest-descent, and WHB techniques; linear vector spaces, and matrices. These methods will be illustrated by physical examples taken from waveguide diaphragms, junctions and other discontinuities, linear antennas and antenna arrays; diffraction and scattering; wave propagation at surface and inhomogeneous media. Prereq., an introduction to complex variables and E.E. 514, or equivalent.


E.E. 641-3. Optimal Control Theory. Formulation of optimal control problems, performance index, the variational approach to optimal control problems; Pontrjagin's maximum principle; Bellman's dynamic programming; the principle of optimality, the Hamilton-Jacobi equation; computational methods; the steepest descent method, variation of extremals, quasilinearization, and gradient projection, etc. Prereq., E.E. 544.


E.E. 673-3. Advanced Synchronous Machines. Study of transient characteristics of synchronous machines such as short-circuit currents and torques, cut-of-phase synchronizing, and starting torque. Prereq., E.E. 518 or equivalent.

E.E. 705-3. Electromagnetic Fields in Electrical Devices II. Numerical methods for nonlinear electrical devices; nonlinear partial differential equations; representation of magnetization characteristics; variational principle; finite difference techniques; relaxation techniques; alternating direction methods; steady-state solutions; application to rotating machines and nuclear accelerator magnets. Prereq., E.E. 704.

E.E. 691 to 699-0 to 3. Selected Topics. Courses of variable title and variable credit, usually offered once by guest lecturers. See current departmental notices for details.


E.E. 800-0 to 8 (16 to 24 maximum). Doctor's Thesis.

E.E. 920-1 to 3. Independent Study. An opportunity for sophomores to do independent, creative work. Prereq., consent of instructor.

E.E. 930-1 to 3. Independent Study. An opportunity for juniors to do independent, creative work. Prereq., consent of instructor.

E.E. 940-1 to 3. Independent Study. An opportunity for seniors to do independent, creative work. Prereq., consent of instructor.

E.E. 950-1 to 6. Independent Study. Affords an opportunity for students to do independent, creative work at the 600 level. Prereq., consent of adviser.

E.E. 960-1 to 6. Independent Study. Affords an opportunity for students to do independent, creative work at the 600 level. Prereq., consent of adviser.

ENGINEERING — NONDEPARTMENTAL TECHNOLOGY COURSES

Engr. 101-2. Engineering Drawing I. Beginning engineering drawing including use of instruments, orthographic projection, pictorial drawing, sections, fasteners, dimensioning, and working drawings.

Engr. 109-3. Creative Uses of Technology I. An introductory-level course for students not majoring in engineering or science. The course is centered around concepts and procedures employed by the engineer and scientist, but with major emphasis on improvement of the understanding of modern technology, its methods, and its impact on society. Modeling, decision making, and feedback as applied to biological, mechanical, electrical, thermal, and other systems. Study of problems such as population growth, traffic flow, spread of disease. Use and impact of computer.

Engr. 110-3. Creative Uses of Technology II. A continuation of Engr. 109 in which the techniques learned there are developed further and applied to problems of general interest. Prereq., Engr. 109.


Engr. 300-2. Interaction of Engineering and Society. A seminar course of case studies in the interrelationships of engineering and society—the effects of social, political, and economic pressures on decision making and operations related to engineering and, conversely, the effects of engineering works on society. The students
prepare written cases for discussion by the class. Prereq., consent of instructor.


E. Phys. 400-3. Technical Report Writing and Communication. Instruction and practice in writing and analyzing reports, papers, articles, and other forms of communication. Style and editing are emphasized. Prereq., junior standing.

E. Phys. 400-3. Occupational Safety Management. Introduction and orientation to the basic fundamentals of the interdisciplinary field of occupational safety and health including the philosophy of recent federal and state laws and standards. Open only to students in the Master of Engineering program or by consent of instructor.

E. Phys. 401-3. Undergraduate Research. Supervised individual research projects in the student's major department.

E. Phys. 403-1. Literature of the Sciences and Engineering. (Bib. 463). A brief survey of the chief reference sources in the sciences and engineering leading to the development of a bibliography in the student's chosen field of interest, under the guidance of the appropriate science librarian. Recommended for majors in sciences and engineering.

**ENGINEERING PHYSICS**

E. Phys. 111-4. General Physics. Two lecs., two rec. per wk., plus four evening exams during the semester. First semester of two-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. Prereq., knowledge of algebra, geometry, and trigonometry. Coreq., calculus through derivatives and indefinite and definite integrals of polynomials and trigonometric functions, as typically covered in Math. 130 or A. Math. 138.


E. Phys. 114-1. Experimental Physics. One lec., one 2-hour lab. period per wk. To be taken in parallel with E. Phys. 112.


E. Phys. 215-1. Experimental Physics. One lec., one 2-hour lab. per wk. To accompany E. Phys. 213. Includes many experiments in modern physics, including atomic physics, solid state physics, electron diffraction, radioactivity, and quantum effects.

E. Phys. 317-2 and 318-2. Junior Laboratory. One lec., one 3-hr. lab. per wk. Contains experiments on data handling, electrical measurements, electronics, optics, vacuum techniques, heat and thermodynamics, mechanics, and modern physics. Emphasis will be on developing basic skills and on design of experiments. Each student will carry out at least one project experiment each semester. Coreq., E. Phys. 331.


E. Phys. 341-3. Thermodynamics and Statistical Mechanics. Statistical mechanics applied to macroscopic physical systems; statistical thermodynamics; classical thermodynamic systems; applications to simple systems. Relationship of the statistical to the thermodynamic points of view. Prereq., E. Phys. 322.


E. Phys. 451-3. Light. Basic electromagnetic theory of light, using Maxwell's equations. Examples in geometrical optics; extensive applications in physical optics, including diffraction and polarization. Spectroscopy, including Zeeman and Paschen effects, and fluorescence. Recent advances in experimental techniques; microscopes, optical lasers, image converters, etc. Prereq., E. Phys. 332.


E. Phys. 493-2, 496-2. Senior Laboratory. One lab. per wk., designed to be taken with E. Phys. 491 and E. Phys. 492. Experiments in advanced topics to provide a reality of experimental physics so that we will gain a better understanding of lecture material and an appreciation of the vast amount of experimental work done in the physical sciences today. For students registered for E. Phys. 496 and not E. Phys. 455, and with E. Phys. 451 as a prerequisite, some experiments from the light laboratory can be included on a replacement basis. Prereq., consent of instructor.

E. Phys. 500-variable credit. Selected Topics for Independent Study. Credit and subject matter to be arranged. Prereq., consent of instructor.

E. Phys. 501-3. Health Physics. Spring. Two lecs., one lab. per wk. Health physics is a course designed to provide job-oriented skills. Topics covered include radiation dosimetry, radiation biophysics, radiocautery, reactor health physics, and medical physics. The labs include exercises with radioactive isotopes as well as tours of off-campus facilities. Prereq., consent of instructor.


E. Phys. 585-3. Gravitational Theory. Alternate years. Theory of general relativity. Three lecs., per wk. Einstein's relativistic theory of gravitation is presented from a geometric viewpoint; applications to astrophysical problems (gravitational waves, stellar collapse, etc.) are given.

**INDUSTRIAL ENGINEERING**


Course Descriptions / 323
I.E. 400-1 to 6. Independent Study. Study of special projects by student and instructor. Prer., consent of instructor.


I.E. 460-3. Senior Project. A major project of the student's choice, simulating as closely as possible the industrial design engineer's professional activity. Strong emphasis is placed on economic evaluation methods, preparation of all specifications, and final report. Prer., senior standing.


I.E. 500-1 to 8. Independent Study. Special studies agreed upon by student and instructor.


I.E. 595-3. Selected Topics. Treatment of specialized aspects of industrial engineering by staff or visiting lecturers. Prer., consent of instructor.

MECHANICAL ENGINEERING

M.E. 130-2. Introduction to Mechanical Engineering. Introduction to vector analysis, dimensional analysis, and the engineering approach to problem solving and design. Considerable emphasis is given to ethics and opportunities in engineering. Prer., high school algebra.


M.E. 195-1 to 3. Special Topics in Mechanical Engineering. Subject matter to be selected from topics of current technological interest. Credit to be arranged. Prer., consent of instructor.


M.E. 295-1 to 3. Special Topics in Mechanical Engineering. Subject matter to be selected from topics of current technological interest. Credit to be arranged. Prer., consent of instructor.

M.E. 301-3. Introduction to Materials Science I. (Aero. 326.) The development of the physical principles relating the structural features of materials to their observed properties. Prer., E.Phys. 212.


M.E. 385-3. Mechanics V. Application of exact and approximate theories to engineering problems in fluids. Examples include: potential flow theory; Euler's equations for inviscid fluids; Bernoulli's equations; Navier-Stokes equation; pipe flow; boundary layer; and compressible flow. Prer. M.E. 383.

M.E. 395-1 to 3. Special Topics in Mechanical Engineering. Subject matter to be selected from topics of current technological interest. Credit to be arranged. Prer., consent of instructor.
M.E. 403-1 to 6. Independent Study. Subjects arranged in consultation with undergraduate advisor to fit needs of the particular student. Prereq., senior standing.


M.E. 414-3. Mechanical Engineering Design I. Review of mechanics of materials and stress analysis; detailed design of various machine elements such as axles, springs, braces, and gears. Prereq., M.E. 384.

M.E. 416-3. Mechanical Engineering Design II. Individual device development and product development cycle. Introduction of topics to motivate the creative process, the quantitative process, or a blend. Incorporation of the supporting disciplines of analysis, organization, cooperation, and communication as needed. Identification of difficulties in creation, organization, decision, and compromise. The subject material is organized chronologically so that a project can be started immediately. Prereq., M.E. 414.

M.E. 421-3. Air Conditioning. Physical and thermodynamic laws of water vapor and air mixtures; basic principles of heating and ventilating; determination of heating and cooling loads; examination of heating and cooling systems. Prereq., M.E. 313 and 362.


M.E. 442-3. Mechanical Engineering Laboratory. Two 3-hr. lab. periods per wk. plus 1 hr. of classroom work. Team participation on nine experience projects on conventional equipment (compressor, engine, fan, etc.). There is considerable emphasis on oral and written communication. Prereq., M.E. 313, 316, 354, and 385.


M.E. 459-3. Computer-Aided Thermal Design. Computer programming of thermodynamic cycles; compressor, expander, and heat exchanger component design; team design project in solar power, heating, or cooling system; oral and written reporting. Prereq., M.E. 313 and 362.

M.E. 461-4. Analytical Methods of Engineering I. Solutions of linear algebraic equations and applications to theory. Topics include matrix analysis, eigenvalue problems, bilinear and quadratic forms, boundary and initial value problems of physics, solution of wave equations by the method of characteristics and applications to elastic wave propagation and supersonic flows. Prereq., A.Math. 230 or equivalent.

M.E. 462-4. Analytical Methods of Engineering II. Boundary and initial value problems of physics. Topics include solution of partial differential equations of physics by the methods of separation of variables; Sturm-Liouville theory, variational principles and applications; Green's functions and applications. Prereq., A.Math. 230 or equivalent.

M.E. 471-4. Fluid Mechanics. Viscous incompressible and compressible fluid flows. Topics include derivation of equation governing viscous compressible fluid motion; specializations to simple flows; boundary-layer theory; nozzles and diffusers; transition. Prereq., M.E. 385 or equivalent.


M.E. 487-4. Rigidity and Dynamics. Kinematics of a rigid body, principal axes, and moments of inertia, angular momentum of a rigid body, Euler's equations. Applications include topics such as motion of a rigid body with a fixed point under no forces, the spinning top, stability of a slewing top, the gyrocompass, motion of a billiard ball, rotational machinery, etc. Prereq., M.E. 382 or equivalent.

M.E. 490-1. Senior Seminar. Presentation of broad range of professional opportunities available to graduating seniors through discussions with practicing engineers. Prereq., senior standing.


M.E. 495-1 to 3. Special Topics in Mechanical Engineering and Mechanics. Subject matter to be selected from topics of current technological interest. Credit to be arranged.

M.E. 500-1 to 5. Independent Study. Available only through approval of graduate advisor. Subject arranged to fit needs of the particular student. Prereq., graduate standing.

M.E. 503-3. Yield-Limited Behavior of Materials. Analysis of material behavior within the "elastic range" with emphasis on the phenomenon of yield and factors that influence it. Introduction to the theory of plasticity; examination of the theory of dislocations; study of strengthening mechanisms in solids. Consideration of a variety of time-dependent but reversible (inelastic) deformation phenomena. Presentation of appropriate engineering case studies to augment various topics. Prereq., M.E. 461 or equivalent.

M.E. 509-3. Plasticity and Creep. Inelastic deformation of materials such as metals, alloys, glasses, composites, polymers, etc., from the phenomenological and structural point of view. Case studies of plastic and creep deformations in engineering materials. Prereq., M.E. 401 or equivalent.

M.E. 505-3. Fracture. Examination of basic mechanisms controlling fracture of high-strength materials. Examples include reduction of critical load by plastic deformation in engineering materials at high-strength levels prior to catastrophic fracture. Emphasis is placed on selection of materials in terms of toughness as well as strength. Prereq., M.E. 401 or equivalent.

M.E. 513-3. Macroscopic Thermodynamics. (Ch.E. 538.) Axiomatic presentation of fundamentals of classical thermodynamics. Energy, work and heat; first law. Equilibria, reversible and irreversible processes; entropy production law; applications to stabilty, phase equilibria, electric and magnetic work. Irreversible thermodynamics and the Onsager reciprocal relations. Prereq., M.E. 313 or equivalent.


M.E. 521-3. Methods of Engineering Analysis I. Selected topics from linear algebra, complex variable theory, and ordinary differential equations. Prereq. to methods courses in engineering. Prereq., graduate standing or consent of instructor.

M.E. 522-3. Methods of Engineering Analysis II. Selected topics from integral transforms methods, partial differential equations, perturbation theory, and probability and statistics. Prereq. to methods courses in engineering. Prereq., graduate standing or consent of instructor.

M.E. 523-3. Introduction to Fluid Dynamics. (Aero. 517.) Physical properties of gases and liquids; kinematics of flow fields; equations
College of Environmental Design

ENVIRONMENTAL DESIGN

Env.D. 100-6. Environmental Design Studio: Individual Scale. Students, working individually and in small teams, develop designs for the needs of individuals. Design problems concentrate on sense of place, anthropometrics, pattern languages, increasing environmental awareness, and realms of privacy.

Env.D. 101-6. Environmental Design Studio for Small Groups. Students, working individually and in small teams, develop designs for the needs of small groups. Design problems concentrate on sense of social interaction, diagramming social forces, multifunctional design, and privacy in a social context. Prereq.: Env.D. 100.

Env.D. 104-2. Environmental Design Perspectives. A survey of major contemporary environmental issues which are representative of faculty teaching and research interest in the College of Environmental Design. This introductory course for non-environmental design students will provide an overview of the environmental design philosophy and problem-solving approach to selected environmental problems.

Env.D. 105-3. Elements and Issues of Environmental Design. Principles of environmental design: attitudes toward the physical surroundings, identification of issues confronting the design and planning of future physical environments, and exposure to and reinforcing the elements and vocabularies for determining environmental qualities as they are translated by the environmental designer in the physical setting.

Env.D. 110-3. Introduction to the Social Sciences and Environmental Design. An introduction to the theories, methods, and research findings of psychology and sociology as they apply to environmental design. Topics covered include human expression through the man-made environment, understanding and reacting to that environment, social science methods in environmental design research, and the relation of small group processes to environmental design practice.

Env.D. 111-3. Programming and Evaluation. A study of current methodologies that enable designers to evaluate existing features of
the man-made environment from a social perspective. The course then teaches application of the evaluations to the planning of the design or redesign of this made environment.

Env.D. 120-3. Beginning Graphic Systems. Deals with introducing the tools and techniques used to communicate graphically. It includes freehand sketching, model making, an introduction to orthographic and isometric projection, and an introduction to one- and two-point perspective.

Env.D. 121-3. Intermediate Graphic Systems. A continuation of Env.D. 120, dealing with the fundamentals of graphic communication, perspective, freehand model making, color, etc. Prereq., Env.D. 120.

Env.D. 130-3. Introduction to Natural Science/Technology and Environmental Design. An introduction to the use of natural science and technology in such environmental design career areas as human-scale design, architecture, and land-use planning. The course will study the influence of natural science and technology on these major design fields through the use of lectures and a survey of recent literature.


Env.D. 134-3. Applications of Mathematics and Physics to Problems in Environmental Design. Physics and mathematics methods are applied to physical concepts in solving basic environmental design problems at the human-scale, architectural, and land-use planning levels. Prereq., high school algebra.

Env.D. 200-6. Environmental Design Studio for Complex Organizations. Continuation of environmental design studio sequence to the organizational needs of the human-made physical environment. Faculty-defined problems, research, scale, tools, etc., leading to physical form design. Prereq., Env.D. 101.

Env.D. 210-3. The Socio-Political Context of Environmental Design. Looks at the social, cultural, political, and economic dynamics of land use at the community and regional levels. Also teaches techniques of primary research used to determine community-level user needs. Prereq., Env.D. 111.


Env.D. 221-3. Advanced Modeling. Structured to introduce the student to the more detailed aspects of simulating space through model building. Each student will be required to build a scale model of an historic landmark building.

Env.D. 230-3. Materials and Technology for Environmental Design. A survey of materials and the properties which dictate limits to their use in design fields. Studies major categories of materials, such as thermoplastic and thermoset plastics, and investigates recent developments in the introduction of new materials and new uses for old materials. Prereq., Env.D. 131.

Env.D. 231-3. Morphological Systems. Investigates form, natural and man-made, from the point of view of the environmental forces that shape it. Student projects focus on the analysis of interdependence of form and environment.

Env.D. 300-5. Environmental Design Studio for Community Problems. Continuation of environmental design studio sequence to neighborhood- or metropolitan-scale problems in the human physical environment. Faculty-defined problems, research, scale, tools, etc., leading to physical form design. Prereq., Env.D. 200.

Env.D. 310-3. Planning and Design Law. Deals with what society imposes upon the designer and planner as legal requirements to be met, how to find out about these requirements, how to understand them, and how to satisfy and carry through changes in these laws. Prereq., Env.D. 312-3. Community Growth. Examines community growth and growth controls in terms of social causes and consequences, legal and ethical issues, and planning techniques.

Env.D. 313-3. Citizen Participation in Planning. Along with some of the history and philosophy concerning citizen participation in planning, this course covers various methods by which the public can become involved in planning decisions and specific examples of situations where these methods have been used.

Env.D. 320-3. Computer Applications for Environmental Design. Introduces students to computer techniques that can be used for analysis of problems and graphic display of solutions in the environmental planning and design professions. Techniques that will be useful for the architect, landscape architect, city and regional planner, geographer, and other design professionals will be covered.


Env.D. 323-3. Mathematical Models for Environmental Design. The use of mathematical models to describe and predict the performance of environmental design systems. Computer-aided design techniques and advanced computer graphics as design tools will also be covered.

Env.D. 333-1 or 2. Practicum in Solar Technology. Individuals or small teams will develop a solar project from conception through construction. Projects will be related to the operations of the college's House of Essentials Project (1972 Marine). Prereq., Env.D. 332.

Env.D. 332-3. Solar Technology. Introduces students to the expanding potential of solar technology relevant to the environmental design profession, through readings and lectures to the nature of the energy crisis and the potential role of solar energy in the future. Prereq., Env.D. 333-3. Appropriate Technology. Students, working individually or in small teams, develop designs for and actually construct simple tools and devices and small experimental dwellings. Emphasis on development of low-cost building technologies, such as passive solar energy systems and energy recycling systems. Prereq., Env.D. 332.

Env.D. 335-1 or 2. Practicum in Appropriate Technology. Students apply skills from Env.D. 332 and 333 in actual contexts. Field work sites range from the college's House of Essentials Project in Boulder to sites in Colorado and the Third World. Credit arranged with instructor. May be taken twice with instructor's consent.

Env.D. 337-3. Systems of Structure and Fabrication. Deals with the current state-of-the-art of structure and fabrication of buildings, both locally and in many foreign countries. Coverage will include systems building (prefabrication in varying degrees) and conventional on-site fabrication. Also, fundamentals of prestressed concrete, tilt-slab construction, and polyurethane structures. Prereq., second, third, or fourth year students or instructor's consent.


Env.D. 431-4. Comparative European Environments. A summer field seminar in Europe offered in alternate years to inspect new towns, satellite cities, and other forms of urban settlement and city and regional planning. It is open to students with a planning emphasis. Prereq., consent of instructor.

Env.D. 432-3. Environmental Impact Assessment. Field-oriented seminar in current environmental impact controversies. Attention is given to the history, theory, and application of impact analysis at the state level for designers, land-use planners and others involved in resource decisions. Prereq., consent of instructor.
School of Journalism

Jour. 100-3. Contemporary Mass Media. Examines the mass media and their interaction with society, looking at journalism and the mass media in historical, intellectual, economic, political, and social contexts. Prer., Jour. 100.


Jour. 320-4. Reporting of Public Affairs. Problems and practice in reporting news of government, politics, the courts, industry, business, science, and other areas involving public issues. Prer., Jour. 250.


Jour. 364-3. Principles of Broadcast Production. Introduction to the use of radio and television equipment. Emphasis is on applying the basic principles to professional program production. Prer., Jour. 250.

Jour. 367-2. Television Production II. Production of material for biweekly segments on CU Today. Students produce material in various formats—16mm, super 8mm, remote and studio videotape, live studio, etc.—with and without editing. Prer., Jour. 364 or Comm. 362.


Jour. 429/529-3. Public Relations Practice. Seminar for students intending to enter the public relations field. Examines specific tools and activities of the field.


Jour. 443/543-3. Retail Advertising Campaigns. Preparation, selling, and servicing of advertising in the retail field; rate structures; building national and retail linkage. Prer., Jour. 440.


Jour. 464/564-3. Radio-TV Station Organization and Operation. Analysis of station operations, public relations, personnel, financing, labor relations, and legal regulations as well as the manager's ethical and social responsibilities. Prer., Jour. 100 or Comm. 260.


Jour. 470/570-3. Critical Writing for the Journalist. Analysis of the entertainment area, especially as it pertains to the print media; emphasis is on the composition of criticism and the attitudes and writing techniques of individual critics. Jour. 480/580-3. Magazine Article Writing. Practice in writing freelance articles; consideration of types, sources, methods, titles, illustrations, and marketing. Prer., Jour. 250 or consent of instructor.

Jour. 485/585-3. Magazine Editing and Production. Editorial and production aspects of magazines, both general and specialized, including company publications, industrial journals, and other types of limited-audience publications. Prer., Jour. 350 or consent of instructor.


School of Law

FIRST YEAR


Law 520-1. Legal Writing. Texts and mimeographed materials. Materials and methods of legal research and writing. After intensive consideration of the types of law books and their functions, students prepare written material of various kinds designed to develop both research technique and writing style.

Law 521-1. Appellate Court Advocacy. Preparation of an appellate brief and delivery of an oral argument before a three-judge court composed of a faculty member and upperclass students.

Law 530-3, 531-3. Civil Procedure I and II. Brief survey of common law and code pleading; major emphasis on trial and appellate practice under Federal and Colorado Rules of Civil Procedure, including jurisdiction, venue, partition, commencement, pretrial, pleadings, and jury trials; federal jurisdiction; federal and state court organization.

Law 540-3, 541-3. Torts I and II. Involves the study of the non-consensual allocation of losses for civil wrongs, focusing primarily on the concepts of negligence and strict liability.

Law 550-4. Criminal Law. Statutory and common law of crimes and defenses, the procedures by which the law makes judgments as to criminality of conduct, the purposes of the criminal law, and the constitutional limits upon it.

Law 561-4. Property. Estates and interests in land; public and private land-use controls; easements, licenses, and covenants; and landlord-tenant law.

SECOND YEAR

Law 605-2. Future Interests. Examination of dispositive provisions which divide property rights into successive interests, including the historical background and current applications of the legal concepts involved.


Law 610-3. Agency-Partnership. The rights and liabilities of the principal, the agent, and third parties with respect to each other, including the concepts of vicarious tort liability, apparent authority, ratification, imputation of knowledge and the undisclosed principal are covered as well as the partnership form of doing business or investing.

Law 618-4. Commercial Transactions. Examination of the methodology of the Uniform Commercial Code and a study of legal devices and substantive principles thereunder relating to financing transactions in personal property and to negotiable instruments, bank deposits, and collections. Some attention to documentary transactions in the sale and shipment of goods.

Law 625-4. Corporations. The formation of corporations and their management, the relations between shareholders and officers and directors, the impact of federal legislation on directors' duties, and the special problems of the closely held corporation.

Law 631-3. Water Resources. Analysis of regional and national water problems, including the legal methods by which water supplies are allocated, and an examination of the problems involved in water resource planning.


Law 635-3. Evidence. Basic methods and forms of proof in the adjudicative process, responsibility for proof, judicial notice, examination and competence of lay and expert witnesses, privileged communications, relevance, opinion and scientific evidence, real proof, writings, and hearsay.

Law 640-3. International Law. Examination of the principles of public international law as developed and applied by all participants in the international legal process, including national and international tribunals, governmental bodies, international organizations, and others. Particular attention to the role of international law in recent events.

Law 650-3. Labor Law. Decisions and statutes relating to rights of workers to act in concert, including legal aspects of strikes, picketing, and boycotts; representation proceedings; establishment of collective bargaining; and administration of the collective agreement.

Law 651-3. Criminal Procedure. This course focuses primarily on the constitutional limitations applicable to such police investigative techniques as arrest, search, seizure, electronic surveillance, interrogation, and line-up identification.

Law 652-3. Unfair Competition and Intellectual Property. Federal and state laws aimed against unfair competition; federal law of copyrights, patents, and trademarks; protection against misappropriation; protection accorded information and ideas having economic value, such as inventions, literary, musical, and other artistic works, designs, commercial symbols, and trade secrets.

Law 653-3. Criminal Procedure: The Adjudicative Process. This course focuses primarily on criminal procedure at and after trial. It
treats such topics as bail, prosecutorial discretion, discovery, plea bargaining, speedy trial, jury trial, the right to counsel at trial, double jeopardy, eppid, and federal habeas corpus.

Law 655-3. Legal Accounting. Study of accounting problems in the form they are placed before the lawyer, including a succinct study of basic bookkeeping, in-depth legal analysis of the major current problems of financial accounting, and consideration of the conduct of financial affairs of business.

Law 650-4. Income Taxation. Basic course in taxation with major emphasis on the fundamentals of the federal income tax system. Generally approached from the standpoint of the impact of the federal income tax system on the individual.

Law 651-4. Constitutional Law. A basic exposure to the full panoply of constitutional law problems. Survey of the legal problems posed by the federal system and protections afforded individual rights.

Law 652-3. Legal Process. Study of law as a purposive process and the functions and interrelationships of the various public and private institutions through which the process is carried on. Gives a general view of the American legal system as a framework to help in organizing knowledge about the various elements of the system.

Law 665-1. Professional Responsibility. The legal profession as an institution, its history and traditions, and the duties of the bar with particular emphasis on the professional responsibilities of the lawyer.

Law 663-3. Advanced Taxation. Consider the impact of the federal income tax system on the business enterprise. Major emphasis is in the partnership and corporate area. Based on a series of problems involving the taxation of partnerships and corporations and the participants in these forms of business entity.

Law 672-1. Legal Aid. Representation of clients in civil matters and criminal misdemeanor matters.

Law 672-2. Legal Aid—Civil Practice. Emphasizes procedural and practical remedies and defenses available in civil litigation. In conjunction with this course, students (who must normally be enrolled in Legal Aid) will be assigned civil cases related to the course material.

Law 674-2. Legal Aid—Criminal Practice. Thorough grounding in problems of criminal defense. Students must be enrolled in Legal Aid and will defend indigent misdemeanants in Boulder area courts.

Law 683-2. Legal Aid—Evidence Presentation. Develops working knowledge of courtroom skills. Prer. or coreq., Law 655; coreq., Law 672.

Law 689-2. Wills and Trusts. Intestate succession; family protection; execution of wills; revocation and revival; wills contracts and will substitute; creation of trusts; modification and termination; charitable trusts; fiduciary administration, including probate and contest of wills; constructional problems in estate distribution.

Law 678-3. Advanced Estate Planning. Discussion of problems and solutions for owners of various sized estates and different types of assets, including jointly held property, stocks in closely held corporations, and farms; analysis of federal taxation of generation-skipping transfers in trust; post-mortem estate planning; drafting of trusts and wills. It is recommended that students take Wills and Trusts and Federal Estate and Gift Taxation before enrolling in this course. Enrollment limited to 35.

Law 730-3. Due Process and Equal Protection. The course is broken up into three parts. The first deals with Congress' enforcement power under the 13th, 14th, and 15th amendments. The second part explores the substantive content of the equal protection clause and the due process clause. The last part is concerned with "state action".

Law 731-3. Civil and Political Rights. This course, which replaces the prerequisite First Amendment course, will emphasize the First Amendment and will also include aspects of the right of privacy.

Law 732-3. Land Use Planning. Public control of private land uses through the judicially created doctrine of nuisance and the legislatively created techniques of zoning, subdivision regulations, and master planning, involving consideration of the typical constitutional and statutory limitations on such legislatively created techniques.

Law 733-2. 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.


Law 735-3. Real Estate Planning. Consideration of the various contemporary legal problems involved in the ownership, use, development, and disposition 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 development.

Law 737-3. American Indian Law. Investigation of the federal statutory, constitutional, and common law which bears upon American Indians and Indian reservation transactions.

Law 740-1. Interviewing. Designed to train students to greater sensitivity and awareness of clients' problems by the use of tape-recorded interviews. Conducts jointly by a psychiatrist and a member of the faculty. Concurrent participation in legal aid is a requirement.

Law 745-3. Securities Regulation. Concerned with the various federal statutes regulating the issue of corporate securities and the cases and regulations which have arisen out of those statutes; emphasis on statutory interpretation.

Law 747-3. Environmental Law. Examination and analysis of important federal pollution control statutes, including the National Environmental Policy Act, the Clean Air Act, and Clean Water Act. Related economic theory and policy issues are considered.


Law 755-3. Creditors' Remedies and Debtors' Protection. This course examines typical state rights and procedures for the enforcement of claims, and federal and state law provisions limiting protection to debtors in the process. Included are a treatment of prejudgment attachment and garnishment; statutory liens and supplemental statutory and equitable remedies; fraudulent conveyance principles; and exemptions and other constitutional, statutory, and judicial protections afforded debtors. The course also provides an introduction to bankruptcy adjustment of claims proceedings and to the federal Bankruptcy Code, Title 11 U.S.C. Principles of bankruptcy law will be treated primarily as they arise in liquidating bankruptcy proceedings (Chapter 7). Brief attention will also be given to proceedings for the adjustment of debts of individuals with regular income (Chapter 13).

Law 756-2. Bankruptcy. This 2-hr. course assumes that the student will have, from the Creditors' Remedies course, a basic familiarity with the federal Bankruptcy Code, Title 11 U.S.C., and principles of bankruptcy law arising in ordinary liquidation bankruptcy proceeding under Chapter 7 of the Code. The course will examine briefly nonbankruptcy business rehabilitation devices and then study
business reorganizations under Chapter 11 of the Code. Some attention will also be given to proceedings for the adjustment of debts of individuals with regular income under Chapter 13 of the Code.

Law 757-2. Legal History. This seminar will focus on understanding and interpreting developments in Anglo-American legal history, the development of English law, the origin of equity and the equity courts, the reception of English law in America, the development of western mining and water law; the effect of competition between courts in the development of substantive law, and the use of history in decision making.


Law 727-2. Constitutional Litigation. The seminar functions as a small law firm, each member having primary responsibility for an actual case involving constitutional questions. These cases are usually referred to the seminar by the American Civil Liberties Union of Colorado.

Law 742-2. Professional Responsibility. An in-depth exploration in a seminar format of the Code of Professional Responsibility and related matters, including the legal profession as an institution, its history, and its traditions. A research and writing experience will be afforded through a seminar paper on a topic of interest to the area.

Law 744-2. Federal Regulation of the Trading of Securities. This seminar will explore the statutes, regulations, and case law dealing with the regulation of issued securities. Among the areas covered will be tender offers; short swing profits; regulation of securities markets (including the creation of a national market system); and regulation of broker-dealers. While some state law will be discussed, the primary focus of the course will be on the Securities and Exchange Act of 1934.

Law 749-2. Public Choice and Theory of Justice. The seminar will examine several recent theories about the normative foundations of legal decision making. Among the theories examined will be those of Rawls, Posner, Nozick, and Buchanan. It is anticipated that the papers will center on application of the theories studied to real, concrete legal problems.

Law 751-2. The Law of Corruptions. Selected topics related to incarcera- tion and its alternatives, including preconviction "diversion" programs, sentencing, probation, parole, and rights of prisoners while in prison. Rights of juveniles are also treated.

Law 752-2. Social Science Research and the Law. This seminar will explore the impact of empirical research on a variety of legal topics. Early classes will use guest lecturers to explain the basics of statistical methodology and will also consider the relationship between law and the social sciences from a broad, jurisprudential perspective. Later class will critique student papers, each of which would probably treat a specific law-related issue that had been the subject of empirical research. A typical paper would probably summarize one relevant social science literature, assess the impact of that research on the attitudes and actions of legal decision makers, and consider the extent to which empirical findings should in fact guide the formulation of policy in the area under consideration.

Law 753-2. Law and Medicine. The first five weeks of the seminar will be devoted to a discussion of theories of liability in medical malpractice cases. The remainder of the seminar (which includes paper presentations) will focus on bioethics issues (such as the right to die) in both the medical and the legal profession.

Law 776-2. Law and Mental Health. Seminar that examines the uses of psychiatry in the law and the constraints that law imposes on institutional psychiatry. Possible topics include civil commitment, competency to stand trial, the insanity defense, the right of treatment, and the privilege to refuse treatment, guardianship, liability of mental health professionals.

Law 777-2. Labor Relations Law in the Public Sector. Study of growing impact of public sector unionization. Examines judicial deci- sion and statutory law bearing on rights and obligations of employees and employers, the right to organize, the collective bargaining relationship, strikes, impasse, and dispute settlement. Seminar paper required.

Law 779-2. Problems in Education Law Seminar. The emphasis in this seminar will be on (a) student rights and (b) equal educational opportunity. Student rights areas will include due process; suspensions and expulsions; free speech and student press; the in loco parentis concept; judicial intervention and review; corporal punishment; substantive due process—excessive punishment, etc.; hair and

SEMINARS

Law 704-2. Economic Analysis of Law: Selected Issues. The seminar will study intensively a fairly small number of issues, using basic economic concepts. Likely issues include unequal bargaining power and unconscionability; contribution and indemnity among multiple tortfeasors; penalties and liquidated damages; and nuisance. There will also be readings on the utility of economic analysis of law. A prior background in economics is not required.

Law 708-2. Constitutional Theory. An examination of the role of the courts and the other branches of government in defining and enforcing constitutional values. Attention is given to separation of powers and federalism and to a case study of school desegregation. Relevant readings are from philosophy and social science as well as cases.


Law 721-2. Legal History. This seminar will focus on understanding and interpreting developments in Anglo-American legal history, the development of English law, the origin of equity and the equity courts, the reception of English law in America, the development of western mining and water law; the effect of competition between courts in the development of substantive law, and the use of history in decision making.


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dress regulations; school regulation of off-campus activities; and Fourth Amendment issues—searches of lockers, dormitory rooms. Equal educational opportunity areas will include; discrimination against minorities; sex discrimination; inequality in school financing; and providing educational opportunities for handicapped children. The basic text for the seminar will be A. Morris, The Constitution and American Education (2nd ed., 1980).

Law 782-2. Labor Arbitration. A study of arbitration procedures and techniques, including standards used for interpreting labor contract language. Students are assigned problems in important areas of arbitration and are required to submit a research paper.

Law 784-2. Energy Law. This seminar focuses on the legal and regulatory mechanisms which determine supply, allocation, and pricing of energy and devotes substantial attention to current problems in energy policy. Topics include natural gas and petroleum regulation, coal policy, nuclear energy, utility rate regulation, and synthetic fuels development.


Law 786-2. Natural Resources Law: Protection vs. Development. Focus on current environmental issues, particularly in the Rocky Mountain region, which illustrate the frequent conflict between resource protection and resource development. The subject matter falls into five major resource categories: land use and transportation planning, water resource development, timber and national forest management, mineral development, and fish and wildlife protection.

College of Music

Choral Music


Mus. 570-3. Introduction to Historical Research. Fall. Introduction to materials and procedures of historical research. For choral majors. Hayes.


History and Literature


Mus. 182-3. Introduction to Music. Fall, Spring. Basic knowledge of music literature and development of discriminating listening in depth. For nonmusic majors only. Galm, Ellsworth.

Mus. 183-3. Appreciation of Music. Fall, Spring. Basic knowledge of music literature and development of discriminating listening habits. In addition, each section emphasizes a different aspect—ethics, history, religious, and concert attendance. For nonmusic majors only. Ellsworth, Kearns, Luhring.


Mus. 276-3. Music and Drama. Fall. Techniques used in combining music and dramatic arts through examples from musical and dramatic literature of the West from ca. 1000 to present. Prer., Mus. 180, 182, or 183. Ellsworth, Hayes.


Mus. 380-3. History of Music. Fall, Spring. Survey of Western art music with stylistic analysis of representative works from all major periods. Prer., Mus. 200 and one of the following: Mus. 181, 275, 276, 277, or 279. Ellsworth, Luhring.


Mus. 471-2, 3/573-2. 4. Renaissance Music. Intensive study of monophonic and polyphonic music circa 1400-1600. History majors and others desiring extended study in this epoch may enroll for 3 hrs. credit. Prer., Mus. 380. Mus. 571—Two regular class meetings per wk., plus seminar meeting for variable credit. Those wishing to study while menural notation in seminar should enroll for 4 hrs. credit. Luhring.


Mus. 477/577-3. History of the Opera. Fall. Literature of the lyric theatre in its most salient currents and works from early Baroque to contemporary productions. Prer., Mus. 381. Ellsworth.


Mus. 482-2, 3/582-3.4. Ancient and Medieval Music. Spring. Survey from early times to circa 1400. History majors and others desiring extended study in this epoch should enroll for 3 hrs. credit. Prer., Mus. 380. Mus. 582—Two regular class meetings per wk., plus seminar for variable credit. Those wishing to study black mensural notation in seminar should enroll for 4 hrs. credit. Ellsworth.


Mus. 484-3/584-3. 4. Music Aesthetics. Fall. Various philosophies of music as they have developed during past 100 years in writings of philosophers, psychologists, sociologists, composers, critics, and historians. Mus. 584—three regular class meetings per wk., plus seminar for 4 hrs. credit. Prer., Mus. 381. Kearns.

Mus. 485/585-2, 3. 5. 17th- and Early 18th-Century Music. Spring. Music from 1580 to 1750 examined in terms of vocal and instrumental styles and national influence. Prer., Mus. 380. Two regular class meetings per wk., plus seminar in analysis for 4 hrs. credit. Luhring.
Music Education

Mus. 210-3. The Public School Music Curriculum. Fall, Spring. Music education within aesthetic education is 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. Prer., Mus. 100, 101, 102, 103, 180, 181. Beall.

Mus. 217-1. Laboratory Chorus. Spring. The study of special music literature available and suitable for young voices (ages 10-17). Opportunities to examine, sing, and conduct this literature are provided with ownership of a portion of the music. Prer., Mus. 100, 101, 102, 103, 180, 181. Class or permission of instructor. Beall.


Mus. 311-3. Introduction to the Arts. Spring. Survey of the arts in Western culture, including architecture, painting, sculpture, poetry, prose, music, dance, comedy, tragedy, and film, along with a presentation of various approaches to relating the arts. Prer., basic course in one art. McCarthy.


Mus. 315-3. Teaching Woodwind. Spring. Instruction in playing and teaching all woodwind instruments. Playing experiences will be in heterogeneous and homogeneous groupings. Staff.

Mus. 316-2. Teaching Stringed Instruments. Fall. Instruction in playing and teaching all stringed instruments. Playing experiences will be in heterogeneous and homogeneous groupings. Staff.


Mus. 319-1. Woodwind and Percussion Design and Repair. Fall, Spring. May be repeated for additional credit. Naylor.


Mus. 321-3. Teaching Brass Instruments. Spring. Instruction in playing and teaching all brass instruments. Playing experiences will be in heterogeneous and homogeneous groupings. Staff.

Mus. 413-2. Teaching the Learning-Disabled Child in the Music Class. Fall.

Mus. 415-1. Percussion Class and Pedagogy. Fall, Spring, Galin.

Mus. 416-1. Introduction to Student Teaching. Fall, Spring. Reeves.

Mus. 417-3. Student Teaching Practicum-Elementary. Required of all students in student teaching programs. Staff.

Mus. 418-3. Student Teaching Practicum-Secondary. Required of all students in student teaching programs. Staff.

Mus. 419-1. Student Teaching Seminar (Choral, General, Instrumental). Fall, Spring. Required of all students in student teaching programs. Staff.


Mus. 522-2. 3. Brass and Woodwind Pedagogy. Fall. Pedagogical problems in connection with teaching wind instruments, as well as survey of solo literature. Prer., 1 semester of brass study and 1 semester of woodwind study, or equivalent (1 semester may be taken concurrently). Staff.

Mus. 610-2. Introduction to Graduate Study. Fall. Materials, techniques, and procedures for research in music education. Required of all music graduate students. Sandford.


Mus. 619-1 to 3. Selected Studies in Music Education. Fall, Spring. May be repeated for additional credit. With consent of instructor and chairmanship of music education division.

These courses are available only to Doctor of Philosophy (music education) candidates.


Mus. 711-3. Research Literature and Techniques II (Survey and Experimental). Fall. Study and analysis of procedures as applied to significant research in music education. Reeves.


ORGAN AND CHURCH MUSIC


PIANO

Mus. 110-2/210-2. Keyboard Musicianship. For music majors (non-piano). A sequence of four semesters for developing musicianship through improvising, playing by ear, harmonizing, score reading, transposing, and performing repertoire. Satisfies class minor requirements. Staff.


Course Descriptions / 33
THEORY / COMPOSITION

Mus. 100-3, 101-3. Theory I. Fall, Spring. An integrated course in the various elements of music theory, including composition, structural analysis, and principles of two-voice, three-voice, and four-voice writing. Coreq., Mus. 102, 103, and class piano. Escalin, Scott.


Mus. 108-3. Rudiments of Music. Fall, Spring. Introduction to the science and art of music to develop tools used in notating, performing, creating, and listening to music. For nonmusic majors only who have little or no previous schooling in the subject. Collins, McCarthy.

Mus. 221, 231, 421, 521. Composition Seminar. Fall, Spring. Weekly assembly of all graduate and undergraduate composition students for presentations and discussions on various aspects of theory and composition. Theory/composition division staff.

PMus. 153, 253, 453, 553-1, 2. Composition. Fall, Spring. Individual or small-group instruction. Theory/composition division staff.


Mus. 207-2. Instrumentation. Spring. Introductory consideration to all instruments with respect to capabilities, technical and musical, single and in combination. Sigma for smaller instrumental ensembles.


Mus. 307-3. Jazz Improvisation. Spring. Offers assistance and guidance to the student toward acquiring the necessary skills and gaining insight in achieving creative musical results. Pr., Mus. 100, 101, and basic skills on an instrument. Sowick.


Mus. 406-2. Analysis I. Fall. Selected works through the 18th century. Pr., Mus. 380 or equivalent.


Mus. 408/508-2. Electronic Music. Fall. Practical approach to composition of electronic music, exploring methods of sound generation, alteration, and combination; emphasizing development of skill in use of synthesizer and recording equipment. Pr., consent of instructor.


Mus. 509-2. Music of Selected 20th-Century Composers. Spring. Musical style of a representative 20th-century composer, such as Stravinsky, Bartok, Messiaen, Ives, through an analysis of his works.


Composition 1 or 2. Fall, Spring. May be repeated for additional credit.

STRINGS

Mus. 357-1. Viola Pedagogy. Fall, Spring.


Mus. 359-1. Cello Pedagogy. Fall, Spring.

334 / College of Music

VOICE
Mus. 341/441/541-1 to 3. Opera Practicum. Active participation (performance or technical) in opera productions.

BACHELOR OF ARTS IN MUSIC
Mus. 399-1. Junior Research Seminar: Bachelor of Arts in Music. Fall, Spring. Concentration on conceptual aspects of research, the psychology and "ordering" of a library search that leads to formal paper. Applies student's interests and curricular goals to specific topic; includes preparation of a prospectus for senior thesis. Arneson.

DOCTOR OF MUSICAL ARTS COURSES
Mus. 801-0 to 8. Precandidacy for D.Mus. A. Fall, Spring, Summer.
Mus. 802-0 to 8. Candidacy for D.Mus. A. Fall, Spring, Summer.
Mus. 821-3. Dissertation Project I. (Solo Recital, Choral Concert, Composition.) Fall, Spring.
Mus. 822-3. Dissertation Project II. (Solo Recital, Choral Concert, Composition, Vocal Pedagogy Project.) Fall, Spring.
Mus. 823-3. Dissertation Project III. (Chamber Music Recital, Vocal Pedagogy Project, Choral Project, Composition Recital.) Fall, Spring.
Mus. 824-3. Dissertation Project IV. (Chamber Music Recital, Choral Project, Composition Recital.) Fall, Spring.
Mus. 825-3. Dissertation Project V. (Lecture-Recital, Pedagogy Lecture.) Fall, Spring.
Mus. 826-3. Dissertation Project VI. (Lecture-Recital, Pedagogy Lecture.) Fall, Spring.
Mus. 831-3. Repertoire Project. Fall, Spring.

SPECIAL STUDIES
Mus. 940-1 to 3. Special Studies. Fall, Spring. Advanced undergraduate studies or special projects in selected areas. For undergraduate music majors only. May be repeated for additional credit.
Mus. 950-1 to 3. Special Studies. Fall, Spring. Graduate studies in specific areas and special projects. For Master of Music degree students only. May be repeated for additional credit.
Mus. 960-1 to 3. Special Studies. Fall, Spring. Advanced graduate studies in specific areas or special topics. For music doctoral degree students only. May be repeated for additional credit.

RECATALS, THESSES, AND REQUIRED CLASSES
Mus. 399-0. Junior Recital.
Mus. 495-2. Senior Thesis: Bachelor of Arts in Music. Fall, Spring.
Mus. 498-0. Theory Thesis. Fall, Spring.
Mus. 499-0. Senior Recital. Fall, Spring.
Mus. 700-4. Master's Composition Thesis. Fall, Spring.
Mus. 800-0 to 8. Doctor's Thesis. Fall, Spring.
Literature Class. Fall, Spring. Required for all undergraduate music majors.
Musical Colloquium. Fall, Spring. Required for all graduate students in musicology. Kearns.

APPLIED MUSIC—INDIVIDUAL AND CLASS INSTRUCTION
The courses offered in vocal or instrumental technique and interpretation are listed below. Two 30-minute recitations and 1 hour of literature class each week, plus minimum daily practice as designated by the instructor concerned, are required (4 hours of credit each semester for a major in performance; 3 hours of credit each semester for a major in music education; 2 hours credit for B.A. in music students). Place and hour of recitation to be arranged.

Course Descriptions / 335
School of Pharmacy

BIOPHARMACY


BIPH 390/590-2. Pathology I. Fall. This is a course in general pathology, covering the topics of cell and tissue injury, inflammation and repair, neoplasia, genetic diseases, and immunopathology. Mallinson.


BIPH 564-2. Cancer: Experimental and Medical Aspects. Fall, even years. Lect. Course is divided into two parts. First is a biochemical and morphological description of tumors, tumor behavior such as metastasis and angiogenesis, and tumor development. The second part concerns carcinogenesis: mechanisms, modulation, testing, and epidemiology. Chemotherapy is covered at the end. Tote-home tests and student presentations. Prer., CHEME 471 or 481-482; or MCB 105-106, or instructor consent.

BIPH 494-1 to 3. Independent Study in Biopharmaceutics. Fall, Spring. Study involving library, laboratory, and a report. Prer., undergraduate standing and consent of instructor.

BIPH 495-1 to 3. Special Problems in Biopharmaceutics. Fall, Spring. Research techniques, methods and reporting. Prer., graduate standing and consent of instructor.

CLINICAL PHARMACY

CNPH 420/520-3. Clinical Pharmacy and Therapeutics I. Fall. Lect. A didactic course providing information on the appropriate use of pharmacotherapy principles in the treatment of selected disease states with particular attention to adverse drug reactions, drug-drug interactions, drug-disease interactions, and rational pharmacotherapy. Prer., fifth-year status or consent of instructor.

CNPH 421/521-3. Clinical Pharmacy and Therapeutics II. Spring. Continuation of CNPH 420. Prer., CNPH 420 or consent of instructor.


CNPH 423-2. Institutional Pharmacy Practice. Fall. Lect. A didactic course providing an introduction to the principles of institutional pharmacy practice with consideration given to purchasing, basic management skills, and protocols to be observed in a hospital pharmacy practice. Prer., fifth-year status.

CNPH 424-2. Communicative and Psychosocial Aspects of Pharmacy Practice. Lect. and discussion. Designed to acquaint the student with aspects of both interpersonal communication relative to patient care and social issues in pharmacy practice. Prer., CNPH 420.

CNPH 425-1. Drug Literature Evaluation. Fall. A didactic course designed to introduce the student to concepts important in critically evaluating the drug literature. Sources of drug information and their proper utilization are also emphasized. Prer., fifth-year status or permission.

CNPH 426-2. Community Pharmacy Practice Internship I. Fall, Spring. Designed to familiarize the student with the practice of community pharmacy. Prer., fifth-year status.

CNPH 427-2. Community Pharmacy Practice Internship II. Fall, Spring. An experiential course to familiarize the student with clinical approaches in the area of community pharmacy practice with particular emphasis on patient consultation. Prer., fifth-year status.
CNPH 510-6. Drug Information Center Clerk. Fall, Summer. This experiential course is designed to provide the student with experience in drug information retrieval, drug literature analysis, and formulation of appropriate response to drug information inquiries. Prer., consent of instructor.

CNPH 511-6. Ambulatory Care Clerkship. Spring, Summer. This experiential course is designed to acquaint the student with outpatient-oriented services including medication histories, patient monitoring, and patient counseling. Prer., consent of instructor.

CNPH 512-6. Inpatient Pharmacy Practice Clerkship. Fall, Summer. This experiential course is designed to acquaint the student with patient assessment and monitoring in the inpatient setting, with particular emphasis on characteristic disease states that occur in this practice area. Prer., consent of instructor.

PHARMACEUTICAL CHEMISTRY

PHCH 370-2. Pharmaceutical Chemistry I. Fall. Lect. and lab. Chemical and physical characteristics of inorganic pharmaceuticals correlated with a study of physico-chemical principles as applied to pharmaceutical systems. Prer., third-year status.


PHCH 375-3. Physiological and Clinical Chemistry. Spring. lect. Concerns regulation of metabolism with emphasis on hormonal mechanisms, changes in biochemistry, due to intrinsic factors such as age and extrinsic factors such as diet, and current diagnostic tests for biochemical abnormalities. Prer., Chem. 471 or 481.


PHCH 563-3. Instrumental Methods of Drug Analysis. Spring. alternate years. Lect. and lab. A survey of the major chromatographic and spectroscopic methods used in organic chemical analysis with emphasis on their applications to the qualitative and quantitative analysis of drugs. Prer., consent of instructor.


PHCH 570-3. Advanced Physical and Inorganic Pharmaceuticals. Fall. Basic and advanced principles of physical and inorganic pharmaceutical chemistry; chemical properties and uses of inorganic compounds and products. Prer., general physical and inorganic chemistry, consent of instructor.

PHCH 664-1 to 3. Advanced Topics in Pharmaceutical Chemistry. Fall, Spring. Conference. A special topic of current interest in pharmaceutical chemistry will be considered each semester; course may be repeated for credit with instructor’s consent. Prer., consent of instructor.

PHCH 949-1 to 3. Independent Study in Pharmaceutical Chemistry. Fall, Spring. Study involving library, laboratory and a report. Prer., undergraduate standing and consent of instructor.

PHCH 959-1 to 3. Special Problems in Pharmaceutical Chemistry. Fall, Spring. Research techniques, methods and reporting. Prer., graduate standing and consent of instructor.

PHARMACOLOGY


PHCL 553-3. Drug Mechanisms. Spring. lect. and lab. Current concepts relate to mechanisms involved in the response of cells to drugs. Prer., PHCL 550 or consent of instructor.

PHCL 556-2. Hormone and Neoplasia. Spring. The emphasis of this course is on the regulation of steroid hormones, polypeptide hormones, and growth factors on cancer development. General pharmacological, biochemical, and cell biological principles on neoplastic development will be discussed. Prer., consent of instructor.

PHCL 557-2. Behavioral Pharmacogenetics. Spring, odd-numbered years. Lect. Each term selected topics will be considered and may include behavioral and biochemical genetics, pharmacogenetics and neurochemistry. Course may be repeated to include different topics. Prer., consent of instructor.


PHCL 654-1 to 3. Advanced Topics in Pharmacology. Fall, Spring. Conference. A special topic of current interest in pharmacology will be considered each semester and the course may be repeated for credit with instructor’s consent.

PHCL 949-1 to 3. Independent Study in Pharmacology. Fall, Spring. Study involving library, laboratory and a report. Prer., undergraduate standing and consent of instructor.

PHCL 959-1 to 3. Special Problems in Pharmacology. Fall, Spring. Research techniques, methods and reporting. Prer., graduate standing and consent of instructor.

PHARMACOLOGY-PHARMACUTICS


PHAR 410/510-4. Pharmacuetics I. Fall. Lect. and lab. Continuation of PHAR 306 with emphasis on the official dosage forms. Prer., PHAR 306 and PHCH 371 or consent of instructor.

PHAR 411/511-4. Pharmacuetics II. Spring. Lect. and lab. Theoretical and practical techniques related to the formulation, preparation and dispensing of modern pharmaceuticals. Prer., PHAR 410 or consent of instructor.


PHAR 517-3. Pharmaceutical Production. Fall. Conference and lab. Advanced techniques and current research on problems and developments in the industrial manufacture of pharmaceuticals. Prer., PHAR 417 or consent of instructor.


PHAR 524-1 to 3. Independent Study in Pharmacuetics. Fall, Spring. Study involving library, laboratory and a report. Prer., undergraduate standing and consent of instructor.

PHAR 590-1 to 3. Special Problems in Pharmacuetics. Fall, Spring. Research problems involving dosage form design, biopharmaceutics and pharmacokinetics. Prer., graduate standing and consent of instructor.

PHARMACY ADMINISTRATION

PHAD 381-3. Laws of Pharmacy. Fall. Lect. and rec. State and federal statutes and regulatory decisions governing the practice of pharmacy with emphasis on the common law principles and ethics of the pharmacy profession. Prer., third-year status.


Reserve Officers Training Corps

AIRC FORCE AEROSPACE STUDIES

Air 101-1. U.S. Military Forces I. One 1-hr. lect.-rec. and one 1-hr. lab. per wk. A survey course describing strategic offense/defense, general purpose, and aerospace support functions of U.S. military forces. Laboratory involves a study of Air Force customs and courtesies, drill and ceremonies, career opportunities, and life and work of an Air Force junior officer.

Air 102-1. U.S. Military Forces II. A continuation of Air 101. One 1-hr. lect.-rec. and one 1-hr. lab. per wk. The course covers the role of the Air Force in the broader context of national security and the use of aerospace technology in national defense.

Air 201-1. Development of Air Power I. One 1-hr. lect.-rec. and one 1-hr. lab. per wk. Introduction to the development of air power and the role of air power in modern warfare. Focus on the evolution of air forces and their impact on military strategy.

Air 202-1. Development of Air Power II. A continuation of Air 201. One 1-hr. lect.-rec. and one 1-hr. lab. per wk. Focus on the role of air power in contemporary military conflicts and the development of new technologies and strategies.

Air 301-3. Air Force Management and Leadership I. Two 1-1/2-hr. seminars and one 1-hr. lab. per wk. This course covers the fundamentals of air force management and leadership, focusing on decision-making and problem-solving skills.

Air 302-3. Air Force Management and Leadership II. Two 1-1/2-hr. seminars and one 1-hr. lab. per wk. A continuation of Air 301. Focus on the practical application of management and leadership principles in real-world scenarios.

Air 401-3. National Security Forces in Contemporary American Society I. Two 1-1/2-hr. seminars and one 1-hr. lab. per wk. Air 401 focuses on the role of national security forces in contemporary society. Includes topics such as national security policy, homeland security, and military strategy.

Air 402-3. National Security Forces in Contemporary American Society II. Two 1-1/2-hr. seminars and one 1-hr. lab. per wk. A continuation of Air 401. Focuses on the implications of national security forces in society, including international relations and military strategy.

MILITARY SCIENCE (U.S. ARMY)

M.S. 101-1. Introduction to Military Science. Develops the history of ROTC and the traditions and origins of the U.S. military. Also examines the career opportunities available through military service. Leadership and the fundamentals of human relations are covered.

M.S. 102-1. Organizing for Defense. Focuses on the organization of the Department of Defense and Army with an emphasis on leadership and the concept of professionalism.

M.S. 201-1. Military Leadership and Management I. Studies supervision, decision making, planning, communication, interaction, and counseling. Problem and group process approaches are utilized to develop leadership skills.

M.S. 202-2. Military Leadership and Management II. Continuation of M.S. 201. Focuses on organizational theory, effectiveness, management by objectives, and personal management. Leadership theories and the concept of professionalism are emphasized.

M.S. 301-2. Advanced Leadership and Military Instruction. Separate Leadership and Military Instruction courses required of all students. Subject areas include map reading, principles of logistics, management, and tactical communications.

M.S. 302-4. Control Aspects of Small Unit Operations. Focuses on the development of leadership skills in small unit operations, including tactical decision-making, command, and control strategies.

M.S. 303-1. Leadership Practicum. Provides practical experience in leadership through an experiential learning approach, which includes field exercises and simulations.

M.S. 401-2. Seminar in Officer Development and Leadership. This course examines the development and leadership skills required of an officer, emphasizing the development of leadership and management skills.
for commissioning and initial duty with the active Army or Reserve Forces; organization and functions of the Army, command staff relations, leadership fundamentals, and career development.

M.S. 402-2. Seminar in Officer Development and Leadership II. This course contains subjects designed to develop and prepare the student for commissioning and initial duty with the active Army or Reserve Forces. Practical leadership exercises using leadership fundamentals and decision-making process, military justice, career development, professionalism/leadership, and counseling.

NAVAL SCIENCE

N.S. 101-2. Introduction to Naval Organization and Ship Design. Fall. Introduction to the structure and principles of naval organization. Principles of ship design and construction are discussed, with an emphasis on quantitative treatment of stability and buoyancy.


N.S. 201-3. Weapons Systems Analysis. Fall. An introduction to the theoretical concepts upon which modern naval weapons systems are designed and constructed. Specific areas of study include the physics of underwater sound propagation, pulse radar theory, automatic tracking principles, and fundamentals of missile guidance.


N.S. 302-3. Naval Operations. Spring. Thorough examination of the Inland and International Rules of the Nautical Road, including court interpretations; principles of relative motion and vector analysis with the maneuvering board; shiphandling procedures, weather, communications, and tactical operations.

N.S. 307-3. Evolution of Warfare I. Fall. A study of the evolution of military thought, strategy, tactics and weapons through the American Civil War. An investigation of the economic, psychological, moral, political and technological influences on continuity and changes in warfare during important periods in the past.


N.S. 402-3. Leadership and Management II. Spring. An introduction to the techniques and tools for effective leadership in the military environment. Includes study in military law, leadership, human resource management, and naval correspondence and administration.

N.S. 407-3. Amphibious Warfare I. Fall. A study of the concept of amphibious warfare and the development and evolution of amphibious warfare doctrines and techniques from the Gallipoli operation in World War I through the Peleliu operation in World War II.

Faculty

College of Arts and Sciences

ANTHROPOLOGY

ROBERT A. ALDRICH, Professor; B.A., Amherst College; M.A., Ph.D., Northwestern University.

BOULOS AYYAD, Professor; B.A., M.A., Ph.D., Cairo University (Egypt); M.A., University of Einshams (Egypt).

DAVID A. BREITENZITZ, Professor; B.A., University of Denver; M.A., Ph.D., University of Arizona.

GERALD LLOYD BRODE, Assistant Professor (Colorado Springs); B.A., M.A., Wichita State University; Ph.D., University of Colorado.

ALICE M. BRUES, Professor; A.B., Bryn Mawr College; Ph.D., Radcliffe College.

HELEN CANNON, Professor Emeritus.

JOHN G. H. CANT, Assistant Professor (Colorado Springs); B.A., Yale University; M.A., Ph.D., University of California, Davis.

DENNIS J. DE SART, Assistant Professor (Denver); B.A., University of Nevada; M.A., Ph.D., Cornell University.

FRANK W. EDY, Associate Professor; B.A., University of New Mexico; M.A., Ph.D., University of Colorado.

DAVID LEE BRENNER, Department Chairman; Professor; B.A., M.A., Ph.D., University of Colorado.

ROBERT A. HACKENBERG, Professor; B.A., M.A., University of Minnesota; Ph.D., Cornell University.

JAMES J. HESTER, Professor; B.A., University of New Mexico; Ph.D., University of Arizona.

GORDON W. HEWET, Professor; A.B., Ph.D., University of California, Berkeley.

DOROTHY S. KASCHUBE, Professor; A.B., M.A., Ph.D., Indiana University.

ALEC J. KELSO, Professor; B.S., Northern Illinois University; M.A., Ph.D., University of Michigan.

GOTTFRIED LANG, Professor; A.B., Brown University; M.A., University of Chicago; Ph.D., Cornell University.

JOSEPH J. LUSCHKA, Associate Professor; B.A., University of Colorado; M.A., Ph.D., University of Arizona.

DENNIS R. MCGILLY, Associate Professor; B.A., Reed College; M.A., Ph.D., University of Chicago.

JAMES RUSSELL MCCOODWIN, Associate Professor; B.S., M.B.A., Ph.D., University of Texas at Austin.

JANET R. MOONE, Associate Professor (Denver); B.A., University of Arizona; M.A., University of Colorado; Ph.D., University of Arizona.

LORNA G. MOORE, Associate Professor (Denver); B.A., Smith College; M.A., Ph.D., University of Michigan.

DAVID F. POTT, Assistant Professor (Attendant rank); B.A., Cornell University; Ph.D., Tulane University.

DUANE QUATTI, Associate Professor (Denver); B.A., A.M., University of Michigan; Ph.D., University of Colorado.

PAUL SHANKMAN, Associate Professor; B.A., University of California, Santa Barbara; Ph.D., Harvard University.

PAYSON D. SHEETS, Associate Professor; B.A., M.A., University of Colorado; Ph.D., University of Pennsylvania.

JACK E. SMITH, Professor (Denver); B.A., University of California, Los Angeles; Ph.D., University of California, Berkeley.

OMER C. STEWARD, Professor Emeritus.

DENNIS P. VANN VERNEN, Associate Professor; B.A., University of Utah; M.A., Ph.D., University of Massachusetts.

REWERT E. WALKER, JR., Professor; B.A., Ph.D., University of Oregon.

RICHARD WARDEN, Associate Professor Adjunct; B.S., B.S., London University; M.A., University of Colorado; D.P.M., Royal College of Physicians, London, England.

JOE BEN WHEAT, Professor; B.A., University of California; M.A., Ph.D., University of Arizona.

THOMAS S. WYNN, Associate Professor (Colorado Springs); A.B., Occidental College; A.M., Ph.D., University of Illinois.

ASTRO-GEOPHYSICS

DAVID M. ANDERSON, Lecturer; Ph.D., University of Colorado.

R. GRANT KATH, Professor Adjunct; B.S., Utah State University; Ph.D., University of Utah.

THOMAS R. AVREY, Lecturer; Ph.D., University of Colorado.

CHARLES A. BARTLETT, Professor; B.S., Lehigh University; M.A., Ph.D., University of California, Los Angeles.

EDWARD R. BENTON, Professor; A.B., Harvard College; A.M., Ph.D., Harvard University.

DONALD F. BILLINGS, Professor Emeritus.

WILLIAM BUHELMAN, Professor; B.S., M.S., Florida State University; Ph.D., Massachusetts Institute of Technology.

BRUCE E. BUSKANIA, Director, Astronomical Laboratories; Associate Professor (Attendant Rank); B.S., University of Alberta (Canada); M.A., Ph.D., University of California, Los Angeles.

EDWARD W. BRUGEL, Lecturer; Ph.D., University of Washington—Seattle.

WEBSTER CASH, Lecturer; S.B., Massachusetts Institute of Technology; Ph.D., University of California, Berkeley.

JOHN A. CASTOR, Associate Professor; B.S., Fresno State College; Ph.D., California Institute of Technology.

PETER S. CONTI, Department Chairman; Professor; B.S., Rensselaer Polytechnic Institute; Ph.D., University of California, Berkeley.

JUDY R. COX, Professor; A.B., M.S., Ph.D., Indiana University.

KENNETH DAVIS, Professor Adjunct; B.S., Ph.D., University of Wales.

GEORGE A. DUKL, Professor; B.S., United States Military Academy; M.S., Purdue University; Ph.D., University of Colorado.

JOHN A. EDDY, Professor Adjunct; B.S., U.S. Naval Academy; Ph.D., University of Colorado.

LARRY W. ESPOSITO, Lecturer; S.B., Massachusetts Institute of Technology; Ph.D., University of Massachusetts.

DAVID S. EVANS, Lecturer; B.S., University of Michigan; Ph.D., University of California, Berkeley.

CATHERINE D. GARMAN, Associate Professor (Attendant Rank); B.S., Indiana University; M.A., Ph.D., University of Virginia.

ROY H. GARSANS, Professor; B.A., M.A., Ph.D., Cambridge University.

KATHARINE B. GERBER, Professor Adjunct; B.A., Bryn Mawr College; B.S., Ph.D., University College, London (England).

JOHN G. GILL, Lecturer; B.S., Yale College; B.A., M.A., Cambridge University; Ph.D., Massachusetts Institute of Technology.

PETER A. GILMAN, Professor Adjunct; B.A., Harvard College; M.S., Ph.D., Massachusetts Institute of Technology.

MARTIN GOLDMAN, Professor; A.B., Princeton University; M.S., Ph.D., Harvard University.

CARL J. HANSEN, Professor; B.S., Duquesne College, New York; M.S., Ph.D., Yale University.

*Graduate School faculty.
JOHN E. HART, Professor; B.A., Amherst College; Ph.D., Massachusetts Institute of Technology.

SIEGHARD HAUSWITZ, Professor Adjunct. Emeritus.

THOMAS E. HOLZER, Professor Adjunct; B.A., Pomona College; Ph.D., University of California, San Diego.

WILLIAM H. HOKE, Associate Professor Adjunct; B.S., Smith College; M.S., Ph.D., University of Chicago.

CHARLES W. HORD, Professor (Attench Address); B.A., Ph.D., University of Colorado.

LEWIS E. HOUSE, Lecturer; M.S., Rensselaer Polytechnic Institute; Ph.D., University of Colorado.

DAVID S. HUMMER, Professor Adjunct; Ph.D., University College (England).

CHARLES A. KNIGHT, Lecturer; M.S., Ph.D., University of Chicago.

GEORGE M. LAWRENCE, Lecturer; B.S., University of Utah; Ph.D., California Institute of Technology.

F. HAROLD LEINBACH, Lecturer; B.S., South Dakota State University; M.S., California Institute of Technology; Ph.D., University of Alaska.

JEFFREY L. LINSKY, Professor Adjunct; B.S., Massachusetts Institute of Technology; M.A., Ph.D., Harvard University.

SHAO C. LIU, Lecturer; B.S., Chong Qing University (Taiwan); Ph.D., University of Pittsburgh.

JULIUS LONDON, Professor; B.A., Brooklyn College; M.S., Ph.D., New York University.

ROBERT M. MACQUEEN, Professor Adjunct; B.S., Southwestem at Missouri; Ph.D., Johns Hopkins University.

J. McKIM MALVILE, Professor; B.S., California Institute of Technology; Ph.D., University of Colorado.

SADAMATSUKA, Professor Adjunct; M.Sc., D.Sc.; Kyoto University (Japan).

RICHARD A. McCAY, Professor; B.A., Stanford University; M.A., Ph.D., University of California, Los Angeles.

GEORGE H. MOUNT, Lecturer; B.A., University of California, Los Angeles; M.A., University of Michigan; Ph.D., University of Colorado.

GORDON A. NEWKIRK, Professor Adjunct; B.A., Harvard University; M.A., Ph.D., University of Michigan.

LUDWIG F. OSTER, Professor; Vordiplom, Diplomphysiker, University of Freiburg (Germany); Dr. Med., University of Kiel (Germany).

GERALD W. PEINIG, Lecturer; Ph.D., Purdue University.

WALTER DOR ROBERTS, Professor; B.A., Amherst College; Ph.D., Harvard University.

BABY J. ROTTMAN, Lecturer; B.A., Rockhurst College; M.S., Ph.D., Johns Hopkins University.

DAVID W. RUSCH, Lecturer; B.S., Loras College; Ph.D., University of Colorado.

THOMAS W. SCHLATTER, Lecturer; B.S., M.S., Ph.D., St. Louis University.

J. MICHAEL SMITH, Assistant Professor; B.S., California Institute of Technology; M.A., Ph.D., Princeton University.

ANDREW SKUMANCH, Professor Adjunct; B.S., Pennsylvania State University; Ph.D., Princeton University.

DEAN F. SMITH, Lecturer; B.S., Massachusetts Institute of Technology; M.S., Ph.D., Stanford University.

THEODORE P. SNOW, Jr., Associate Professor; B.A., Yale College; M.S., Ph.D., University of Washington.

THEODOR W. SPEIGER, Associate Professor; B.S., Colorado State University; M.S., California Institute of Technology; Ph.D., Pennsylvania State University.

RAUL A. STEIN, Professor; B.S., M.S., University of Wisconsin; Ph.D., University of California, Berkeley.

A. IAN STEWART, Professor (Attench Address); B.Sc., Ph.D., Queen's University (Canada).

STEVEN T. SUSS, Professor Adjunct; B.A., University of California, Berkeley; Ph.D., University of California, Los Angeles.

GARY E. THOMAS, Professor; B.S., New Mexico State University; Ph.D., University of Pittsburgh.

RONALD J. THOMAS, Lecturer; B.S., New Mexico State University; M.S., Ph.D., Utah State University.

J. GETHIN TIMOTHY, Lecturer; B.Sc., Ph.D., University College (London).

JURI TOOMRE, Professor; B.S., M.S., Massachusetts Institute of Technology; Ph.D., Trinity College, Cambridge University (England).

THOMAS E. VAN ZANT, Professor Adjunct; B.S., Duke University; M.S., Ph.D., Yale University.

JAMES W. WARWICK, Professor; B.A., A.M., Ph.D., Harvard University.

ROBERT A. WEST, Lecturer; B.S., California Institute of Technology; Ph.D., University of Arizona.

JON W. WYNGAARD, Lecturer; B.S., M.S., University of Wisconsin; Ph.D., Pennsylvania State University.

ELLEN G. ZWEBEL, Assistant Professor; A.B., University of Chicago; Ph.D., Princeton University.

BIOLOGY—ENVIRONMENTAL, POPULATION, AND ORGANISTIC

ANNE C. BEKKOFF, Assistant Professor; B.A., Smith College; Ph.D., Washington University.

MARC BEKKOFF, Associate Professor; B.A., Ph.D., Washington University; M.A., Hofstra University.

RUTH A. BERZERSTEIN, Associate Professor; B.S., University of Wisconsin; Ph.D., University of California, Los Angeles.

CHARLES R. BITTER, Professor Emeritus.

CARL E. BOCK, Professor; A.B., Ph.D., University of California; Berkeley.

JANE E. BOCK, Professor; B.A., Duke University; M.A., Indiana University; Ph.D., University of California, Berkeley.

ERIK K. BONOMO, Professor; B.A., M.A., University of Colorado; Ph.D., University of Chicago.

J. PLATT BRADBURY, Assistant Professor Adjunct; B.A., University of Arizona; M.A., University of New Mexico.

MICHAEL D. BREED, Assistant Professor; B.A., Grinnell College, Grinnell, Iowa; M.A., Ph.D., University of Kansas.

ALAN PRIEST BROCKWAY, Professor (Emeritus); B.A., St. John's College (Annapolis); Ph.D., Western Reserve University (Cleveland).

WILLIAM H. BURT, Associate Professor in Warm-Blooded Vertebrates, University Museum; Visiting Professor; B.A.E., A.M., University of Kansas; Ph.D., University of California, Berkeley.

JOHN H. BUSKEL, Jr., Professor; B.A., Vassar College; M.S., Ph.D., Michigan State University.

ROBERT A. BYE, Jr., Assistant Professor; B.S., State University of New York, Stonyfield, Ph.D., Harvard University.

CYNTHIA CAREY, Assistant Professor; A.B., M.A., Occidental College; Ph.D., University of Michigan.

ROBERT H. CATLETT, Professor (Colorado Springs); A.B., M.A., Colorado College; Ph.D., University of California, Davis.

DANIEL E. CHURAS, Assistant Professor (Denver); B.A., Kansas State University; Ph.D., University of Kansas Medical Center.

DAVID W. CRUMPACKER, Professor; B.S., Oklahoma State University; Ph.D., University of California, Davis.

ALEXANDER CRUZ, Associate Professor; B.S., City College of New York; Ph.D., University of Florida.

LINDA DIXON, Associate Professor (Denver); B.S., California State College; M.S., University of California, Berkeley; Ph.D., University of Illinois.

ROBERT C. EATON, Assistant Professor; M.S., University of Oregon; B.A., Ph.D., University of California, Riverside.

JAMES H. ELEY, Associate Professor (Colorado Springs); B.S., M.A., Ph.D., University of Texas at Austin.

JO ANN W. FLOCK, Research Associate; B.A., University of Alaska; M.A., Ph.D., University of Colorado.

MICHAEL C. GANT, Associate Professor; B.A., A.M., Texas Technological University; M.A.; Ph.D., Duke University.

ROBERT E. GREGG, Professor Emeritus.

EMILY L. HARTMAN, Professor (Denver); B.A., M.A., Ph.D., University of Kansas.

EDWIN R. HEWIS, Professor Emeritus.

DONALD HORAK, Professor Adjunct; B.S., M.S., Ph.D., Colorado State University.

EDNA LOUISE JOHNSON, Professor Emeritus.

RICHARD E. JONES, Professor; B.A., M.A., Ph.D., University of California, Berkeley.

JAMES JOULE, Associate Professor (Denver); B.S., Pennsylvania State University; B.A., Western Washington State College; M.S., Ph.D., University of Houston.

MAHER B. KENNY, Assistant Professor (Attench Address); B.S., Butler University; M.S., Ohio State University.

PETER R. KEVA, Assistant Professor (Colorado Springs); B.S., McGill University; Ph.D., University of Alberta.

VERA KOMARKIVA, Assistant Professor (Attench Address); M.Sc., Charles University, Prague (Czechoslovakia); Ph.D., University of Colorado.

MEREDITH A. LANE, Assistant Professor; B.S., M.S., Arizona State University; Ph.D., University of Texas at Austin.

UNLESS NORTON LAMBER, Professor; B.A., University of Colorado; Ph.D., University of California, Berkeley.

WILLIAM M. LEWIS, Jr., Associate Professor; B.S., University of North Carolina at Chapel Hill; Ph.D., Indiana University at Bloomington.

YAN B. LINHART, Assistant Professor; B.S., Rutgers University; M.A., Yale University; Ph.D., University of California, Berkeley.

JOHN W. MACR, Professor; B.S., Texas Technological College; Ph.D., University of Minnesota.

T. PAUL MASLIN, Jr., Professor Emeritus.

JAMES R. MATTON, Professor (Colorado Springs); B.S., University of Illinois; M.S., Ph.D., University of Wisconsin.

*Graduate School faculty.
CENTER FOR INTERDISCIPLINARY STUDIES

DAVID M. ARMSTRONG, Director, Associate Professor of Biological Science, B.S., Colorado State University; M.A.T., Harvard University; Ph.D., University of Kansas.

Hazel estella barnes, Robert B. Hawkins, Distinguished Professor of Humanities, B.A., D.III., Wilson College, Ph.D., Yale University.

RonalD W. colton, Associate Professor of Biological Science, Dipl., Royal Horticulture Society.

Malcolm cornell, Professor of Physical Sciences, Professor of Physics and Astrophysics, Emeritus.

Milford F. CUNDIFF, Associate Professor of Biological Science, B.A., Ph.D., University of Colorado.

Ray P. Cuzzort, Professor of Social Sciences, Professor of Sociology, B.A., M.A., University of Cincinnati, Phil., University of Minnesota.

John a. eddy, Professor Adjunct of Physical Science, B.S., U.S. Naval Academy, Ph.D., University of Illinois.

Nancy K. Hill, Assistant Professor of Humanities, B.A., Carroll College, M.A., Columbia University, Ph.D., Northwestern University.

Kaye howe, Assistant Professor of Comparative Literature, Assistant Professor of Humanities, B.A., Ph.D., Washington University.

Harriet jeffrey, Professor of Humanities and Comparative Literature Emeritus.

Benni e. klank, Assistant Professor of Physical Science, B.S., University of Erlangen (Germany), Ph.D., University of Colorado.

Vernon H. Minor, Assistant Professor of Humanities, Assistant Professor of Fine Arts, B.A., Kent State University, M.A., Ph.D., University of Kansas.

philip L. Mitterling, Professor of Social Science, B.A. (Knox), Muhlenberg College, M.A., Ph.D., University of Illinois.

Anna lee owen, Assistant Professor of Social Science, B.S., Wisconsin State University, Whitewater, Ph.D., University of Wisconsin.

James W. Palmer, Assistant Professor of Humanities, B.A., Dartmouth College, M.A., Ph.D., Claremont Graduate School.

Aaron sayet, Professor of Physical Science, B.S., Ph.D., University of Chicago.

Richard J. schrock, Professor of Humanities, Professor of English, M.A., Ph.D., Princeton University.

Paul V. thompson, Professor of Humanities Emeritus.

CHEMISTRY

Peter abercrombie, Professor, B.S., Cornell University, Ph.D., California Institute of Technology.

John William Birks, Associate Professor, B.S., University of Arkansas; M.S., Ph.D., University of California, Berkeley.

Marvin H. Camrath, Professor, B.S., Iowa State University, Ph.D., Northwestern University.

albert Welford castellan, Jr., Professor, B.Ch.E., Remsen Research Polytechnic Institute, M.S., Ph.D., Polytechnic Institute of Brooklyn.

*Graduate School Faculty.

BLACK STUDIES

William M. King, Associate Professor, B.A., Kent State University; M.A., University of Akron, Ph.D., Stanford University.

Willard D. Samuels, Assistant Professor, B.A., University of California, Riverside, M.A., Ph.D., University of Iowa.
COMMUNICATION DISORDERS AND SPEECH SCIENCE

BONNIE AARONS, Lecturer, B.S., Boston University; M.A., University of Illinois—Urbana.

FLORENCE S. BLAESER, Assistant Professor. B.A., Ohio University; M.A., Ph.D., University of Denver.

NeD B. BOWLER, Professor Emeritus.

SARA J. SAREE, Instructor. B.A., M.A., San Francisco State University.

JON M. HAKROUK, Assistant Professor Adjunct. B.A., M.A., University of Montona; Ph.D., University of Denver.

NATALIE L. HEDBERG, Associate Professor. B.S., Syracuse University; M.A., University of Minnesota; Ph.D., Northwestern University.

TAKASHI HORI, Professor. B.S., University of Wabur; M.B., Wabur State University; Ph.D., Purdue University.

JON W. JENSEN, Assistant Professor Adjunct. B.S., Northern Illinois University; M.A., University of Toronto; Ph.D., University of Oklahoma.

ALPHONSE KESLEY, Instructor. B.A., Louisiana State University; M.S., Phillips University.

RICHARD F. KUEN, Professor. B.S., Illinois State University at Normal; M.A., Northwestern University; Ph.D., University of Oklahoma.

MALCOLM LUCIN, Lecturer. B.S., Northern Michigan University; Ph.D., University of Denver.

JUDY L. KURTH, Associate Professor Adjunct. B.A., Colorado College; M.Sc., Guelph College; M.A., University of Denver; Ph.D., University of Colorado.

ELIZABETH K. PFENNINGER, Instructor. B.E., M.E., University of Kansas; M.A., University of Colorado.

THOMAS P. MCGRAT, Assistant Professor Adjunct. B.S., Manhattan State College; M.A., Kansas State University; Ph.D., Denver University.

LOMBARDI A. RAMOS, Assistant Professor. B.S., University of Wisconsin—Oshkosh; M.S., University of Wisconsin— Madison; Ph.D., Purdue University.

PETE RAMOS, Assistant Professor. B.S., M.S., University of Wisconsin; Ph.D., Purdue University.

RICHARD H. SWEETMAN, Chairman, Professor. B.A., University of Colorado; M.A., Ph.D., Northwestern University.

DAVID T. TETER, Assistant Professor Adjunct. B.A., University of Oma; M.A., Ph.D., University of Denver.

RITA S. WEISS, Professor. B.S., Simmons College; M.A., Ph.D., University of Colorado.

REBECCA J. SWEETMAN, Instructor. B.A., University of Northern Colorado; M.A., University of Colorado.

L. MICHAEL BELL, Associate Professor. A.B., Harvard University; Ph.D., University of Chicago.

WESLEY W. BLOOMER, Professor. B.A., University of Iowa; M.A., Ph.D., University of Colorado.

WILLIAM N. CALDER III, Professor. B.A., Harvard College; M.A., Harvard University; Ph.D., University of Chicago.

JOHN C. COPELAND, Assistant Professor. B.S., M.A., University of Minnesota.

JOSÉ ENZISI, Professor Emeritus.

JULI A. FREY, Assistant Professor. B.A., Antioch College; M.A., University of Texas; Ph.D., Yale University.

ULRICH K. GOLDWICH, Professor Emeritus.

KATE HOWE, Vice Chancellor for Academic Services; Dean, College of Arts and Sciences; Assistant Professor. A.B., Ph.D., Washington University.

BRUCE F. KAWIN, Associate Professor. A.B., Columbia University; M.A., Ph.D., Cornell University.

MYRIS L. KENNEB, Associate Professor. B.A., University of Minnesota; M.A., Ph.D., Northwestern University.

JAMES R. KINDRA, Professor. B.S., Case Institute of Technology; M.A., Case Western Reserve University.

JOE K. LING, Associate Professor. B.A., Knox College; M.A., University of Wisconsin; Ph.D., University of Colorado.

C. NICHOLAS LEE, Professor. B.A., M.A., University of Michigan; Ph.D., Harvard University.

SIEGFRIED MANDER, Professor. B.A., Brooklyn College; M.A., Columbia University; Ph.D., University of Denver.

SOPHIA S. MORGAN, Assistant Professor. B.A., Smith College; M.A., Ph.D., University of Michigan.

EDWARD F. NOLAN, Associate Professor. B.A., Yale University; M.A., Indiana University.

RUBEN RABINDHAR, Professor. B.S., Rutgers University; M.A., Ph.D., Columbia University.

JULIUS E. AMHERST JR., Associate Professor. B.S., Davidson College; M.S., Ph.D., University of Oregon.

JEFFREY C. BENDRICK, Associate Professor. A.B., Harvard College; M.A., University of Chicago; Ph.D., Brandeis University.

HUGO SCHMITZ, Professor. B.A. equi, University of Vienna (Austria); M.A., Ph.D., Columbia University.

RICHARD JOSEPH, Professor. B.A., Stanford University.

LEONARD F. WESSELL, JR., Professor. B.A., San Diego State College; M.A., (Phil.) Ph.D., University of Washington.

CONSTANCE WRIGHT, Associate Professor. B.A., Scripps College; M.A., University of California, Berkeley.

ESTER A. ZAG, Assistant Professor. B.S., Columbia University (Berlin); Ph.D., University of Oregon.

ECONOMICS

A. PAUL BALLANTYNE, Professor. (Colorado Springs); B.A., University of Southern California; M.A., Iowa State University; Ph.D., Stanford University.


JAMES E. DOUGLAS, Professor Emeritus.

RAICERIS E. MALADIA, Professor. B.A., M.A., Cairo University; M.A., Ph.D., Rutgers University.

MORRIS E. EARNEST, Professor Emeritus.

FRED R. GLASS, Professor. B.S., M.S., Ph.D., Purdue University.

PIKUL E. GRAVES, Associate Professor. B.S., Indiana University; M.A., Ph.D., Northwestern University.

MICHAEL J. GREENWOOD, Professor. B.A., DePauw University; M.A., Ph.D., Northwestern University.

SUZANNE M. HELSBURG, Professor (Denver). B.A., American University; M.A., Ph.D., Indiana University.

CHARLES W. HOWE, Professor. B.A., Rice University; M.A., Ph.D., Stanford University.

FRANK D. KAY, Professor. B.A., M.A., National Taiwan University; M.A., Ph.D., University of Rochester.

BYRON L. JOHNSON, Professor (Denver). B.A., M.A., Ph.D., University of Wisconsin.

WILLIAM H. KEMPFER, Assistant Professor. B.A., College of Wooster; M.A., Ph.D., Duke University.

JANE H. KIRKLAND, Associate Professor. B.A., Denison University; M.A., Ph.D., Duke University.

KEITH E. MASTERS, Assistant Professor. B.A., Knox College; M.A., Ph.D., University of Michigan.

CARL W. MCNALLY, Professor Emeritus.

ROBERT F. McILHANON, Associate Professor. B.A., University of California, Los Angeles; Ph.D., University of California, San Diego.

EDWARD G. MOREY, Assistant Professor. B.A., University of Denver; M.A., University of Arizona; Ph.D., University of British Columbia.

JOHN R. MORRIS, JR., Associate Professor (Denver). B.A., Cornell University; M.S., Ph.D., Purdue University.

JULIANE MORRISSEY, Director, Center for Economic Education; Professor. A.B., Smith College; M.A., Ph.D., University of California, Berkeley.

TRACY MOTT, Associate Professor. A.B., Princeton University; M.Div., Union Theological Seminary; M.A., Stanford University.

WYN W. MOWRY, Professor. B.S., University of Sydney (Australia); D.A., B.Litt., Oxford University; Ph.D., University of Wisconsin.

BARRY W. MOULTON, Professor. B.A., Ohio Wesleyan University; M.A., Ph.D., Ohio State University.

JOHN P. POWERS, Professor. M.A., B.S., University of Pennsylvania; B.A., M.A., Ph.D., Harvard University.

NICHOLAS W. SCHROCK, Associate Professor. B.A., Western Reserve University; B.A., San Diego State College; Ph.D., University of Oregon.

LAWRENCE SENCER, Professor Emeritus.

JACOB B. SHEPP, Assistant Professor. B.A., M.A., Ph.D., University of Pennsylvania.

LARRY D. SINGEL, Professor. B.A., Eastern Nazarene College; M.A., Ph.D., Wayne State University.

TIMOTHY D. TREGUARD, Assistant Professor. (Colorado Springs). A.B., Chico State College; M.A., Ph.D., University of California, Davis.

BERNHARD UDUS, Director, Bureau of Economic Research; Professor. B.A., Pennsylvania State University; M.A., University of Pennsylvania; Ph.D., Princeton University.

*Graduate School Faculty.
ENGLISH

DONALD C. BAKER, Professor Emeritus.

BRUCE BASSIFF, Associate Professor: B.A., Brandeis University; M.A., Columbia University; Ph.D., The City University of New York.

L. MICHAEL BELL, Associate Professor: A.B., Harvard College; Ph.D., Harvard University.

C. DAVID BENSON, Associate Professor: A.B., Harvard College; M.A., Ph.D., University of California, Berkeley.

MARTIN E. BICKMAN, Assistant Professor: A.B., Amherst College; M.A., Harvard University; M.A., Ph.D., University of Pennsylvania.

RONALD BILLINGSLEY, Assistant Professor: B.A., University of Redlands; M.A., Ph.D., University of Oregon.

ALEXANDER L. BLACKBURN, Associate Professor (Colorado Springs): B.A., Yale University; M.A., University of North Carolina, Ph.D., University of Cambridge.

ARTHUR M. BOARDMAN, Associate Professor: B.A., M.A., University of Nevada; Ph.D., University of California, Berkeley.

LESLEY W. BRILL, Assistant Professor: B.A., University of Chicago; M.A., State University of New York at Binghamton; Ph.D., Rutgers University.

JANE A. BROWN, Associate Professor: A.B., Radcliffe College; M.Phil., Ph.D., Yale University.

MARTHA BROWN, Associate Professor: B.A., Harvard College; M.Phil., Ph.D., Yale University.

DOUGLAS A. BUMBER, Associate Professor: B.A., Colorado State College; M.A., Ph.D., Liberal Arts University.

Rex S. BURNS, Professor (Detroit): B.A., Stanford University; M.A., Ph.D., University of Minnesota.

MELVIN H. BUXBAUM, Professor: B.A., M.A., Roosevelt University; Ph.D., University of Chicago.

CORDelia C. CANDELARIO, Assistant Professor: B.A., Fisk University; M.A., Ph.D., University of Notre Dame.

JACK H. COWCH, Professor: B.A., University of California, Los Angeles; M.A., Ph.D., Cornell University.

RICHARD T. DILLON, Associate Dean of the College of Liberal Arts and Sciences; Associate Professor (Denver): B.A., Yale University; M.A., Ph.D., University of California, Berkeley.

J. WALLACE DONALD, Associate Professor: A.B., Williams College; M.A., Ph.D., Columbia University.

EDWARD DORN, Associate Professor: B.A., Black Mountain College (North Carolina).

HERBERT G. ELDOR, Professor (Denver): B.A., M.A., Ph.D., University of Pennsylvania.

CHARLES L. EVANS, Professor: A.B., Mercer University; M.A., Emory University.

JAMES KING FOLSOM, Department Chairman; Professor: B.A., Northwestern University; M.A., Ph.D., Princeton University.

SIDNEY GOLDFARB, Assistant Professor: A.B., Harvard College.

JOHN N. GRAHAM, Associate Professor: A.B., Middlebury College; M.A., Ph.D., New York University.

VIRGIL F. GRILLO, Professor: B.A., University of Southern California; M.A., Ph.D., University of California, Berkeley.

PHILIP F. GUIRA, Assistant Professor: A.B., Harvard College; Ph.D., Harvard University.

ELIZABETH GUIRAN GUALDINIC, Associate Professor: A.B., M.A., University of Pennsylvania; M.Phil., Ph.D., Yale University.

LOUIS H. HALL, Professor (Denver): B.A., Pennsylvania State University; M.A., University of North Carolina, Ph.D., University of Oregon.

EUGENE IREY, Professor Emeritus.

ROBERT D. JOHNSTON, Professor (Denver): B.A., University of Maryland; M.A., Ph.D., University of Missouri.

SHIRLEY A. JOHNSTON, Associate Professor (Denver): B.A., University of Denver; Ph.D., University of New Mexico.

SUZANNE H. JURASS, Assistant Professor: B.A., Bennington College; M.A., Ph.D., University of California, Berkeley.

HAROLD J. KANE, Professor: B.A., Marquette University; M.A., Ph.D., University of Pennsylvania.

STEVEN KATZ, Associate Professor: A.B., Cornell University; M.A., Ph.D., University of Oregon.

BRUCE F. KAWIN, Associate Professor: B.A., Columbia University; M.A., Ph.D., Cornell University.

JAMES K. KINCAID, Professor: B.S., Case Institute of Technology; M.P.D., Case Western Reserve University.

RICHARD L. KINNEY, Associate Professor: B.A., University of San Francisco; M.A., University of Notre Dame; Ph.D., Pennsylvania State University.

ARTHUR L. KISNER, Associate Professor: B.A., M.A., University of Illinois.

JOAN E. KLINGEL, Assistant Professor (Colorado Springs): B.A., State University of New York at Stony Brook; M.A., Ph.D., Brown University.

PHILIP L. KRAUTH, Assistant Professor: A.B., M.A., Ph.D., Indiana University.

MARILYN D. KRYSL, Assistant Professor: B.A., M.A., Ph.D., University of Oregon.

PAUL M. LEVITT, Professor: B.A., M.A., University of California; M.A., Ph.D., University of California, Los Angeles.

THOMAS R. LINCOLN, Director, Expository Writing Program, A.B., Ph.L., St. Louis University; M.A., Ph.D., Washington University.

ROY LUTCH, Professor Emeritus.

BEN MOODY, Professor Emeritus.

CLARENCE MAJOR, Associate Professor: B.S., State University of New York, Albany; Ph.D., Union Graduate School, Amherst College.

JOHN M. MAJOR, Professor: A.B., A.M., University of Harvard University.

SIEGFRIED MANDEL, Professor: B.A., Brooklyn College; M.A., Columbia University; Ph.D., University of Denver.

WILLIAM MARKWARD, Professor Emeritus.

JEFFREY MEYERS, Professor: B.A., University of Michigan; M.A., Ph.D., University of California, Berkeley.

PETER F. MICHELSON, Associate Professor: B.A., Whitman College; M.A., University of Wyoming.

LEONARD MOSKOVITZ, Professor: B.A., M.A., Ph.D., University of California, Berkeley.

JOHN LEO MURPHY, Professor: B.A., St. Benedict's College; Ph.D., University of Oklahoma.

THOMAS H. NAPIERKOWSKI, Associate Professor (Colorado Springs): B.A., University of Wisconsin; M.A., Ph.D., University of Colorado.

MARY BETH NELSON, Associate Professor: B.A., Ph.D., University of California, Berkeley.

CHARLES K. NUGENT, Professor: B.S., Tennessee State College; M.A., University of Kansas; Ph.D., University of Wisconsin.

EDWARD P. NOLAN, Associate Professor: B.A., Yale University; M.A., Indiana University.

GERDA S. NORVIUS, Assistant Professor: B.A., Bennington College; M.A., Ph.D., Brandeis University.

JACK G. O'BRIEN, Professor Emeritus.

ELHEM PELLMAN, Associate Professor (Denver): B.A., Cornell University; M.A., Ph.D., Harvard University.

KENT H. PETERS, Associate Professor (Colorado Springs): B.A., Michigan State University; M.A., Ph.D., University of Nebraska.

PAUL PERERA, Associate Professor: B.A., Delhi University (India); M.A., University of Michigan.

HENRY PETIT, Professor Emeritus.

MICHAEL J. PROVENZANO, Associate Professor: B.A., Gonzaga University; M.A., University of Virginia; M.A., Ph.D., University of Colorado.

MICHAEL A. PROUDFIT, Professor: B.A., M.A., University of Michigan.

RUBIN RABINOWITZ, Professor: B.A., Rutgers University; M.A., Ph.D., Columbia University.

JULIUS S. RIVERS, Professor: B.A., Davidson College; M.S., Ph.D., University of Oregon.

FRANCIS CARLETON ROBINSON, Professor Emeritus.

JEFFREY C. ROBINSON, Associate Professor: A.B., Harvard University; M.A., University of Chicago; Ph.D., Brandeis University.

JOEL SALZBERG, Associate Professor (Denver): B.A., City College of New York; M.A., Indiana University; Ph.D., University of Oklahoma.

REGINALD L. SANER, Professor: B.A., St. Norbert College; M.A., Ph.D., University of Illinois.

LEWIS SAMIN, Professor: B.A., M.A., University of Kentucky; Ph.D., Duke University.

RICHARD J. SCHAEFFER, Professor: B.A., M.A., Ph.D., Princeton University.

DORIS J. SCHMALKE, Associate Professor (Denver): B.A., M.A., University of Toledo; Ph.D., University of Colorado.

CHARLES LABARRE SQUIER, Professor: A.B., A.M.T., Harvard University; Ph.D., University of Michigan.

JANE SMITH, Associate Professor (Colorado Springs): B.S., Oklahoma Baptist University; M.A., University of Kansas City; M.A., Ph.D., University of Denver.

ROBERT STEINER, Assistant Professor: B.A., New York; M.A., Bowing Green University; Ph.D., University of Massachusetts.

RONALD SUKERNICK, Professor: B.A., Cornell University; M.A., Ph.D., Brandeis University.

*Graduate School faculty.
ORIENTAL AND SLAVIC LANGUAGES AND LITERATURES

ROBERT H. ABARNATHY. Professor of Slavic Linguistics. B.A., University of Arizona; Ph.D., Harvard University.

HOWARD A. DAUGHERTY. Assistant Professor of Russian. B.A., Ph.D., University of Wisconsin.

PAUL W. KRILL. Assistant Professor of Chinese. B.A., M.A., Ph.D., University of Michigan.

C. NICHOLAS LEE. Department Chairman; Professor of Russian. B.A., M.A., University of Maryland; Ph.D., Harvard University.

WILLIE T. NASAL, Senior Instructor in Japanese. B.A., Rikkyo (St. Paul's) University, Tokyo (Japan); M.A., Ph.D., University of Colorado.

O. L. PLANK. Professor of Russian. B.A., Ph.D., University of Washington.

EARL D. SAMPSON. Associate Professor of Russian. B.A., University of Colorado; M.A., Ph.D., Harvard University.

KUMAKO TAKAHARA. Associate Professor of Japanese and Linguistics. B.A., M.A., University of the Sacred Heart; M.A., University of Edinburgh (Scotland); Ph.D., University of London (England).

DONALD SIGURJONSSON WILLIS. Professor of Chinese and Japanese. B.A., Ph.D., University of Washington.

PHILOSOPHY

LEONARD G. BODNIA. Professor. B.A., City College of New York; LL.B., New York University School of Law; M.A., New York School for Social Research; Ph.D., Columbia University.

JOHN ROBB CARNES. Professor. B.S., M.S., Ph.D., University of Michigan.

LEWIS CROWE. Professor. A.B., Duke University; M.A., Ph.D., Columbia University.

JOHN ANDREW FISHER. Associate Professor. B.Phys., University of Minnesota.

RICHARD F. FRANCIS. Associate Professor (Colorado Springs). B.A., Catholic University of America; M.A., University of Colorado; Ph.D., University of Notre Dame.

JAMES PATTERSON FRANK. Professor. B.S., M.S., Ph.D., Northwestern University.

DAVID HAWKINS, Distinguished Professor. A.B., M.A., Stanford University; Ph.D., University of California.

DALE W. JAMESON. Assistant Professor. B.A., San Francisco State University; M.A., Ph.D., University of North Carolina.

CHARLES A. KENNEVAN. Associate Department Chairman (Denver Campus); Associate Professor. B.A., M.A., University of Illinois; Ph.D., Northwestern University.

PHILLIS KENNEWAY. Associate Professor. B.A., M.A., University of Minneapolis; Ph.D., Northwestern University.

JAMES P. KIMBLE, JR. Professor. B.A., M.A., Ph.D., University of Texas.

BEREL LANG. Professor. B.A., Yale University; Ph.D., Columbia University.

STEPHEN LEHR. Associate Professor. A.B., Harvard University; Ph.D., Massachusetts Institute of Technology.

EDWARD J. MACHE. Professor Emeritus.

JERRY L. MARTIN. Professor. B.A., University of California; M.A., University of Chicago; Ph.D., Northwestern University.

Ed L. MILLER. Professor. B.A., M.A., Ph.D., University of California.

PAUL JOHNSON MILLER. Professor. B.A., M.A., Ph.D., University of Southern California.

WESLEY MURRASTON. Associate Professor. B.A., Queen's University of Belfast (N. Ireland); Ph.D., Northwestern University.

JOHN OSBORN NELSON. Professor. A.B., Princeton University; M.A., College University; Ph.D., Cornell University.

WILLIAM J. PRIOR. Assistant Professor. B.A., Michigan State University; Ph.D., University of Texas.

ROBERT ROGERS. Department Chairman; Professor. B.A., M.A., Ph.D., University of Chicago.

WILLIAM SACKSTEDER. Professor. Ph.B., M.A., Ph.D., University of Chicago.

HOWARD E. SMOKER. Professor. B.A., Rutgers University; M.A., Ph.D., Columbia University.

GARY STANLY. Professor. B.S., Williams College; M.A., Brown University; Ph.D., Columbia University.

ELDON L. STEVENS. Professor (Colorado Springs). B.A., M.A., University of Minnesota; Ph.D., University of Colorado.

GLENN WEBSTER. Associate Professor (Denver). B.A., M.A., Ph.D., University of Washington.

WALTER D. WEIR. Professor. A.B., Boston University; M.A., Ph.D., Harvard University.

FORREST WILLIAMS. Professor. B.Sc., M.A., Ph.D., Northwestern University.

PHYSICAL EDUCATION AND RECREATION

ELIZABETH ABBOTT. Professor Emeritus.

WILLIAM S. APPENZELLER. Assistant Professor. B.S., M.Ed., University of Minnesota.

MARY-ETHEL BALL. Professor Emerita.

DAVID C. BARTELMA. Professor Emeritus.

FRANCES R. BASSOM. Professor Emerita.

RALPH E. BISLER. Associate Professor. B.S., Ball State Teachers College; M.A., Columbia University.

FREDERICK W. BIERSHUS. Professor. B.S., Minnesota State Teacher's College (St. Cloud, Minn.); M.Ed., University of Minnesota; Ed.D., University of Colorado.

WILLIAM C. BYRNES. Assistant Professor. B.S., University of North Carolina; M.S., Western Reserve University; Ph.D., University of Washington.

HARRY D. CARLSON. Professor Emeritus.

ARTHUR L. DICKINSON. Professor. B.A., State College of Iowa; M.S., Western Reserve University; Ph.D., University of Washington.

GEO BLENNIS. Professor Emeritus.

PATRICK T. LONG. Assistant Professor. B.A., University of Illinois; M.A., State University of New York; Ed.D., Teachers College, Columbia University.

DALE PAUL MOOD. Assistant Professor. B.S., M.A., University of Arizona.

FRED R. MURPHY. Associate Professor. B.S., University of Minnesota; Ed.D., University of Colorado.

DON R. PARKIN. Assistant Professor. B.A., Rockefeller College; B.S., Northern Arizona University; M.S., Ph.D., University of Colorado.

FRANK C. POTTS. Professor Emeritus.

FRANK BERNARD PRENTUP. Professor Emeritus.

WALDEMAR BRUCKBAUER. Department Chairman; Professor. B.S., Louisana State University; M.A., Ph.D., University of Southern California.

JOHN B. SMITH. Assistant Professor. B.S., Springield College; Ph.D., University of California.

EUGENE WOODELL. Associate Professor. B.A., Springield College; M.A.; New Mexico State University; Ed.D., University of Utah.

STEPHEN A. WALLACE. Assistant Professor. B.S., M.A.; Kent State University; B.S., University of Wisconsin.

DALLAS WARD. Professor Emeritus.

DAVID B. WARDEN. Assistant Professor. B.S., Colorado State University; M.S., Northern Illinois University; Ph.D., University of Utah.

ARTHUR WELTMAN. Associate Professor. B.A., Queens College; M.A., New York University; Ph.D., University of Michigan.

EDNA WILLIS. Professor Emeritus.

PHYSICS

ROBERT S. AITKEN. Assistant Professor (Colorado Springs). B.S., Colorado Springs; B.S., Northen Colorado; M.A., University of Illinois; Ph.D., University of Illinois.

JACOB ASHBY. Professor. B.A., University of Colorado; M.A., Ph.D., University of Michigan.

Graduate School Faculty.
ALBERT ALLEN BARTLETT, Professor.* B.A., Colgate University; M.A., Ph.D., Harvard University.

DAVID BARTLETT, Associate Professor.* A.B., Harvard University; A.M., Ph.D., Columbia University.

A. D. BBIB, Professor.** Diploma, Doctor of Science, Swiss Federal Institute of Technology.

EARL C. BEATY, Lecturer.* A.B., Murray State College; Ph.D., Washington University.

PETER BEYER, Professor Adjunct.* B.S., Rutgers University; M.A., Ph.D., Princeton University.

RICHARD A. BLADE, Professor (Colorado Springs).* B.S., Ph.D., University of Colorado.

WESLEY E. BRITTEN, Professor.* B.S., M.S., University of Colorado; M.A., Princeton University; Ph.D., University of Alaska.

JAMES W. BROXON, Professor Emeritus.

KEITH BURNETT, Assistant Professor.* B.A., D.Phil., Oxford University.

NOEL A. CLARK, Associate Professor.* B.S., M.S., John Carroll University; Ph.D., Massachusetts Institute of Technology.

JOHN M. CLEVELAND, Professor Emeritus.*

JOHN COOPER, Professor.* B.A., M.A., Cambridge University; Ph.D., University of London.

MALCOLM CORRELL, Professor.* A.B., Indiana University; Ph.D., University of Iowa.

JOHN P. CUMALAT, Assistant Professor.* B.A., M.A., Ph.D., University of California, Santa Barbara.

THOMAS A. CRANDALL, Assistant Professor.* B.S., University of Tennessee; Ph.D., Massachusetts Institute of Technology.

BERTHAR W. DOWNS, JR., Professor.* B.S., California Institute of Technology; M.S., University of Minnesota; Ph.D., Stanford University.

JOSEPH DREITZEL, Professor.* B.S., Manhattan College; M.S., University of Chicago; Ph.D., Washington University; St. Louis.

GORDON DUNN, Professor Adjunct.* B.S., Ph.D., University of Washington.

JAMES F. DUNN, Professor Adjunct.* A.B., Indiana University; M.A., Ph.D., Princeton University.

WILLIAM T. FORD, Associate Professor.* B.A., Carleton College; Ph.D., Princeton University.

ALLAN D. FRANKLIN, Associate Professor.* A.B., Columbia College; Ph.D., Cornell University.

ALAN C. GALLAGHER, Professor Adjunct.* B.S., Purdue University; Ph.D., Columbia University.

ROY HENRY GARSTANG, Professor.* B.A., M.A., Ph.D., Cambridge University.

SYDNEY GILMAN, Professor Adjunct.* B.S., M.S., Ph.D., Yale University.

MARTIN V. GOULD, Professor.* B.A., Princeton University; M.S., Ph.D., Harvard University.

JOHN L. HALL, Lecturer.* B.S., M.S., Ph.D., Carnegie Institute of Technology.

CARL HODGINS, Professor.* A.B., Harvard College, Ph.D., California Institute of Technology.

AZZI PHILIP IMAD, Lecturer. B.S., American University of Beirut; M.S., Ph.D., University of London.

ROBERT E. JONES, Associate Professor (Colorado Springs).* B.A., Kansas State College; Ph.D., Iowa State University.

JACK J. KRAUSHAAR, Professor.* B.S., Lafayette College; M.S., Ph.D., Syracuse University.

PETER DALE KUNK, Professor.** B.S., M.S., Oregon State College; Ph.D., University of Washington.

JUDAH LEVINE, Professor Adjunct.* A.B., Yeshiva College; M.S., Ph.D., New York University.

DAVID A. LIND, Professor.** B.S., University of Washington; M.S., Ph.D., California Institute of Technology.

WILLIAM F. LOVE, Professor.* B.A., M.A., Ph.D., Rice Institute.

K.T. MATHANATHAPPA, Professor.* B.Sc., Central College at Bangalore; M.S.C., Delhi University; Ph.D., Harvard University.

MARTIN MALTEMPO, Assistant Professor.* A.B., Queens College, New York City; M.S., Ph.D., Columbia University.

THOMAS S. MASTERSON, Assistant Professor (Abdertant Rank).* B.A., Rice University; M.A., Ph.D., University of Wisconsin.

STANLEY C. MILLER, JR., Professor.* B.S., University of Colorado; Ph.D., University of California.

MATSUTAKA MIZUSHIMA, Professor.* M.A., Sci., University of Tokyo.

RICHARD C. MOCKLER, Professor.* B.S., Northwestern University; M.S., University of Chicago; Ph.D., Duke University.

FRANZ MOULINS, Professor.* B.S., Rensselaer Polytechnic Institute; Ph.D., University of Washington.

UREL NAUERG, Professor.* B.S., Ph.D., Columbia University.

FRANK OPPENHEIMER, Professor Emeritus.*

WILLIAM J. O'SULLIVAN, Professor.* B.S., Rensselaer Polytechnic Institute; M.S., University of Southern California; Ph.D., University of Pittsburgh.

ROY JEROME PETRUSON, Associate Professor.* B.S., Ph.D., University of Washington.

ARTHUR PHELPS, Lecturer.* B.S., University of Texas; B.S., University of Florida; B.S.D., Massachusetts Institute of Technology.

PAUL E. PHILLIPSON, Professor.* B.A., M.S., Ph.D., University of Chicago.

WILLIAM A. RENNE, Professor Emeritus.*

BRIAN W. RUDOLF, Professor.* Ph.D., Cavendish Laboratory (Cambridge, England).

ROBERT RUSTEN, Professor.* B.S., University of Minnesota; M.S., Ph.D., University of Colorado.

ERNST ROST, Professor.* A.B., Princeton University; Ph.D., University of Pittsburgh.

MARLAN G. SCULLY, Professor Adjunct.* B.S., University of Wyoming; M.S., Ph.D., Yale University.

JAMES L. SCOTT, Professor.* A.B., Harvard University; Ph.D., Ohio State University.

JAMES R. SHEPARD, Associate Professor (Abdertant Rank).* B.S., Yale University; Ph.D., University of Colorado.

EDWARD R. SICILIANO, Assistant Professor (Abdertant Rank).* B.A., University of Connecticut; M.S., M.D., Indiana University.

JAMES G. SMITH, Assistant Professor (Abdertant Rank).* B.S., Massachusetts Institute of Technology; Ph.D., University of California, San Diego.

MARTIN L. SMITH, Jr., Assistant Professor (Abdertant Rank).* B.S., M.S., California Institute of Technology; Ph.D., University of California.

STEPHEN J. SMITH, Professor Adjunct.* A.B., Kalamazoo College; M.A., Ph.D., Harvard University.

ROMAN SNYTHE, Professor.* B.S., M.S., Ph.D., California Institute of Technology.

RAUL A. STERN, Professor.* B.S., University of Wisconsin; Ph.D., University of California, Berkeley.

WALTER H. TANITA, Professor.* B.S., M.A., University of Alabama; Ph.D., University of Washington.

JOHN A. TAYLOR, Professor.* B.A., Cambridge University; (England); Ph.D., University of California, Berkeley.

WALTER WYSS, Professor.* Dipl. Phys. Dr. Sc. NAT, ETH, University of Zurich, Switzerland.

CHRIS ZAFRATOS, Department Chairman; Professor.* B.S., Lewis and Clark College; Ph.D., University of Washington.

CLYDE A. ZADIN, Professor (Denver).* B.S., M.S., Ph.D., California Institute of Technology.

ALEX ZUNGER, Professor Adjunct, B.Sc., M.Sc., Ph.D., Tel Aviv University.

**Graduate School Faculty.

POLITICAL SCIENCE

KATHLEEN MURPHY BEATTY, Assistant Professor (Colorado Springs).* B.A., University of Colorado; M.A., Tufts University; Ph.D., Washington State University.

FRANCIS S. BEER, Professor.* A.B., Harvard College; M.A., Ph.D., University of California, Berkeley.

LAWRENCE WARD BEER, Professor.* A.B., M.A., Gonzaga University; Ph.D., University of Washington.

BERTON D. BRUNNER,* B.A., Ph.D., Yale University.

JOHN C. BUCHNER, Professor.* A.B., College of Wooster, M.P.A., Ph.D., University of Michigan.

JAMES L. BUSCH, Professor Emeritus.*

GEORGE M. COKING JR., Professor.* B.A., M.A., University of Washington; Doctor des Sciences Poitiques, University of Geneva (Switzerland).

ANNE N. COSTAIN, Associate Professor.* A.B., Brown University; M.A., Ph.D., Johns Hopkins University.

MICHAEL S. CUMMINGS, Assistant Professor (Denver).* A.B., Princeton University; M.A., Ph.D., Stanford University.

DENIS R. CUEU, Associate Professor.* A.B., M.A., University of California, Davis; Ph.D., University of California, Los Angeles.

JOEL C. EDELSTEIN, Associate Professor (Denver).* B.A., M.A., New School for Social Research; Ph.D., University of California, Riverside.

JARE EVERTT, Associate Professor (Denver).* B.A., Mount Holyoke College; M.A., University of Michigan.

JON S. FITCH, Associate Professor.* A.B., Randolph-Macon College; M.A., M.P., Ph.D., Yale University.

HENRY F. GOODMAN, Professor.* B.A., Amherst College; M.A., University of Chicago; Ph.D., Columbia University.

EDWARD S. GREENBERG, Professor.* B.A., M.A., Miami University (Ohio); Ph.D., University of Wisconsin.

ZUBER KRYSTUFK, Professor.* J.D., Charles University, Prague; J.S.M., Stanford University; Ph.D., Czechoslovak Academy of Sciences.

ROBERT S. LOCH, Professor (Colorado Springs).* B.A., State University of Iowa; M.A., University of Nebraska; Ph.D., University of Wisconsin.
SRAHAM M. STERIOTT, Professor (Denver); B.A., Adelphi College; M.A., City College of New York; Ph.D., University of Colorado.

WILLIAM A. SUTTON, Assistant Professor Adjunct (Colorado Springs); B.S., Western Michigan University; M.P.S., Ph.D., University of Ottawa.

RONALD G. TAYLOR, Professor; B.S., Western Michigan University; M.A., Ph.D., Michigan State University.

DAVID R. THOMAS, Professor; B.A., M.A., Brooklyn College; Ph.D., Duke University.

ROBERT H. TINKER, Assistant Professor Adjunct (Colorado Springs); B.A., B.S., Michigan State University.

STEVEN G. VANGENREED, Professor; B.S., Municipal Gymnasium Groningen; B.A., M.A., Groningen University (Netherlands); Ph.D., University of Michigan.

THEODOR VOLSKY, JR., Vice President for Administration; Professor; B.S., M.S., Kansas State University; Ph.D., University of Minnesota.

MOZELLA POWELL WALKER, Assistant Professor; B.A., M.A., Ph.D., University of California, Los Angeles.

DONALD ARTHUR WEATHERLEY, Associate Professor; B.S., M.A., Northern Illinois University; Ph.D., Stanford University.

JOHN S. WEINER, Assistant Professor; B.A., M.A., University of Kansas; Ph.D., Brown University.

MICHAEL WERTHEIM, Professor; B.A., Swarthmore College; M.A., Johns Hopkins University; Ph.D., Harvard University.

JAMES R. WILSON, Associate Professor; B.A., Ph.D., University of California, Berkeley.

RELIGIOUS STUDIES

DAVID CARASCO, Assistant Professor; B.A., Western Maryland College; M.A., D.Min., Ph.D., University of Chicago.

IRA CHERNOFF, Assistant Professor; B.A., Rutgers College; M.A., Ph.D., Temple University.

FREDERICK M. Denny, Associate Professor; B.A., College of William and Mary; B.S., Antioch Newton Theological School; M.A., Ph.D., University of Chicago.

DOUGLAS WEBSTER HANCE, Professor Emeritus.

ROBERT C. LESTER, Department Chairman; Professor; B.A., University of Montana; B.D., Yale Divinity School; M.A., Ph.D., Yale University.

ROONEY L. TAYLOR, Associate Professor; B.A., University of Southern California; M.A., University of Washington; Ph.D., Columbia University.

SOCIOLOGY

E. MERLE ADAMS, Professor; A.B., Drake College; M.A., Ph.D., Harvard University.

RICHARD H. ANDERSON, Associate Professor (Denver); B.A., M.A., Ph.D., University of Oregon.

OTMAR J. BARTOS, Director, Bureau of Sociological Research; Professor; B.A., M.A., University of Colorado; Ph.D., Yale University.

ELISE M. BOURDING, Visiting Professor; B.A., Douglass College; M.S., Iowa State College; Ph.D., University of Michigan.

HERBERT BYNDER, Associate Professor; A.B., Wilkes College; M.P.H., Ph.D., Columbia University.

JAY J. COAKLEY, Associate Professor (Colorado Springs); B.A., St. John's College; M.A., Ph.D., University of Notre Dame.

M. JAY CROWE, Professor (Denver); B.A., M.A., Washington State University; Ph.D., University of Kentucky.

RAY F. DUVORT, Department Chairman; Professor; B.A., M.A., University of Cincinnati; Ph.D., University of Minnesota.

JAMES V. DOWTON, Professor; B.A., M.A., Sacramento State College; Ph.D., University of California.

RICHARD L. DUKE, Assistant Professor (Colorado Springs); B.S., California State University; M.A., Ph.D., University of Southern California.

DELBERT S. ELLIOTT, Professor Adjunct; B.A., Pomona College; M.A., Ph.D., University of Washington.

RUSSELL ENDO, Associate Professor; B.A., Stanford University; M.A., University of California; Ph.D., University of Wisconsin.

KARL H. FLAMING, Associate Professor (Denver); B.A., M.A., University of Nebraska; Ph.D., Syracuse University.

MARTHA E. GIMENEZ, Associate Professor; B.A., Montana State University; M.A., National University of Colombia (Argentina); Ph.D., University of California, Los Angeles.

ROBERT C. HANSON, Professor; B.A., M.A., Ph.D., University of California, Berkeley.

HOWARD HUMAN, Professor; B.A., M.A., University of Colorado.

ROBERT H. HUGHES, Associate Professor (Colorado Springs); B.A., M.A., Ph.D., University of Colorado.

ROBERT M. HUNTER, Associate Professor; B.A., Ph.D., University of Colorado.

J. M. KLOJSETH, Associate Professor; B.A., University of Colorado.

BARBARA DAY LORCH, Professor (Colorado Springs); B.S., Washington State University; M.A., State College of Washington; Ph.D., University of Washington.

THOMAS F. MAYER, Director, Program on Social and Cultural Processes, Institute of Behavioral Science; Associate Professor; B.A., Oberlin College; Ph.D., Stanford University.

BLAINE E. MENGCE, Professor; B.A., University of Colorado; M.A., Colorado State College; D.S.Sc., Syracuse University.

ELIZABETH W. MOE, Associate Professor; B.S., Long Beach College; Ph.D., Johns Hopkins University.

JOYCE M. NIELSEN, Associate Professor; B.A., University of Colorado; M.A., Ph.D., University of Washington.

RICHARD H. O'GLES, Professor (Denver); B.S., University of Utah; M.S., Brigham Young University; Ph.D., Washington State University.

ISIDORO MONTIEL, Professor Emeritus.

TERESA A. PAREDES, Associate Professor; B.A., Universidad de Misiones, Argentina; B.S., Texas A & M University; M.A., University of New Mexico.

LILLIAN FERNANDEZ DE ROBINSON, Associate Professor; B.S., Rider College; M.A., Ph.D., University of Colorado.

DOMINGO RICART, Visiting Professor; B.A., Paris, France; B.A., Ph.D., Barcelona, Spain.

FRANCISCO ARMANDO RIOS, Assistant Professor; B.A., University of Denver; Ph.D., University of Oklahoma.

EDITH RANDOLPH ROGERS, Professor (Denver); B.A., University of Denver; Ph.D., University of Colorado.

DONALD L. SCHMIDT, Associate Professor; B.A., University of Colorado; M.A., University of Kansas.

CHARLES WEBB STANSFIELD, Associate Professor; B.A., B.S., University of Colorado; Ph.D., Florida State University.

BRENDA KIC, Professor Emeritus.

**Spanish and Portuguese**

YVONNE GUILLON BARNETT, Associate Professor; B.A., University of Colorado; M.A., Florida State University.

INEZ DOLZ-BLACKBURN, Associate Professor (Colorado Springs); B.A., University of Santiago, Chile; M.A., University of Colorado.

JOHN G. CEPHEL, Assistant Professor; B.S., M.A., Indiana University.

RODRIGUEZ SALVADOR DEL PINTO, Assistant Professor; B.A., California State University; B.S., University of California, Long Beach; M.A., University of California, Santa Barbara.

JOSE DE ONIS, Professor Emeritus.

JOSE B. FERNANDEZ, Associate Professor (Colorado Springs); B.A., University of Florida; M.A., Florida State University.

WILLIAM J. GRIM, Professor; B.A., University of Oregon; M.A., Ph.D., Cornell University.

CHARLES L. KING, Professor; B.A., University of New Mexico; M.A., Ph.D., University of Southern California.

RALPH K. KITE, Associate Professor; B.A., Texas A & M University; M.S., University of New Mexico.

ANTHONY B. LOZANO, Department Chairman; Professor; B.A., Ph.D., University of Texas at Austin.

PAULINE MARSHALL, Professor Emerita.

DOUGLAS R. MOLL, Professor (Colorado Springs); B.A., University of Utah; M.A., University of Oregon; Ph.D., Michigan State University.

ISIDORO MONTIEL, Professor Emeritus.

**Spanish and Portuguese**

**Law School Faculty**

**Graduate School Faculty**
College of Business and Administration

JOSEPH W. BACHMAN, Professor of Accounting Emeritus.*

GWENDOLYN BAKER, Assistant Professor of Transportation and Management. B.A., M.B.A., University of Colorado.

F. KENDRICK BANGS, Professor of Business Environment and Policy.* B.Ed., Illinois State Normal University; M.P.S., University of Colorado; Ed.D., Indiana University.

GORDON BARNEWALL, Professor of Marketing.* B.S., University of Colorado; M.B.A., Ph.D., Ohio State University.

WILLIAM H. BAUGHIN, Dean of the College of Business and Administration and Graduate School of Business Administration: Professor of Finance.* B.S., University of Alabama; M.A., Ph.D., University of Virginia.

CHAUNCEY M. BEASLY, Associate Professor of Accounting.* B.A., M.A., University of Illinois; CPA, Colorado.

RICHARD W. BEATTY, Professor of Management and Organization.* B.A., Hanover College; M.B.A., Emory University; Ph.D., Washington University.

Rex D. Bennett, Associate Professor of Marketing.* B.S., University of Tennessee; Ph.D., University of North Carolina.

WILMAR F. BERNthal, Professor of Management and Organization.* B.A., Valparaiso University; M.B.A., University of Michigan; D.B.A., Indiana University.

KEITH E. BOLES, Assistant Professor of Finance.* B.S., University of Illinois; M.A., Florida Atlantic University; Ph.D., University of Arizona.


PETER G. BRYANT, Associate Professor of Management Science and Information Systems, A.B., Harvard College; M.S., Purdue University; Ph.D., Stanford University.

DOUGLAS S. BUCHANAN, Professor of Marketing.* A.B., Princeton University; M.B.A., Harvard University; Ph.D., Massachusetts Institute of Technology.

THOMAS A. BUCHANAN, Associate Professor of Accounting.* B.S., M.S., Ph.D., University of Illinois; CPA, Illinois.

WAYNE CASCIO, Professor of Management and Organization. B.A., Holy Cross; M.A., Emory University; Ph.D., University of Rochester.

PHILIP R. CATEODA, Head, Marketing Division; Professor of Marketing.* B.B.A., M.B.A., Ph.D., University of Texas.

Marilynn L. Collins, Associate Professor of Accounting.* B.B.A., North Texas State University; M.A., Ph.D., University of Alabama.

MEL A. COLTER, Assistant Professor of Management Science.* B.S., Iowa State University; Ph.D., University of Iowa.

LAWRENCE D. COOLIDGE, Professor of Business Administration.* A.B., Ph.D., Columbia University.

J. DANIEL COUGER, Professor of Management Science.* B.A., Phillips University; M.A., University of Kansas City (Missouri); D.B.A., University of Colorado.

JOHN W. COWEE, Chancellor, Medical Center; Professor of Business Administration.* B.A., M.B.A., Ph.D., LL.B., University of Wisconsin.

PAUL D. CRETIEN, JR., Professor of Finance.* B.F.A., Washington University; M.B.A., Southern Methodist University; Ph.D., University of Texas.

RAYMOND CROSS, Assistant Professor of Business Law.* B.S., Stanford University; J.D., Yale University.

VINTON S. CURRY, Associate Professor of Accounting Emeritus.

JEROME C. DARNELL, Professor of Finance.* B.S., Southwest Missouri State College; M.B.A., D.B.A., Indiana University.

JON D. DEMAREE, Associate Professor of Management Science.* B.S., University of Illinois; M.A., D.B.A., Michigan State University.

JOHN E. DITTRICH, Professor of Business Policy.* B.S., Purdue University; M.B.A., Harvard University; Ph.D., University of Washington.

CALVIN P. DUNCAN, Associate Professor of Marketing. B.S., M.B.A., University of Colorado; Ph.D., Indiana University.

DOUGLAS DURAND, Professor of Management and Organization. B.A., Westminster College; M.B.A., Ph.D., Washington University; St. Louis.

JEFFERY M. FERGUSON, Assistant Professor of Marketing. B.A., Denison University; M.B.A., University of Montana; D.B.A., Arizona State University.

JERRY R. FOSTER, Associate Dean, College of Business and Administration; Director of Undergraduate Studies; Associate Professor of Transportation and Management.* B.A., University of Wyoming; M.P.A., University of Colorado; Ph.D., Syracuse University.

JOSEPH L. FRASCONA, Professor of Business Law.* B.S., College of the City of New York; J.D., Harvard University.

KATHERINE B. FRAZIER, Assistant Professor of Accounting. B.S.B.A., Appalachian State University; M.B.A., University of South Carolina.

H. LEE FUSILIER, Professor of Business Environment and Policy.* B.A., J.D., University of Colorado.

DONALD M. GARDNER, Assistant Professor of Management and Organization. B.S., Carroll College; Ph.D., Purdue University.

FRED W. GLOVER, Professor of Management Science.* B.A., University of Missouri; Ph.D., Carnegie Institute of Technology.

CHARLES R. GOELDNER, Head of Business Research Division; Professor of Marketing.* B.A., M.A., Ph.D., State University of Iowa.

KENNETH R. GORDON, Assistant Professor of Management Science. B.A., University of Iowa; M.S., Ph.D., Northwestern University.

DOROTHY H. GRIESE, Head, Division of Business Environment and Policy; Professor of Business Administration.* B.S., M.B.E., University of Colorado; Ph.D., Louisiana State University.

JOHN M. GRIESE, Associate Professor of Finance Emeritus.

RICHARD O. HACKATHORN, Director, Division of Information Science Research; Associate Professor of Management Science. B.S., California Institute of Technology; M.S., Ph.D., University of California.

DOUGLAS HEARTH, Assistant Professor of Finance. B.S., University of Wisconsin-Madison; M.S., University of Iowa.

*Graduate School faculty.
THOMAS E. HENDRICK, Head, Management and Organization Division; Professor of Management and Organization and Management Science.* B.A., M.B.A., University of Washington; Ph.D., University of Oregon.

JOHN M. HESS, Professor of Marketing. B.S.C., University of Iowa; M.B.A., University of Oregon; Ph.D., Stanford University.

CHARLES L. HINKLE, Professor of Business Administration. B.B.A., M.S., Baylor University; D.B.A., Harvard University.

MARVIN W. HOLLAND, Assistant Professor of Management and Organization. B.S., B.A., Rutgers University, MA, Seton Hall University; B.A., Ph.D., University of Colorado.

VAUGHN R. HOCKER, Professor, Adjunct of Management Science. B.A., University of Colorado; M.S., Ph.D., Case Western Reserve University.

PAUL J. JEGANUS, Professor of Business Statistics.* B.S., M.B.A., Ph.D., University of Wisconsin.

HOWARD S. JENSEN, Associate Professor of Accounting.* B.B.A., M.A., Ph.D., University of Minnesota.

HENRY I. KESTER, Professor of Finance. B.S., Wisconsin State University, Whitewater; Ph.D., Northwestern University.

JOHN E. KLINE, Professor of Management and Organization. B.S., M.S., J.D., University of Colorado.

ROBERT W. KNAPP, Professor of Business Administration.* B.A., University of Detroit; M.B.A., Ph.D., University of Michigan.

CHRISTINE KUBEK, Assistant Professor of Management and Organization. B.S., Western State College; M.B.A. Bowling Green State University.

SBOROS K. KULB, Professor of Finance. B.S., A.B., M.B.A., University of Michigan; Ph.D., University of Washington.

EUGENE J. KOPROWSKI, Professor of Management and Organization. B.S., University of Wisconsin; M.A., Ph.D., University of Denver.

JOSEPH LAZAR, Professor of Business Law. B.A., J.D., University of Chicago; Ph.D., University of Minnesota.

P. JOHN LYMBERDOPH, Professor of Finance. B.S.C., Ohio University; M.B.A., Ph.D., University of Texas.

FRED R. McFADDEN, Professor of Management Science. B.S., Michigan State University; M.B.A., University of California; Ph.D., Stanford University.

H. ALEXANDER McKINNON, Jr., Assistant Professor of Real Estate. B.A., University of North Carolina; M.B.A., Ph.D., University of Texas.

CLAUDE McGILL, Professor of Management Science and Information Systems. B.S., M.S., University of Colorado; Ph.D., Ohio State University.

KENNETH R. MEISINGER, Assistant Professor of Accounting. B.S., University of Nebraska; M.C.S., Ph.D., Texas A & M University.

RONALD W. MEIJER, Head, Finance Division; Professor of Finance. B.S., M.B.A., D.B.A., Washington University, St. Louis, Missouri.

G. DALE MEYER, Professor of Management and Organization. B.S., Northwestern University; M.S., Northern Illinois University; Ph.D., University of Iowa.

JOHN A. MILLER, Associate Dean of College of Business and Administration (Colorado Springs); Professor of Marketing. B.A., Concordia College; M.B.A., D.B.A., Indiana University.

DAVID W. MONARCHI, Associate Professor of Management Science. B.S., Colorado School of Mines; Ph.D., University of Arizona.

EDWARD MURDOCH, Professor of Management and Organization. B.S., West Virginia University; M.B.A., D.B.A., Indiana University.

JAMES E. NELSON, Assistant Professor of Marketing. B.S., M.S., Ph.D., University of Minnesota.

BRUCE R. NEUMANN, Associate Professor of Accounting.* B.S., M.S., University of Minnesota; Ph.D., University of Illinois.

MICHAEL J. ORRIS, Assistant Professor of Business Law. B.A., J.D., University of Detroit.

ELDON NYGAARD, Assistant Professor of Business Law and Government. B.S., University of Nebraska; J.D., Marquette University.

EDWARD B. OPPERMANN, Associate Professor of Management Science. B.S., U.S. Naval Academy; M.B.A., A.F., Institute of Technology; Ph.D., Indiana University.

MICHAEL A. PALMER, Associate Professor of Finance. B.S., M.S. San Diego State College; D.B.A., University of Washington.

DONALD R. PLANE, Head of Management Science Division and Information Systems; Professor of Management Science.* M.E., University of Cincinnati; M.S., D.B.A., Indiana University; P.E., Ohio.

CHARLES P. RANE, Associate Professor of Business Administration. B.A., M.A., Southern Illinois University; Ph.D., University of Colorado.

KENNETH A. REGO, Professor of Management and Organization. B.S., Washburn College; M.S., D.B.A., University of Colorado; Ph.D., University of Nebraska.

ROBERT S. REED, Professor of Accounting. B.S., M.S., University of Illinois; D.B.A., Texas Technical University.

CAYDE W. ROCHEY, Professor of Real Estate. B.S. (C.F.E.), Purdue University; M.B.A., Indiana University; Ph.D., University of Wisconsin.

RALPH G. RINGENBERG, Associate Professor of Finance. B.A., Cornell College; M.S., D.B.A., Indiana University.

LEONARD M. BARA, Associate Professor. S.T.B., Catholic University of America; M.A., University of New Mexico; Ed.D., University of Northern Colorado.

R. JAMES BRANSFORD, Assistant Professor. B.A., M.A., New Mexico Highlands University; Ed.D., University of Colorado.

JOHN D. BROOKHURST, Assistant Professor of Business Environment and Policy. B.S., University of Colorado; M.S., Ph.D., Virginia Polytechnic Institute and State University.

RICHARD D. SPINNELL, Associate Professor of Management Science. B.S., Bowling Green State University; M.S., University of Michigan; Ph.D., Cornell University.

WILLIAM J. STANTON, Professor of Marketing. B.S., Illinois Institute of Technology; M.B.A., Ph.D., Northwestern University.

DONALD P. STEBELL, Professor of Finance. B.S., M.S., University of Colorado; D.B.A., Indiana University.

DONALD L. STEVENS, Professor of Finance. B.A., M.B.A., Ph.D., Michigan State University.


ROBERT H. TAYLOR, Professor of Marketing and Management Science. B.S., Purdue University; M.B.A., Indiana University.

NANCY L. TAYLOR, Assistant Professor of Marketing. B.S., M.S., Ph.D., University of Illinois.

JOHN A. TRACY, Professor of Accounting. B.S.C., Creighton University; M.B.A., Ph.D., University of Wisconsin; CPA, Colorado.

MAURICE A. UNGER, Professor of Real Estate and Business Law. A.B., LL.B., Duke University.

DONALD D. WARRICK, Associate Professor of Management and Organization. B.B.A., M.B.A., University of Oklahoma; B.A., University of Southern California.

ROBERT S. WASHLY, Professor of Accounting. B.S., University of Denver; M.S., University of Denver; M.S., University of Colorado; Ph.D., Ohio State University.

PHILLIP D. WHITE, Associate Professor of Marketing. B.S., M.B.A., Oklahoma State University; Ph.D., University of Texas.

KIRKLAND A. WILCOX, Associate Professor of Accounting. B.S., M.B.A., University of Arkansas; Ph.D., University of Texas.

WILLIAM D. WILSTED, Associate Dean of the College of Business and Administration; Director of Graduate Studies; Professor of Business Administration. B.S., Brigham Young University; M.B.A., D.B.A., Indiana University.

DARYL WINS, Associate Professor of Business Administration. B.S., Arizona State University; M.B.A., Ph.D., University of Michigan.

JOHN E. YOUNG, Assistant Professor of Business Policy. B.B.A., University of Cincinnati; M.S., Ph.D., University of Kansas.

JAMES K. ZAVARCI, Associate Professor of Finance. B.S., M.S., Ph.D., University of Washington.

ROBERT A. ZAVARCI, Professor of Management and Organization. B.S., M.S., University of Wyoming; Ph.D., University of Washington.

DONALD E. CARLING, Professor. B.A., M.A., University of Denver; Ed.D., Pennsylvania State University.

RUTH K. CLINE, Associate Professor. B.A., St. Olaf College; M.A., Ph.D., University of Iowa.

*Graduate School faculty.

School of Education

BOULDER CAMPUS

HAROLD MILTON ANDERSON, Professor Emeritus.

RONALD DAILEM ANDERSON, Professor. B.S., Ph.D., University of Wisconsin,
College of Engineering and Applied Science

AEROSPACE ENGINEERING SCIENCES (BOULDER)
LUDWIG BIERMANN, Special Visiting Professor, Ph.D., Goettingen University, Germany; Hon.D.Sc., University of Colorado.

ADOLF RUSEMANN, Professor Emeritus.

CHUEN-YEN CHOU, Professor: B.S., National Taiwan University; M.S., Purdue University, M.S., Massachusetts Institute of Technology; Ph.D., University of Michigan.

ROBERT D. CULP, Professor: B.S., University of Oklahoma; M.S., University of Colorado.

JAMES D. FOCH JR., Associate Professor: A.B., Dartmouth College; Ph.D., Rockafeller University.

PETER FREMUTH, Professor: M.S., Ph.D., Technische Universität (Berlin).

Faculty / 355
LOUIS G. DAMBY, Professor, A.B., Northern Michigan College of Education; B.S. (Aero), M.S., Ph.D., University of Michigan.

GEORGE F. KINZ, Department Chairman; Professor, B.S. (Aero), M.S., Wayne University, Ph.D. (Aero), University of Michigan.

DONALD A. KENNEDY, Associate Professor, B.S., Ph.D. (Aero), and M.S., Johns Hopkins University.

MARVIN W. LUTTGES, Professor, B.S., University of Oregon, Ph.D., University of California (Irvine).

ALFRED RICHARD SEEBASS, III, Dean of the College of Engineering and Applied Sciences; Professor, B.S.E., M.S.E., Ph.D., Princeton University; Ph.D., Cornell University.

HOWARD A. SNYDER, Associate Professor, B.S., Stanford University; M.A., Ph.D., University of Chicago.

GEORGE E. UHLENBECK, Special Visiting Professor, Ph.D., London (Germany); Hon. S.C.D., University of Notre Dame; Hon. S.C.D., Case Western Reserve University; Hon. D.Sc. and Eng., University of Colorado; Hon. D.Sc., Yeshiva College; Hon. S.C.D., Rockford College.

KARL DAVIDSON, Professor Emeritus.

NOUGUY X. JIN, Associate Professor, Licences en sciences, Doctor in Theoretical Physics, D.Sc., University of Paris.

CHEMICAL ENGINEERING (BOULDER)

PAUL L. BANNICK, Professor, B.S. (Ch.E.), University of Illinois; Ph.D., Cornell University.

CARL F. BORGMANN, Professor Emeritus.

DAVID E. CLOUGH, Associate Professor, B.S., Case Institute of Technology; M.S., Ph.D., University of Colorado.

JOHN L. FALCONER, Associate Professor, B.S., Johns Hopkins University; M.S., Ph.D., Stanford University.

ROBERT G. GADWELL, Professor, B.A. (Biol.), M.S., Ph.D. (Microbiol-Biophysics), University of Colorado.


R. CURTIS JOHNSON, Dean of International Education; Professor, B.S., M.S. (Ch.E.), University of Illinois; Ph.D., Pennsylvania State University.

WILLIAM B. KRANTZ, Professor, B.A. (Chem.), St. Joseph's College; Alfonsi; B.S. (Ch.E.), University of Illinois; Ph.D., University of California, Berkeley.

FRANK KREITZ, Professor Emeritus.

B. EMER L. LAUER, Professor Emeritus.

RONALD J. MAZIDORUK, Associate Professor, B.S., M.S., Ph.D., Purdue University.

MAX S. PETERS, Acting Department Chairman; Professor, B.S. (Ch.E.), M.S., Ph.D., Pennsylvania State University.

W. FRED RAMIREZ, Professor, B.S., M.S., Ph.D. (Ch.E.), Tulane University.

ROBERT L. SANNI, Professor, Fellow of CREPS; B.S., M.S., University of California, Berkeley; Ph.D., University of Minnesota.

KLAUS O. TIMMERMANS, Director of the Engineering Research Center, Associate Dean of Engineering for Graduate and Research Programs; Professor, B.S. (Ch.E.), M.S., Ph.D., University of Illinois.

RONALD E. WEST, Professor, B.S.E., M.S.E., Ph.D., University of Michigan.

CIVIL, ENVIRONMENTAL, AND ARCHITECTURAL ENGINEERING (BOULDER)

DANIEL P. ABRAMS, Assistant Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), Illinois Institute of Technology; M.S., Ph.D., University of Illinois.

ROBERT S. AYRE, Professor Emeritus of Civil Engineering.

L. DUANE BALL, Associate Chairman; Associate Professor, B.S. (Civil), University of Colorado.

EDWIN R. BENNETT, Professor of Civil Engineering; B.S. (Civil), M.S. (Civil), Washington University; Ph.D., University of Pennsylvania.

CHARLES H. BRENDECKE, Assistant Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), University of Colorado; M.S., Ph.D., Stanford University.

WARREN W. DIAPA, Professor Emeritus of Civil Engineering.

JAMES E. DICKMANN, Assistant Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), M.S., University of Missouri; Ph.D., University of California.

JOHN D. DOW, Assistant Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), General Motors Institute; M.S., University of Michigan; Ph.D., University of Colorado.

CHUAN CHUNG FENG, Professor of Civil Engineering; B.S. (Civil), Chiao Tung University; M.S., Ph.D., University of Missouri.

J. ERNEST FLACK, Professor of Civil Engineering; B.S. (Civil), Colorado State University; M.S., University of Illinois; Ph.D., Stanford University.

KURT H. GIESCHE, Professor of Civil Engineering; B.S. (Civil), M.S., University of California; Ph.D., University of Colorado.

GEORGE B. GIBB, Department Chairman, Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), University of Idaho; M.S., Ph.D., University of Washington.

JOHN L. GROSS, Assistant Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), M.S., Ph.D., Cornell University.

MILAN F. KEALEY, Associate Professor of Civil Engineering; B.S., University of California, Berkeley; Ph.D., University of California, Berkeley.

WALTER L. MEYER, Professor of Civil and Environmental Engineering; B.S. (Civil), University of Denver; M.S. (Civil), University of Colorado.

LEO A. NOVAK, Professor Emeritus of Civil Engineering.

CONSTANTIN N. PAPANTONIOPOULOS, Associate Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), National University of Athens, M.S., University of Texas at Austin.

ROBERT F. RATHEURN, Professor Emeritus of Civil Engineering.

ROLAND C. RAUTENSTRAUS, President Emeritus; Professor of Civil Engineering; B.S. (Civil), M.S., University of Colorado.

EDWARD RAMPSON, Associate Professor Emeritus of Civil Engineering.

ROBERT L. SCHIFFMAN, Professor of Civil Engineering; B.S., M.S., Columbia University; Ph.D., Stanford University.

PHILIP J. SULLIVAN, Associate Professor of Civil, Environmental, and Architectural Engineering; B.S. (Civil), M.S., University of Colorado; Ph.D., Iowa State University.

LEONARD D. TULIN, Professor of Civil and Environmental Engineering; B.S. (Civil), M.S., University of Colorado; Ph.D., Iowa State University.

WALTER A. WANG, Associate Professor of Civil Engineering; B.S. (Civil), M.S., University of Minnesota; Ph.D., Clemson University.

CIVIL AND URBAN ENGINEERING (DENVER)

PAUL E. BARTELT, Associate Dean, College of Engineering and Applied Science (Denver); Professor, B.S. (Civil), B.S. (Eng.), M.S. (Civil), University of Colorado.

NICHOLAS M. BAY, Professor, B.S., National Chung-Hsing; M.S., National Taiwan University; Ph.D., Ohio State University.

ALAN R. FLEMMING, Assistant Professor, B.S., University of Maine; M.S. (Civil), University of New Brunswick.

ERNEST C. HARRIS, Professor, B.S. (Civil), M.S., Ph.D., University of Wisconsin; M.S., University of Texas; Ph.D., University of Colorado.

ROBERT W. HILTON, Associate Professor, B.S., M.S., Ph.D., Iowa State University.

WILLIAM C. HUGHES, Associate Professor, B.S. (Civil), University of New Mexico; B.S. (Civil), University of Utah; M.S., Ph.D., University of New Mexico.

ROBERT L. KESSLER, Professor, B.S. (Civil), University of Colorado; Ph.D., University of Denver.

JOHN R. PAYNE, Associate Professor, B.S., Lamar State College; M.S., Ph.D., University of Colorado.

MARK A. MOODY, Department Chairman; Professor, B.S. (Civil), University of Missouri; M.S., University of Colorado; Ph.D., Stanford University.

RENEE M. NORDY, Chancellor (Denver); Professor, B.S. (Civil), Oregon State University; M.S., Ph.D., University of Minnesota.

WILLIAM S. POLLARD, JR., Professor, B.S. (Civil), M.S. (Civil), Purdue University.

ABISHAI POLUZ, Associate Professor, B.S. (Civil), Israel Institute of Technology; M.S., Ph.D., Northwestern University.

*Graduate School Faculty.
ELECTRICAL ENGINEERING AND COMPUTER SCIENCE (COLORADO SPRINGS)

EDWARD J. BALMAN, Professor Adjunct; B.S. (EE), University of Minnesota; M.S., Massachusetts Institute of Technology; Ph.D., University of California.

ROBERT W. BURT, Associate Professor; B.S. (EE), Naval Academy; B.S. (EE), Massachusetts Institute of Technology; Ph.D., Harvard University.

SERGIO CANAVOLI, Associate Professor; B.S. (EE), University of Perugia; M.S. (EE), University of Perugia; Ph.D., University of Washington.

MICHAEL D. CICLETI, Associate Professor; B.A. (EE), M.S. (EE), University of Notre Dame.

JOHN P. JACKSON, Visiting Associate Professor; B.S. (Phy.), Colorado State University; Ph.D., Naval Post Graduate School.

KENNETH J. KLEINSTEIN, Assistant Professor; B.A. (Math.), Brandeis University; M.A. (Math.), Ph.D. (Math.), University of California.

JOHN MURRAY, Associate Professor; B.S. (EE), M.S. (EE), University of South Florida; Ph.D., Clemson University.

GERALD M. OSZKIR, Associate Professor; B.S. (EE), Wayne State University; M.S. (EE), Ph.D. (EE), Syracuse University.

LEWIS PYSH, Associate Professor; B.S. (EE), University of California; M.S. (EE), Ph.D., University of Florida.

ROBERT RESEDA, Associate Professor; B.S. (Appl. Math.), University of California; M.S., Ph.D., Pennsylania State University.

CLAUDE A. WITZKOWSKI, Assistant Professor; B.S. (Physics), Illinois Institute of Technology; M.S. (EE), Ph.D. (EE), University of Arizona.

RICHARD WIENER, Associate Professor; D.D.E.E., M.E.E., City College of New York; Ph.D., Polytechnic Institute of Brooklyn.

BARBARA C. WOLTZ, Instructor Adjunct; B.S. (Mathematics), M.S. (Appl. Math.), University of California at Santa Barbara.

MATHEMATICS (COLORADO SPRINGS)

JOHN T. BURNS, Assistant Professor; B.A., University of Colorado; Ph.D., University of Minnesota.

SANDRA R. HILL, Instructor Adjunct; B.A., Emory University; M.A., Ph.D., University of North Carolina.

JAMES R. MORGAN, Associate Professor; Chairman; B.S., M.S., Ph.D., University of Colorado.

CARL F. MOGENSEN, Assistant Professor; A.B., Princeton University; M.A., Ph.D., University of Colorado.

JOHN J. NASH, Assistant Professor; A.B., Princeton University; M.S., University of Oregon; M.S., Ph.D., Stanford University.

LAUREL ROGERS, Assistant Professor; A.B., Colorado College; M.S., Ph.D., New Mexico State University.

ALEXANDER SZER, Associate Professor; M.S., Ph.D., Moscow State Pedagogical Institute.

MECHANICAL ENGINEERING (BOULDER/DENVER)

R. THOMAS ANNBERG, Associate Professor; B.S. (M.E.), M.S., University of Colorado.

BETTY A. BUCK, Assistant Professor; M.A., University of Denver; B.S. (Aero.-E.), M.S. (M.E.), University of Colorado.

ADRIAN BEJSA, Associate Professor; S.M. (M.E.), S.B. (M.E.), Ph.D. (M.E.), Massachusetts Institute of Technology.

MELVYN C. BRANCH, Associate Professor; B.S.E., (Aero.-Mech. Sc.), Princeton University; M.S., Ph.D. (M.E.), University of California, Berkeley.

LAWRENCE W. CARLSON, Associate Professor; B.S. (M.E.), M.S. (M.E.), Oregon State University.

E. PAUL GERMACK, Assistant Professor; B.S., Ph.D. (Mech.), Rensselaer Polytechnic Institute.

ROBERT A. CHRISTIE, Chairman; Professor; B.A. (Math.), B.S., M.S., Ph.D. (M.E.), University of Colorado.

WILLIAM H. CLOUGH, Professor; B.S., Queens College; M.A., Cornell University.

RICHARD H. CRAWFORD, Professor Emeritus.

SUBRAMANIA DATTA, Professor; B.S. (Math.), Presidency College (Calcutta, India); Ph.D. (Math.), Jadavpur University (Calcutta).

FRANKLIN EISENBERG, Professor of Mechanics; B.S.E. (M.E.), J.D. (M.S.); W.M. (M.E.), University of Michigan.

HERBERT L. JONSON, Associate Professor Emeritus.

CHARLES H. KRAMER, Professor; B.S. (M.E.), Seoul National University; Dipl.-Ing., Dr.-Ing. (M.E.), Technical University of Aachen, Germany.

DAVID R. KASSET, Professor; B.S. (Aero.Eng.), Polytechnic Institute of Brooklyn; M.S., Ph.D. (Aero.Eng.), University of Michigan.

VIKRAM K. KIRKIN, Assistant Professor; B.S., Indian Institute of Technology (Kanpur, India); M.S. (M.E.), Utah State University; Ph.D. (E. Mech.), Brown University.

RALPH C. KNOX, Associate Chairman (Denver); Associate Professor; B.S. (M.E.), Ph.D. (Mech.), Illinois Institute of Technology.

DON R. Mosher, Associate Professor Emeritus.

PHILIP F. OSTWALD, Professor; B.S. (M.E.), University of Nebraska; M.S. (M.E.), State University of Iowa; Ph.D. (E. Eng.); Oklahoma State University.

BENJAMIN M. SPURLOCK, Jr., Professor Emeritus.

CHUNG-HO SONG, Professor; B.S. (M.E.), Seoul National University (Korea); M.S. (M.E.), Ph.D. (M.E.), University of California.

WILLIAM L. WAINWRIGHT, Associate Professor; B.S. (Mech.), M.S. (E. Sc.), Purdue University; Ph.D. (E. Mech.), University of Michigan.

PATRICK D. WEIDMANN, Associate Professor; B.S. (Aeronautics), California State Polytechnic College; M.S. (Aeronautics), California Institute of Technology; Dipl.-Ing., Von Karman Institute, Belgium; Ph.D. (Aero.Eng.), University of Southern California, Los Angeles.

ROBERT J. WILLIAMS, Professor; B.S. (M.E.), M.S., Michigan State University.

MAHENDRAN K. UBEROI, Professor of Engineering; B.S., Punjab University (India); M.S. (Aeronautics), California Institute of Technology; Dr. Eng., Johns Hopkins University.

College of Environmental Design

DIVISION OF ENVIRONMENTAL DESIGN

MAURICE E. BARR, Professor of Environmental Design; B.A., A.M., University of Wisconsin.

C. HERBERT BOWERS, Professor of Environmental Design; B.Arch, University of Florida; M.Arch., University of Michigan, Registered Architect: Colorado, Florida.

C. A. BRIGGS, Professor Emeritus.

DeVOR M. CARLSON, Dean Emeritus.

GERALD S. CROSBY, Professor of Environmental Design; B.S. (Arch.), Rhode Island School of Design; M.S. (Design), Southern Illinois University.

JOHN D. FINKELBERG, Visiting Lecturer in Environmental Design; B.A. (Env. Design), Amherst College, Ohio; M.I.A. (Land Planning), University of Massachusetts.

NELSON D. GREENE, Assistant Professor of Environmental Design; B.A. (Arch.), University of Arizona; M.S. (Arch.), Pennsylvania State University.

SPENSER W. HAVLICK, Assistant Dean; Professor of Environmental Design; B.A., Beloit College; M.S., University of Colorado; Ph.D. (Environmental Planning), University of Michigan.

STEPHEN H. KENDALL, Assistant Professor of Environmental Design; B.S. (Arch.), University of Cincinnati; M.Arch., Washington University.

MARLIT A. JOHANSON, Assistant Professor of Environmental Design; B.A., Radcliffe College; M.A., Ph.D., Columbia University.

JOSEPH JUHASZ, Associate Professor of Environmental Design; Director of Environmental Design Division; A.B., Brown University; Ph.D., University of California, Berkeley.

WALTER KLEEMAN, JR., Visiting Lecturer in Interior Design; B.S., University of North Carolina (Chapel Hill); Ph.D., Union Graduate School.

Graduate School Faculty.
Graduate School

In addition to the graduate faculty members indicated by asterisk in the college and school faculty lists, the following are members of the graduate faculty.

BEHAVIORAL GENETICS

JOHN C. DUMIES, Professor. *B.S., M.S., Ph.D., University of Illinois.

SCHOOL OF MEDICINE

Anatomy

GERALD B. JONAS, Associate Professor. *B.S., University of Santa Clara; Ph.D., University of Chicago.

THOMAS A. FINCH, Assistant Professor. *B.S., S.M., Ph.D., Massachusetts Institute of Technology.

WILLIAM E. HAHN, Professor. *B.S., University of Idaho; M.S., Texas Technological College; Ph.D., Tulane University.

PAUL H. JONES, Assistant Professor. *B.A., Reed College; Ph.D., Case Western Reserve University.

ROBERT S. TAJIOS, Associate Professor. *B.A., Reed College; A.A., Ph.D., Columbia University.

DAVID Y. MORAN, Associate Professor. *A.B., Princeton University; Ph.D., Brown University.

JOHN F. NOLTE, Assistant Professor. *B.S., Providence College; Ph.D., Massachusetts Institute of Technology.

STEPHEN D. ROSS, Associate Professor. *B.A., Harvard College; Ph.D., University of London.

M. ROY SCHWARTZ, Professor. Dean of the School of Medicine. *B.A., Pacific Lutheran University; M.D., University of Washington.

CLAUDE SELTENKIKOFF, Assistant Professor. *B.A., California State University; Ph.D., University of California, Los Angeles.

STUART W. SMITH, Associate Professor. *B.A., Allegheny College; M.D., Western Reserve University.

DAVID B. WHITLOCK, Professor. *B.S., Oregon State University; M.D., Ph.D., University of Oregon.

JOHN T. WILLSON, Professor. *A.A., B.S., M.S., George Washington University; Ph.D., University of Colorado.

Anesthesiology

J. ANTONIO ALDRETE, Professor. *B.S., University Center of Mexico, Mexico City; M.D., National University of Mexico, Mexico City; M.S., University of Colorado.

DWAYNE C. NIZUMI, Professor of Architecture. *B.Arch., University of Colorado; M.Arch., Massachusetts Institute of Technology; Doctoral (Town Planning), Delft Technical University, The Netherlands. Registered Architect: Colorado, Virginia.


BINGUMAL R. MAAWADU, Assistant Professor. *M.B.B.S., University of Ceylon (India); M.Sc., University of London (England); Ph.D., University of London and Nullifield Institute of Comparative Medicine.

VALENTINO D. R. MIAZZA, Professor. *B.S., City College of New York; M.D., New York University.

GEORGE D. SWANSON, Associate Professor. *B.S., California State Polytechnic University; M.S., Ph.D., Stanford University.

Biochemistry, Biophysics and Genetics

CARLOS ABEL, Associate Professor. *B.S., M.Burgaro College (Argentina); M.D., University of Buenos Aires (Argentina).

ADOLPH ABRAMS, Professor. *B.S., City College of New York; Ph.D., University of Wisconsin.

JERRY L. BROWN, Associate Professor. *B.S., M.S., North Texas State University; Ph.D., University of Texas Southwestern Medical School.

CLARK BUBELITZ, Associate Professor. *Ph.B., Ph.D., University of Chicago.

JOHN H. CANN, Professor. *B.S., Moravian College; M.S., Lehigh University; A.A., Ph.D., Princeton University.

DORI MEI CHIKARASHI, Assistant Professor. *B.S., M.S., University of Illinois; Ph.D., University of California, San Diego.

DAVID MICHAEL COX, Associate Professor. *B.S., University of South Carolina; Ph.D., University of London, England.

ANGELINE S. DOUVAS, Assistant Professor. *B.A., University of Colorado; Ph.D., University of California, San Diego.

WALTER B. GOOD, Visiting Professor. *B.S., Union College; Ph.D., University of Colorado.

DAWNA D. HAGERMAN, Professor. *B.A., M.S., University of Colorado; M.D., Harvard University.

PAUL J. HAGERMAN, Assistant Professor. *B.A., University of Oregon; M.D., Ph.D., Stanford University.

FRANKLIN M. HAROLD, Professor. *B.S., City College of New York; Ph.D., University of California at Berkeley.

GEORGE P. HENRY, Assistant Professor. *M.D., University of Michigan.

C. R. S. HIRS, Professor. *B.S., Manchester University (England); Ph.D., Columbia University.

KATHRYN B. HORNITZ, Assistant Professor. *B.A., Columbia University; M.S., New York University; Ph.D., University of Texas at Dallas.


PHILLIP J. TABB, Visiting Lecturer in Environmental Design. *B.Arch., University of Cincinnati; M.Arch., University of Colorado.

ALLAN WALLIIS, Associate Professor of Environmental Design. *B.Arch., Cooper Union; Ph.D. (Env. Psych.), City University Graduate Center, New York.

CAROL L. JONES, Associate Professor. *B.A., Ph.D., University of Colorado.

FAII-KAO, Associate Professor. *B.S., National Taiwan University (China); Ph.D., University of Minnesota.

SYLVIA KERR, Associate Professor. *B.A., Smith College; Ph.D., Columbia University.


M. LAURENCE MOREE, Associate Dean of the Graduate School. *B.S., University of New Hampshire; M.S., University of Kentucky; Ph.D., University of Wisconsin.

JAMES J. NORD, Professor. *B.A., Harvard University; M.D., Yale University; M.P.H., University of California.

MICHAEL PAST, Assistant Professor. *B.S., Boston College; Ph.D., Purdue University.

NORMAN N. PACE, Associate Professor. *B.A., Indiana University; Ph.D., University of Illinois.

DAVID PATTERSON, Associate Professor. *B.S., Massachusetts Institute of Technology; Ph.D., Brandeis University.

DAVID E. PETTIJOHN, Professor. *B.S., M.S., Washington State University; Ph.D., Stanford University.

THEODORE T. PUCK, Professor. *B.S., Ph.D., University of Chicago.

DAVID J. QUINCE, Assistant Professor. *B.A., Augustana College; Ph.D., University of Wisconsin.

OSCAR K. REISS, Associate Professor. *B.S., Ph.D., University of Chicago.

HOWARD V. RICKENBERG, Professor. *B.S., Cornell University; Ph.D., Yale University.

ARTHUR ROBINSON, Professor. *B.S., Columbia University; M.D., Rush Medical College.

JOHN R. SADLER, Professor. *B.A., Reed College; Ph.D., Oxford University.

NICHOLAS W. SEEDS, Associate Professor. *B.S., University of New Mexico; Ph.D., University of Iowa.

MICHAEL S. SINENSKY, Associate Professor. *A.B., Columbia College; Ph.D., Harvard University.

MITCHELL L. SORIN, Assistant Professor. *B.S., M.S., Ph.D., University of Illinois.

JOHN M. STEWART, Professor. *B.S., Davidson College; M.S., Ph.D., University of Illinois.

EWA SUJANSKY, Associate Professor. *M.D., Comenius University (Slovakia).

*Graduate School faculty.


**Biometrics**

- **PHILIP G. ARCHER**, Associate Professor: B.A., M.A., University of Utah; M.D., Johns Hopkins University.
- **WILLIAM R. NOAKES**, Associate Professor: B.A., M.D., University of California, San Francisco; Ph.D., Johns Hopkins University.
- **W. J. WALTERS**, Associate Professor: B.S., M.S., Pennsylvania State University; Ph.D., Brown University.
- **JAMES W. ROBERTS**, Assistant Professor: B.S., University of Michigan; M.S., University of Wisconsin-Madison.
- **ANDREW L. MACINTOSH**, Assistant Professor: B.S., M.D., Yale University.
- **STEVEN W. ZELLSCHWERD**, Assistant Professor: B.S., M.S., University of Pittsburgh; Ph.D., Johns Hopkins University.
- **CARY E. LERNER**, Assistant Professor: B.S., M.D., Upstate Medical University.
- **RICKY A. KIRKLAND**, Assistant Professor: B.S., Louisiana State University; M.D., University of Chicago.
- **JACQUELINE KIRKLAND**, Assistant Professor: B.S., M.D., University of Chicago.
- **HARRY J. SMITH**, Assistant Professor: B.S., M.D., University of Chicago.
- **JASON L. BUCK**, Assistant Professor: B.S., M.D., University of Chicago.
- **MICHAEL J. SMITH**, Assistant Professor: B.S., M.D., University of Chicago.

**Dermatology**

- **WILLIAM L. WESTON**, Professor: B.A., University of Pennsylvania; M.S., University of South Dakota; M.D., University of Colorado.

**Health Administration**

- **JEFFREY BAUER**, Assistant Professor: B.A., Colorado College; M.A., University of Colorado.
- **LELAND K. KAISER**, Associate Professor: B.A., M.A., University of Colorado; M.P.H., University of Pittsburgh; Ph.D., University of Denver.
- **ROBERT S. LEWIS**, Associate Professor: B.S., Harvard University; M.D., University of Colorado.
- **ROBERT E. SCHLICHTER**, Assistant Professor: B.A., M.A., Ph.D., University of Michigan.
- **PETER SHAUGHNESSY**, Associate Professor: B.A., Boston College; M.A., Pacific University.
- **CARL H. SLATER**, Assistant Professor: B.A., Harvard University; M.D., University of Colorado; M.Ed., University of Illinois.
- **GEORGE STUCKLER**, Jr., Assistant Professor: B.A., University of Pennsylvania; B.S., M.P.H., Sc.D., Johns Hopkins University.

**Medicine**

- **JERRY K. ARAKA**, Professor: B.A., University of California, Berkeley; M.D., Bowman Gray School of Medicine, Wake Forest College.
- **ALLEN ARTHUR**, Professor: M.D., Baylor University.
- **ROBERT H. ALLEN**, Professor: B.A., Amherst College; M.D., Washington University (St. Louis).
- **MATTHEW H. BLOCK**, Professor: M.S., University of Michigan; Ph.D., University of Chicago.
- **E. GILBERT BLOUNT**, Jr., Professor: B.S., Brown University; M.D., Cornell University.
- **RICKY A. BROWNSTEIN**, Assistant Professor: B.S., Long Island University; M.S., Medical College of Virginia; Ph.D., University of Colorado.
- **WILLIAM A. ROBINSON**, Professor: B.S., Colorado State University; M.D., University of Colorado.
- **BONNIE S. SCHLESCH**, Associate Professor: B.A., Oberlin College; M.D., University of California, San Francisco.
- **FRANKS R. SIMON**, Professor: B.A., Pomona College; M.D., Wayne State University.
- **SHELDON L. SPECTOR**, Associate Professor: B.S., Washington University; M.D., University of Maryland.
- **KARL E. SUSSMAN**, Professor: B.A., Johns Hopkins University; M.D., University of Pennsylvania.
- **YASUHISA TAKEI**, Associate Professor: B.S., Chiba Medical School (Japan).
- **JIM M. TAN**, Professor: B.A., M.D., Johns Hopkins University.
- **JOHN M. VIERLING**, Assistant Professor: B.A., M.D., Stanford University.

**Microbiology and Immunology**

- **ELIAS BALDWIN**, Professor: B.S., University of Michigan; Ph.D., Indiana University.
- **ERNEST BOREK**, Associate Professor: B.S., City College of New York; M.A., Ph.D., Columbia University.
- **J. C. BORKHUS**, Assistant Professor: B.A., M.D., Washington University.
- **J. JOHN COHEN**, Associate Professor: B.S., M.S., Ph.D., McGill University.
- **ALFRED J. CROWE**, Professor: B.A., San Jose State College; Ph.D., Stanford University.
- **DONALD J. CUMMINGS**, Professor: B.S., George Washington University; M.S., Ph.D., University of Chicago.
- **J. C. CUNNINGHAM**, Associate Professor: B.S., University of Wyoming; Ph.D., University of California (Los Angeles).
- **DONALD J. HARRIS**, Assistant Professor: B.A., Ph.D., University of South Dakota.
- **RALPH M. KUBO**, Associate Professor: B.A., University of California, Los Angeles; M.A., Ph.D., University of Hawaii.
- **W. M. MORGAN**, Associate Professor: B.A., University of Kansas; M.S., Michigan State University; Ph.D., State University of New York (Buffalo).
- **MARTIN L. PATO**, Associate Professor: B.A., Massachusetts Institute of Technology; Ph.D., University of California (Berkeley).
- **LEWIS J. PETERSON**, Professor: B.S., University of New Hampshire; Ph.D., University of New York, Buffalo.
- **WALDEN K. ROBERTS**, Professor: B.S., Iowa State University; Ph.D., University of California.
- **DAVID W. TALMAGE**, Professor: B.S., Davidson College; M.D., Washington University.
- **AUSTIN H. TAYLOR**, Associate Professor: B.S., Western Maryland College; Ph.D., University of California.
- **MICHAEL L. YAELI**, Assistant Professor: B.S., M.D., University of Texas.

**Neurology**

- **JAMES H. AUSTIN**, Professor: B.A., Brown University; M.D., Harvard University.

**Obstetrics and Gynecology**

- **GEORGE B. BETZ**, Associate Professor: B.S., Kansas State University; M.D., University of Colorado.
- **WATSON A. BOWES**, Jr., Professor: B.S., Washington University; M.D., University of Colorado.
- **EDGAR L. MAKOWSKI**, Professor: B.S., M.D., Marquette University.
- **MICHAEL A. NAUGHTON**, Professor: B.S., University of St. Andrews (Scotland); Ph.D., University of Cambridge.

**Orthopedics**

- **JAMES S. MILES**, Professor: A.B., Grinnell College; M.D., University of Chicago.
CARL N. Zimet, Professor: B.A., Cornell University; Ph.D., Syracuse University.

Radiology

J. ED BARNES, Assistant Clinical Professor: B.S., General Missouri State College; M.S., Ph.D., University of Kansas.

ROBERT K. CACERES, Assistant Professor: B.S., M.S., Ph.D., University of Nebraska.

PAUL W. CARSON, Associate Professor: B.S., Colorado College; M.S., Ph.D., University of Arizona.

MARVIN L. DAVIES, Professor: B.A., Washington and Lee University; M.D., Johns Hopkins University.

ALAN R. FITZGERALD, Assistant Professor: B.S., Washington University; M.A., University of Wisconsin; Ph.D., Wesleyan University.

WILLIAM R. HENDRICKSON, Professor: B.S., Williams College; Ph.D., University of Texas Southwestern Medical School.

JOSEPH HENRY HOLMES, Professor Emeritus.

F. BING HUNN, Associate Professor: B.S., Colorado State University; M.D., University of Colorado.

MICHAEL L. JOHNSON, Associate Professor: B.S., Colorado College; M.D., University of Colorado.

WILLIAM C. KLEINSCHMIDT, Associate Professor: A.B., Cornell University.

DAVID A. KUMPE, Associate Professor: A.B., Oberlin College, M.D., Harvard University.

CHRISTOPHER D. KUNI, Assistant Professor: B.S.E.E., Northwestern University; M.D., St. Louis University.

CHARLES R. MEYER, Assistant Professor: B.S., Colorado State University; Ph.D., Iowa State University.

FREDERICK R. PIQUETTE, Associate Professor: A.B., University of Colorado.

KEDAR N. PRASAD, Associate Professor: B.S., T.N.J. College (India); M.S., Ranchi College (India); Ph.D., State University of Iowa.

RAYMOND P. ROSS, Assistant Professor: B.S., Loyola University; M.S., DePaul University.

CAROL M. RUMACK, Assistant Professor: B.S., University of Chicago; M.D., University of Wisconsin.

PAUL E. SIEGERT, Assistant Professor: A.B., M.D., Washington University.

VICTOR M. SPITZER, Assistant Professor: B.S., University of Southern California; M.S., Ph.D., University of Illinois.

JOHN C. STEARNS, Associate Professor: B.A., M.D., University of Texas.

JEFFREY V. SUTHERLAND, B.S., U.S. Military Academy (West Point); M.S., Stanford University; Ph.D., University of Colorado.

JOHN D. TAUBMAN, Associate Professor: M.B., Ch.B., M.R.C.P., University of Edinburgh (Scotland); D.M.R.D., F.F.R., University of London (England).

CHARLES A. WALDREN, Associate Professor: B.A., M.S., Ph.D., University of Colorado.

SCHOOL OF DENTISTRY

THOMAS J. BOMBER, Associate Professor: B.S., University of Denver; D.D.S., University of Missouri (Kansas City).

ROBERT G. SCHALLHORN, Professor: M.S., University of California; D.D.S., Marquette University.

SCHOOL OF NURSING

MAXINE R. BEECHER, Associate Professor: B.S., Loretto Heights College; M.A., University of Chicago.

FRANCES A. BURGESS, Professor: M.S., Northwestern State College; M.S., Ed.D., University of Colorado.

DOROTHY W. BUSH, Professor: M.S., Fairview Hospital School of Nursing; B.S., University of Minnesota; M.S., Ph.D., University of Colorado.

BARBARA F. BROOKWAY, Professor: B.S., University of California, Santa Barbara; M.S., Ph.D., Cornell University.

MARIE S. BROWN, Associate Professor: B.S., Marquette University; M.S., M.A., Ph.D., University of Colorado.

VIRGINIA J. CARROLL, Associate Professor: M.D., Wilkes-Barre General Hospital School of Nursing; B.S., University of Colorado; M.A., University of Denver, D.N.Sc., Boston University.

MICHAEL J. CARRER, Assistant Professor: B.S.N., University of Wisconsin; M.S.N., University of Wisconsin.

COLLEEN CONWAY, Professor: B.S.N., Georgetown University; M.S.N., Catholic University; Ph.D., New York University.

ALICE H. DENNIS, Associate Professor: B.S.N., University of Texas; B.S., University of California at Los Angeles; D.N.Sc., Boston University.

JEANETTE M. DUNN, Assistant Professor: B.S.N., M.S.N., University of Colorado; Ed.D., University of Colorado.

MARGY J. EBERT, Professor: B.S., University of California; M.A., Stanford University; Ph.D., University of California, Berkeley.

B. NOON HUFF, Associate Professor: B.S., Harris College of Nursing; B.S., University of Texas; B.S., Texas Christian University; M.A., University of Chicago; Certificate of Advanced Graduate Study, Boston University.

SUMI COY KIM, Associate Professor: A.S., Weber Junior College; B.S., Ph.D., University of Hawaii; M.S., Washington University, St. Louis.

JOAN KLINKE, Associate Professor: B.S., University of Chicago; M.S., M.S.P.H., University of Colorado.

LAURA D. GOODWIN, Assistant Professor: B.A., M.A., University of Santa Clara; Ph.D., University of Colorado.

DOROTHY E. EGGLE, Professor: B.S., University of Colorado; M.A., Teachers College, Columbia University.

D. ANNE HARRISON, Associate Professor: B.S., University of Mississippi; M.A., Teachers College, Columbia University; Ed.D., University of Colorado.

DEBRA HYMCH, Professor: B.S., Skidmore College; M.A., Columbia University; Ph.D., University of Maryland.

JUDITH M. IGUE, Associate Professor: B.S.N., State University of New York; M.S., University of Minnesota.

*Graduate School Faculty.
School of Journalism

SAMUEL J. AUKERBAUER, Associate Professor.* B.A., University of Colorado; M.A., American University.

JOANNE EASLEY ARNOLD, Associate Professor.* B.A., M.A., Ph.D., University of Colorado.

WILLIAM BILOW, Assistant Professor.* A.B., University of Florida; M.A., Ph.D., University of California, Berkeley.

JAMES E. BRINTON, Professor Emeritus.*

MALCOLM M. DEANS, Senior Instructor.* B.A., Washington and Lee University.

ROGER H. ELLIS, Professor.* B.S., M.S., University of Illinois.

STEPHEN R. JONES, Assistant Professor.* B.A., B.M., West Virginia University; Ph.D., University of Utah.

FRANK I. KAPLAN, Associate Professor* B.A., M.A., University of Southern California; Ph.D., University of Wisconsin.

SAMI KUCZUN, Professor.* B.S., M.S., Boston University; Ph.D., University of Minnesota.

WILLIAM J. MCNEIL, Associate Professor.* B.S., M.I., University of Texas; Ph.D., University of Minnesota.

ROBERT B. RHODE, Associate Dean; Professor.* B.A., University of Wyoming; M.A., University of Denver.

RUSSELL E. SMITH, Dean; Professor* B.A., University of Kansas; M.S., Ph.D., University of Illinois.

ABBYN SOHN, Assistant Professor.* B.A., University of Illinois; M.S., Ph.D., Southern Illinois University.

DON S. SORRENSON, Professor* B.A., Capitol University; M.A., Baylor University; Ph.D., University of Illinois.

A. GAYLE WILDER, Professor Emeritus.*

LILLIAN WILKINS, Instructor,* B.A., B.J., University of Missouri; M.A., University of Oregon.

School of Law

NORMAN F. AARONSON, Staff Attorney, Legal Aid Clinic; B.A., Brandeis University; J.D., Boston University.

ALBERT W. ALSCHULER, Professor; A.B., LL.B., Harvard University.

JOHANNES BAILIN, Director, Legal Aid Clinic; B.A., University of Chicago; J.D., New York University.

WILLIAM J. BOWE, Professor Emeritus.*

JAMES B. BRESEE, Staff Attorney, Legal Aid Clinic; B.A., Harvard College; J.D., Northeastern University.

CLIFFORD J. CAHOON, Professor; A.B., LL.B., Harvard University.

EMILY M. CALHOUN, Associate Professor; B.A., M.A., Texas Tech; J.D., University of Texas.

RUTH CASAREZ, Assistant Dean; B.A., University of Texas; J.D., University of Denver.

JONATHAN B. CHASE, Professor; B.A., Williams College; LL.B., Columbia University.

HOMER H. CLARK, JR., Professor; A.B., Amherst College; LL.B., LL.M., Harvard University.

JAMES H. CONRIDGE, JR., Professor; A.B., Brown University; LL.B., Yale University.

LUKE DANIELSON, Staff Attorney; Adjunct Associate Professor; B.A., Antioch College; J.D., University of California, Berkeley.

ROBERT J. DIETER, Staff Attorney, Legal Aid Clinic; B.A., Yale University; J.D., University of Denver.

TED E. FRAZER, Professor; B.S., Northwestern University; LL.B., Harvard University.

DAVID H. GETCHES, Associate Professor; B.A., Occidental College; J.D., University of Southern California.

ROBERT GLATEN, Adjunct Professor; B.A., University of Michigan; J.D., Harvard University.

DAVID S. HILL, Associate Professor; B.S., J.D., University of Nebraska.

MICHAEL HOCKERSMITH, Staff Attorney, Institute for Law and Aging; B.A., J.D., University of Texas.

J. DENNIS HYNES, Professor; B.A., LL.B., University of Colorado.

HOWARD C. KLEEME, Professor; B.A., LL.B., University of Colorado; LL.M., Yale University.

JUSTICE ROBERT R. LEE, Associate Professor (Adjunct); A.B., University of Michigan; LL.B., Harvard University.

BETSY LEVIN, Dean; A.B., Bryn Mawr College; LL.B., Yale University.

MARK LOWENSTEIN, Associate Professor; B.S., J.D., University of Illinois.

*Graduate School Faculty.

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College of Music

PHILIP SANGLIN, Assistant Professor (Clarinet). B.A., M.A., University of Wisconsin; D.M.A., University of Arizona.

DAVID ABDOSCH, Lecturer (Oboe). B.M., University of Denver.

PETER AMSBURG, Assistant Professor (Piano). B.Mus., M.Mus., D.M.A., Peabody Conservatory.

FRANK BURD, Professor of Music (Brass). B.S., Western Tennessee College (Kentucky); M.Mus., University of Michigan.

WALTER BARR, Associate Professor (Denver Campus). B.S., Ed., Arizona State College; M.A., Northern Arizona University; Ed.D., Arizona State University.

DAVID BASKERVILLE, Professor (Denver Campus). B.A., University of Washington; M.A., Ph.D., University of California.

GRETHA HERMANN BEALL, Professor of Music (Saxophone). B.A., University of Iowa; M.S., Ed.D., University of Illinois.

DORI BERNSTEIN, Professor of Music (Violin). B.M., Julliard School of Music; M.F.A., Brandeis University; D.M.A. Boston University.

STORM BULL, Professor Emeritus.

CHARLES BYERS, Associate Dean, Undergraduate Studies; Professor (Choral). B.Mus.Ed., University of Kansas; M.Mus.Ed., University of Colorado.

HEROLD DODG, Professor Emeritus.

WALTER COLLINS, Professor (Choral). A.B., B.Mus., Yale University; M.A., Ph.D., University of Michigan.

LOUIS CUMMINGHAM, Professor Emeritus.

JURGEN DE LEMOS, Lecturer (Musicology). Artist in Residence (Saxophone). B.A., Julliard School of Music; M.Mus., University of Michigan; D.M.A., University of Toronto.

DENNIS DIAMOND, Assistant Professor (Saxophone). Director, Jazz Ensembles. B.Mus.Ed., Northern Michigan University; M.Mus., University of Hartford.

BARBARA DOSCHER, Assistant Professor (Piano). B.A., Governor General's College; B.Mus., M.Mus., D.Mus., University of Colorado.

BUCK DUCKWORTH, Professor of Music (Piano). B.A., University of California, Los Angeles; M.A., University of British Columbia; D.Mus., Columbia University.

CHARLES EAKIN, Professor of Music (Theory and Composition). B.S., Mathematics, Columbia University; M.A., Carnegie Institute of Technology; Ph.D., University of Minnesota.

CECELIA EFFINGER, Professor Emeritus. Composer in Residence (Piano).

OLIVER ELSWORTH, Associate Professor (Piano). B.A., M.A., University of California; B.M., M.A., University of Washington.

ZOE ERASMUS, Associate Professor (Denver Campus). B.M., Indiana University; M.F.A. in Performance, University of Hawaii.

BART FINK, Dean; Professor (Theory). B.Mus., M.Mus., Ph.D., University of California.

WILLIAM FOWLER, Professor (Denver Campus). B.M., American Conservatory of Music (Chicago); M.F.A., University of Utah.

JOHN BALM, Associate Professor of Music (Theory and Composition). B.M., M.Mus., University of Illinois, Champaign.

LUIS GONZALEZ, Assistant Professor (Theory and Composition). B.Mus., M.Mus., University of Illinois, Champaign.

LARRY GRAHAM, Associate Professor (Piano). B.M., M.A., University of California, Berkeley.

ROBERT HARRISON, Assistant Professor (Voice). B.A., Yale University; M.Mus., University of Wisconsin-Madison.

KUNIKI HATA, Associate Professor (Vocal). B.M., Otsuma College of Music (Japan); M.Mus., University of Tokyo.

DEBORAH HAYES, Associate Professor (Voice and Literature). B.A., Oberlin College; M.A., Ph.D., University of California, Berkeley.

GARY HEND, Assistant Professor; Associate Director of Bands. B.Mus.Ed., M.Mus., University of Michigan.

EVELYN JAY HILTON, Professor Emeritus.

HELEN LUNN HOPE, Lecturer (choral). B.A., Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral 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Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Director, Choral Dir
Maurice C. Andries, Associate Professor Emeritus.

Glenn D. Appelt, Assistant Dean for Student Affairs; Professor of Pharmacology; B.S. (Phar.), M.S., University of North Carolina; M.S., University of Kentucky.

Ronald F. Baer, Associate Professor Adjunct of Clinical Pharmacy; B.S., M.S., University of North Carolina; Pharm.D., University of Kentucky.

Duane C. Bloedow, Assistant Professor of Pharmacology; B.S. (Phar.), South Dakota State University; Pharm.D., University of North Carolina.

Harold L. Bober, Assistant Professor Adjunct of Pharmacy Administration; B.S., B.S., University of Illinois; M.S., University of North Carolina.

L. Harold Carter, Instructor in Pharmacy (Chief Pharmacist); B.S., Wake Forest College; B.S. (Phar.), University of North Carolina.

Leland W.K. Chung, Associate Professor of Pharmacology; B.S., National Taiwan University; M.S., Oregon State University; Ph.D., University of Oregon.

Allan C. Collins, Associate Professor of Pharmacology; B.S. (Phar.), M.S., Ph.D., University of Wisconsin.

Ann G. Davis, Assistant Professor of Clinical Pharmacy; B.S. (Phar.), University of North Carolina; Pharm.D., University of Utah.

Michael P. Dutro, Assistant Professor Adjunct of Clinical Pharmacy; B.S., New Mexico State University; M.S., University of Kentucky.

V. Gene Erwin, Dean of the School of Pharmacy; Professor of Pharmacology; B.S. (Phar.), M.S., Ph.D., University of North Carolina.

Alan R. Fritzberg, Assistant Professor (Attending Pharmacist) of Pharmacy; B.S., Washington State University; M.S., University of Washington; Ph.D., West Virginia University.

Francis C. Hammeke, Professor of Pharmacy Administration; B.S.(Phar.), M.S., Montana State University; Pharm.D., University of North Carolina.

Thomas C. Hardin, Assistant Professor of Clinical Pharmacy; B.S. (Phar.), University of Mississippi; Pharm.D., University of Texas.

Arnold J. Hennings, Professor of Pharmacy; B.S. (Phar.), M.S., University of Wisconsin.

Tony E. Jones, Professor of Pharmaceutical Chemistry; B.S. (Phar.), M.S., University of Texas; Ph.D., University of Colorado.

Leroy C. Knodel, Assistant Professor of Clinical Pharmacy; B.S. (Phar.), Pharm.D., University of Kentucky.

Gary A. Louie, Assistant Professor of Clinical Pharmacy; Pharm.D., University of Southern California.

Alvin M. Malkinson, Assistant Professor of Biochemical Pharmacology; B.A., University of Buffalo; Ph.D., Johns Hopkins.

David M. Melnik, Assistant Professor of Clinical Pharmacy; Assistant Director of Clinical Services; Colorado General Hospital; Pharm.D., University of the Pacific.

Dennis R. Petersen, Assistant Professor of Pharmacogenetics-Pharmacology; B.S., University of Southern California; M.S., University of Kentucky.

Robert W. Phipps, Associate Dean for Clinical Affairs; Professor of Pharmacy; B.S. (Phar.), University of Illinois; Ph.D., Loyola University.

James A. Ruth, Assistant Professor of Medicinal Chemistry-Chemical Pharmacology; B.S., University of Kansas; Ph.D., Northwestern University.

Martha J. Sacks, Graduate Coordinator; Lecturer in Clinical Pharmacy; B.S. (Phar.), University of Kansas; Pharm.D., University of Southern California.

John A. Thompson, Associate Professor of Pharmaceutical Chemistry; A.S., Clark University; Ph.D., University of California.

DON VOLLSTEIDT, Associate Professor (Organ and Church Music); B.M., Lawrence College; M.M., Union Theological Seminary.

Mark Watt, Associate Professor (Piano); B.S., Virginia State University; M.M., Kansas State University; D.M.A., University of Colorado. Conservatory.

Keith Wallingford, Professor (Piano); B.S., Kansas State University; M.S., Juilliard School of Music; D.M.A., University of Colorado.

Howard Waltz, Professor Emeritus.

Lynn Whitten, Professor (Choral); B.A., Wayland College; B.A., University of Texas; M.A., University of Southern California.

Karen Yonovitz, Assistant Professor (Brass, Woodwind Chamber Music); B.Mus.Ed., Baldwin-Wallace College Conservatory of Music; M.Mus., Yale.
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