THE UNIVERSITY OF
ARIZONA
RECORD

GENERAL CATALOG
1991-92
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GENERAL CATALOG
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All colleges and departments establish certain academic requirements which must be met before a degree is granted. These requirements concern such things as curricula and courses, majors and minors, and campus residence. Advisors, directors, department heads, and deans are available to help the student understand and arrange to meet these requirements, but the student is responsible for fulfilling them. At the end of the student's course of study, if requirements for graduation have not been satisfied, the degree will not be granted. For this reason it is important for each student to be acquainted and remain currently informed about all regulations, and to be responsible for completing requirements. Courses, programs, and requirements described in the catalog may be suspended, deleted, restricted, supplemented, or changed in any other manner at any time at the sole discretion of The University of Arizona and the Arizona Board of Regents. The catalog does not establish a contractual relationship, but it summarizes the total requirements which the student must presently meet before qualifying for a faculty recommendation to the Arizona Board of Regents to award a degree.

The determination of acceptability of credit for course work completed at another institution of higher learning, whether the other institution is accredited or not, is made solely at the discretion of this institution as guided by its academic policy bodies. Students are advised to check with the Office of Admissions and New Student Enrollment to determine the acceptability of credit from other institutions and its applicability toward a program of study at The University of Arizona.

The University of Arizona does not discriminate on the basis of sex, age, race, religion, color, national origin, Vietnam Era Veteran's status, or disability in its admissions, employment and educational programs or activities, and is required by Title IX of the Education Amendments of 1972, Title VII of the Civil Rights Act of 1964, Sections 503 and 504 of the Rehabilitation Act of 1973, the Age Discrimination in Employment Act of 1967, and the Vietnam Era Veteran's Readjustment Assistance Act of 1972 not to discriminate in such manner. Inquiries concerning the application of said regulations to The University of Arizona may be referred to Dr. Joseph H. Stauss, Affirmative Action Officer, Administration 501, phone (602) 621-3081. In compliance with the Family Education Rights and Privacy Act of 1974, The University of Arizona guarantees that the parents of dependent children may have a right to information about their offspring without having to gain the student's consent.

Announcements in this catalog concerning regulations, fees, curricula, or other matters are subject to change without notice. Inquiries regarding admission to The University of Arizona should be addressed to:

Director of Admissions and New Student Enrollment
The University of Arizona
Robert L. Nugent Building
Tucson, Arizona 85721
(602) 621-3237

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<thead>
<tr>
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<tbody>
<tr>
<td>Applications for bachelor's degree</td>
<td>Aug. 1 Th</td>
<td>Aug. 3 M</td>
</tr>
<tr>
<td>candidacy must be filed for degrees to</td>
<td></td>
<td></td>
</tr>
<tr>
<td>be awarded at close of the following</td>
<td></td>
<td></td>
</tr>
<tr>
<td>summer session</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Degrees awarded as of this date for</td>
<td>Aug. 8 Th</td>
<td>Aug. 13 Th</td>
</tr>
<tr>
<td>students completing requirements at</td>
<td>Aug. 18 Su</td>
<td>Aug. 16 Su</td>
</tr>
<tr>
<td>close of summer session</td>
<td>Su-Tu</td>
<td>Su-Tu</td>
</tr>
<tr>
<td>Residence halls open</td>
<td>Aug. 18-20</td>
<td>Aug. 16-18</td>
</tr>
<tr>
<td>New-student orientation program</td>
<td>Aug. 21 W</td>
<td>Aug. 19 W</td>
</tr>
<tr>
<td>(Last session)</td>
<td>Aug. 22 Th</td>
<td>Aug. 20 Th</td>
</tr>
<tr>
<td>Freshman Convocation</td>
<td>Aug. 29 Th</td>
<td>Aug. 27 Th</td>
</tr>
<tr>
<td>Classes begin</td>
<td>Sept. 2 M</td>
<td>Sept. 7 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>Sept. 18 W</td>
<td>Sept. 16 W</td>
</tr>
<tr>
<td>Labor Day—no classes</td>
<td>Oct. 30 W</td>
<td>Oct. 28 W</td>
</tr>
<tr>
<td>Last day for dropping courses with</td>
<td>Nov. 11 M</td>
<td>Nov. 11 W</td>
</tr>
<tr>
<td>deletion of course enrollment from</td>
<td>Nov. 19 Tu</td>
<td>Nov. 17 Tu</td>
</tr>
<tr>
<td>record</td>
<td>Nov. 28-29</td>
<td>Nov. 26-29</td>
</tr>
<tr>
<td>Thanksgiving recess</td>
<td>Dec. 1</td>
<td>Th-Su</td>
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### Second Semester

<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>Residence halls open</td>
<td>Jan. 12 Su</td>
<td>Jan. 10 Su</td>
</tr>
<tr>
<td>New student orientation program</td>
<td>Jan. 12-14</td>
<td>Jan. 10-12</td>
</tr>
<tr>
<td>(Last session)</td>
<td>Su-Tu</td>
<td>Su-Tu</td>
</tr>
<tr>
<td>Classes begin</td>
<td>Jan. 15 W</td>
<td>Jan. 13 W</td>
</tr>
<tr>
<td>M. L. King Holiday—no classes</td>
<td>Jan. 20 M</td>
<td>Jan. 18 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>Jan. 23 Th</td>
<td>Jan. 21 Th</td>
</tr>
<tr>
<td>Last day for dropping courses with</td>
<td>Feb. 11 Tu</td>
<td>Feb. 9 Tu</td>
</tr>
<tr>
<td>deletion of course enrollment from</td>
<td>Mar. 14-22</td>
<td>Mar. 13-21</td>
</tr>
<tr>
<td>record</td>
<td>Sa-Su</td>
<td>Sa-Su</td>
</tr>
<tr>
<td>Spring recess</td>
<td>Mar. 31 Tu</td>
<td>Mar. 30 Tu</td>
</tr>
<tr>
<td>Last day for dropping courses</td>
<td></td>
<td></td>
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<td>Applications for bachelor's degree</td>
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<td>candidacy must be filed for degrees to</td>
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<tr>
<td>be awarded at close of the following</td>
<td></td>
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</tr>
<tr>
<td>spring semester</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Class and laboratory sessions end</td>
<td>May 1 F</td>
<td>May 3 M</td>
</tr>
<tr>
<td>Semester examinations begin</td>
<td>May 6 W</td>
<td>May 5 W</td>
</tr>
<tr>
<td>Semester examinations end</td>
<td>May 8 F</td>
<td>May 7 F</td>
</tr>
<tr>
<td>Spring Commencement</td>
<td>May 15 F</td>
<td>May 14 F</td>
</tr>
<tr>
<td></td>
<td>May 16 Sa</td>
<td>May 15 Sa</td>
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### Summer Session

<table>
<thead>
<tr>
<th>Event</th>
<th>1992</th>
<th>1993</th>
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<tbody>
<tr>
<td>Presession classes begin</td>
<td>May 18 M</td>
<td>May 17 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for Presession</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Classes of Presession end</td>
<td>May 19 Tu</td>
<td>May 18 Tu</td>
</tr>
<tr>
<td>First Summer Session classes begin</td>
<td>June 8 M</td>
<td>June 7 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for first session</td>
<td>June 10 W</td>
<td>June 9 W</td>
</tr>
<tr>
<td>Classes of first session end</td>
<td>July 9 Th</td>
<td>July 8 Th</td>
</tr>
<tr>
<td>Second Summer Session classes begin</td>
<td>July 13 M</td>
<td>July 12 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for second session</td>
<td>July 15 W</td>
<td>July 14 W</td>
</tr>
<tr>
<td>Classes of second session end</td>
<td>Aug. 12 W</td>
<td>Aug. 11 W</td>
</tr>
</tbody>
</table>
Application for admission may be obtained by mailing or calling:

Tucson, AZ 85721
Robert L. Undergraduate
The University of Arizona
Office of Admissions and New Student Enrollment

Application for admission is required of all prospective students who apply to the University of Arizona for any semester. Applications for admission must be submitted by June 1 for the fall semester and December 1 for the spring semester. Applications are encouraged to be submitted by the Priority Service Plan.

Applicants who submit complete credentials by the Priority Service Plan deadline will receive priority consideration for admission decisions. This fee must be paid in order to receive priority services. However, applicants who submit incomplete credentials or who submit their applications after the deadline may still be considered for admission. If selected, they will be invited to submit additional information to complete their application.

Applications for transfer students must be submitted by April 1 for the fall semester and December 1 for the spring semester. Further information about admission policies and procedures for undergraduates is available from the appropriate offices (including Residence Life, the Office of Undergraduate Admissions, and the Office of Financial Aid). Applicants who are not residents of the United States or who are not legal residents of Arizona must be holders of a valid visa to enter the United States.

Applicants should submit their applications and all supporting documentation to the office of undergraduate admissions at the University of Arizona. Applications are evaluated on the basis of academic achievement, personal characteristics, and potential contributions to the University community. The University of Arizona welcomes applications from students who have demonstrated excellence in teaching, research, and community service. The University of Arizona has received national recognition for its academic programs and commitment to excellence in teaching and research. The University of Arizona is committed to providing equal educational opportunities to all students who qualify.

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Admission to the University
Service Plan as described under the Freshman Applicants section above.

SAT or ACT Requirements

All freshman students are required to take the Scholastic Aptitude Test (SAT) or the American College Test (ACT) and have official scores sent to The University of Arizona. To submit SAT scores, indicate code 4832 on the test reservation form or code 0096 on the ACT reservation form. Information regarding these tests may be obtained from high school counselors. Transfer applicants who have earned less than 36 transferable semester hours of credit may be required to submit official SAT or ACT results.

Domicile Affidavit

A student enrolling at The University of Arizona for the first time, or a student returning after an absence of one or more semesters, must provide information which will allow classification as either resident or nonresident of Arizona. For new students, this information is requested on the application for admission; for returning students, a domicile affidavit is provided with the application for readmission. Foreign students (nonimmigrants) are classified nonresidents of the state of Arizona for the duration of their enrollment and a domicile affidavit is, therefore, not required.

Health Service

All new students or reenrolled students born after December 31, 1955, must submit proof of vaccination for measles and rubella since 1980 before they will be allowed to register for classes. Additionally, it is recommended that the results of a tuberculin skin test taken within six months prior to registration be submitted. If the skin test is found to be positive, a chest x-ray is recommended. Medical or nursing students should defer the chest x-ray until arrival at the University.

Admission as a Nondegree Student

Through nondegree status, a student may enroll for a maximum of six credits or two courses per semester. A maximum of 15 credits completed as a nondegree student may be used for fulfilling degree requirements. All non-native English-speakers who apply as nondegree students are required to submit Test of English as a Foreign Language (TOEFL) results with a minimum score of 500. Nondegree students are not eligible for scholarships, financial aid, or on-campus housing. A student disqualified from the University cannot attend as a nondegree student.

Deadlines for nondegree admission are August 1 for the fall semester, December 1 for the spring semester, May 28 for the first summer session, and July 1 for the second summer session.

Applications for nondegree admission may be obtained from the Office of Admissions and New Student Enrollment.

Four classifications for nondegree students are available. They are:

NONDEGREE REGULAR STUDENT—For community members who wish to upgrade skills or complete course work for personal enrichment. Applicants must be at least 19 years of age.

NONDEGREE SUMMER SESSION ONLY—For those who do not plan to attend in the spring or fall semesters but only wish to study in the summer. Completion of a high school or equivalent program is required.

NONDEGREE HIGH SCHOOL STUDENT—For Arizona residents currently enrolled in high school who wish to attend a fall, spring, or summer term. In addition to the application, a letter from the high school principal approving concurrent enrollment and an official high school transcript is required. An alternative to this procedure is available through standardized testing. Please contact the Office of Admissions and New Student Enrollment for details.

NONDEGREE VISITING STUDENT—For students pursuing degree programs at other colleges or universities. Applicants must provide official transcripts or a letter from the home institution indicating good academic standing.

Summer Session

The University of Arizona provides opportunities for academic, cultural, and recreational enrichment. Up to 15 units of credit are available through summer study. Summer Session classes are open to all regularly admitted students. Summer-only undergraduate admission is also available. (For a brief definition of eligibility, see Nondegree Summer Session Only section above.)

New and former undergraduate students interested in summer admission may obtain materials from the Office of Admissions and New Student Enrollment.

Cancellation of Admission or Registration

The University reserves the right to cancel the admission or registration of an individual whose attendance at the University, in the opinion of the appropriate administrative officer and the President, would not be mutually beneficial to the student and to the institution.

Accommodation of Religious Observance and Practice

In accord with Board of Regents' policy, no employee, agent or policy of The University of Arizona shall discriminate against any student, employee, or other individual because of that individual's religious belief or practice or any absence thereof. Administrators and faculty members are responsible for reasonable accommodation of individual religious practices. A refusal to accommodate is justified only when undue hardship would result from each available alternative of reasonable accommodation. Further, no administrator or faculty member shall retaliate or otherwise discriminate against any student, employee or prospective employee because that individual has sought a religious accommodation pursuant to this policy.

Persons wishing clarification of the nature or proper application of this policy should consult the Office of the Dean of Students or the Office of the Director of Personnel, as appropriate.

ADMISSION REQUIREMENTS FOR ENTERING FRESHMEN

Applicants presenting academic achievement at or above the criteria indicated below are excellent candidates for admission. High school achievement above minimum eligibility requirements and an early application maximize a candidate's likelihood for an offer of admission. Admission for nonresident students is competitive; applicants may be selected on a basis which exceeds the stated requirements.

Admission Requirements Prior to Summer and Fall 1992

GENERAL APTITUDE

A. Resident applicants:
1. Rank in the upper 50 percent of the high school graduating class; or
2. Achieve a cumulative high school grade-point average of at least 2.5 on a 4.0 scale; or
3. Obtain a combined score of at least 930 on the Scholastic Aptitude Test (SAT), or a composite score of at least 22 on the American College Test (ACT).

B. Nonresident applicants:
1. Rank in the upper 25 percent of the high school graduating class; or
2. Achieve a cumulative high school grade-point average of at least 3.0 on a 4.0 scale; or
3. Obtain a combined score of at least 1010 on the Scholastic Aptitude Test (SAT), or a composite score of at least 24 on the American College Test (ACT).

Admission Requirements Effective Summer and Fall 1992

The revised admission criteria establish two types of admission status for freshman and transfer students: unconditional and conditional. The qualifications for each category of admission are outlined below. It is important to note that these revisions will not result in denial of admis-
ADMISSION TO THE UNIVERSITY

ADMISSION TO THE UNIVERSITY

ADMISSION WITH DEFICIENCIES

Applicants who meet the general aptitude requirements but who have not completed all of the competency requirements, may be admitted with deficiencies. Applicants who lack no more than two credits of the required competency course work may be admitted in this manner. There may be no more than one credit of deficiency in any competency area. A grade-point average lower than 2.00 on a 4.0 scale in any of the academic competency areas will be considered as one deficiency in that area.

The deficiencies must be made up within one calendar year of the date of first enrollment, either by additional high school courses or by college courses in summer school, in a community college, or at The University of Arizona. Students who fail to remove deficiencies within one calendar year of the date of their first enrollment will not be permitted to register for future terms. Academic competency requirements may also be met by obtaining a specified score on the Scholastic Aptitude Test (SAT) and the ATP Achievement Tests; or the American College Test (ACT).

MEETING ACADEMIC COMPETENCY REQUIREMENTS

Applicants who are age 22 or older and who demonstrate readiness for college-level study may be admitted under alternative requirements. Applications for admission will be reviewed individually.

Applicants who do not meet the general aptitude and basic competency requirements may appeal in writing to be admitted on the basis of at least one of the criteria listed below. Appeals may be approved or denied by an admissions committee based upon the space available in the college selected and evidence of potential for success.

A. Has a high school grade-point average of at least 2.0 on a 4.0 scale and either an upward grade trend during high school or an upward grade trend during the senior year in academic courses such as mathematics, English, social science, science, and foreign languages;
B. Has attained an average score on the General Education Development Test of at least 50;
C. Has positive written recommendations from professional individuals who are personally familiar with the applicant's academic potential as demonstrated by work experience, leadership ability, or extracurricular activities;
D. Does not meet the general aptitude requirement but has completed high school courses in English, mathematics, laboratory science, or social science in excess of the minimum basic competency requirements and/or provides evidence of above average grades for the average of all courses taken in those subjects and has no deficiencies in the basic competencies.

ADMISSION TO PARTICULAR COLLEGES AND SCHOOLS

Agriculture

Applicants are expected to present credit in mathematics and laboratory science as follows: one unit of algebra I, one unit of algebra II, one unit of plane geometry, and one unit of physics, chemistry or biological science with a lab. Students are strongly advised to include among their...
# ACADEMIC COMPETENCY REQUIREMENTS

<table>
<thead>
<tr>
<th>SUBJECT AREAS</th>
<th>HIGH SCHOOL COURSE WORK</th>
<th>SAT &amp; ACHIEVEMENT SCORES</th>
<th>ACT SCORES</th>
<th>COLLEGE COURSE WORK (Credits based on semester system)</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>(“C” average required)</td>
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<tr>
<td><strong>English</strong></td>
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<tr>
<td>4 units</td>
<td>English I</td>
<td>Verbal subscore of 450 or above</td>
<td>English subscore of 21 or above</td>
<td>One transferable 3-credit English course</td>
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<tr>
<td>(Composition &amp; Literary Analysis only)</td>
<td>English II</td>
<td></td>
<td>Mathematics subscore of 20 or above</td>
<td>Two 3-credit pre-college math courses or one transferable 3-credit algebra course</td>
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<tr>
<td></td>
<td>English III</td>
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<td></td>
<td>English IV</td>
<td></td>
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<tr>
<td><strong>Mathematics</strong></td>
<td>Algebra I</td>
<td>Mathematics subscore of 500 or above</td>
<td></td>
<td>Two 4-credit transferable laboratory science courses</td>
</tr>
<tr>
<td>3 units</td>
<td>Plane Geometry</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td>Algebra II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Laboratory Science</strong></td>
<td>One unit from any two of the following: Biology Chemistry Physics</td>
<td>ATP Achievement Test Scores: Chemistry: 575 or above Biology: 550 or above Physics: 590 or above</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 units</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social Studies</strong></td>
<td>American History</td>
<td>ATP Achievement Test Scores: American History/Social Studies: 510 or above</td>
<td>Social Studies Competency equivalency is not available.</td>
<td>One 3-credit transferable American History course and one additional 3-credit transferable social science course</td>
</tr>
<tr>
<td>2 units</td>
<td>One additional unit from: European/World History Economics Sociology Geography Government Psychology Anthropology</td>
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### Test Scores May Be Used To Satisfy Only One Laboratory Science Unit

<table>
<thead>
<tr>
<th></th>
<th>Mathematics subscore of 20 or above</th>
<th>Natural Science subscore of 20 or above</th>
<th>Two 3-credit pre-college math courses or one transferable 3-credit algebra course</th>
</tr>
</thead>
</table>

**Electives**

Additional courses in mathematics such as trigonometry, advanced algebra or solid geometry.

**Architecture**

Applicants are expected to present credit in mathematics and laboratory science as follows: one unit of algebra I, one unit of algebra II, one unit of plane geometry and two units of laboratory science, one of which must be physics or chemistry. Three units of laboratory science, biology, chemistry, and physics are strongly recommended. Entering students are also strongly advised to include among their electives additional courses in mathematics such as trigonometry, advanced algebra and solid geometry; one or more studio art courses; and two or more years of foreign language. (Spanish is preferred, as the college offers exchange programs in Mexico and Spain.)

**Arts and Sciences**

Applicants are expected to complete patterns of study, with better than average grades, which offer a solid preparation for university academic areas. Each applicant is expected to demonstrate completion of the required college preparatory courses. Included are mathematical courses which include algebra, geometry, trigonometry, calculus, and mathematical analysis; study of foreign languages, natural and physical sciences; the humanities; and English courses. English courses in the 11th and 12th grades should include substantial writing, both expressive and analytical, demanding a high level of thinking skills and integrated with extensive reading of significant literature.

**Business and Public Administration**

Upper-division courses in the college are open only to students who meet the requirements for advanced standing, as specified in the College of Business and Public Administration section of this catalog.

**Education**

Formal admission to the College of Education is required of all undergraduate students who wish to pursue a major for a College of Education degree as well as for students who wish to enroll in restricted professional education courses for the purpose of earning a teaching certificate. Students must have completed 56 semester units of credit applicable to a baccalaureate degree with a cumulative grade-point average of 2.5 (on a 4.0 scale) or better to be considered eligible for admission to the College of Education. Those undergraduates wishing to enroll in professional education courses for the purpose of obtaining a teaching certificate must meet the above requirements and have passing scores on all three portions of the Pre-Professional Skills Test (PPST) to be considered eligible for admission. For further information regarding admission criteria and requirements, see the College of Education section of this catalog.

**Engineering and Mines**

Applicants are required to present credit in mathematics as follows: one unit of algebra I, one unit of algebra II, one unit of plane geometry, and
1/2 unit of trigonometry. It is strongly recommended that one unit of physics and one unit of chemistry be presented. Students transferring into the college must have a cumulative grade-point average of 2.5000 in all previous university studies. In-state high school applicants must have a class standing in the top 25 percent; or a grade-point average of 2.75 (3.0 for out-of-state applicants) on a 4.0 scale; or a composite score of 23 (24 for out-of-state applicants) on the ACT; or a minimum combined score of 1010 (1050 for out-of-state applicants) on the SAT.

Health-Related Professions

Admission to the school is solely through acceptance into a specific program. Applicants are required to have completed 58-63 semester hours of college credit and to have maintained a 2.2500 grade-point average on all collegiate work attempted. Applicants must meet the school's general prerequisites as well as those prerequisites established for the particular program of study for which the student is applying.

Nursing

One-and-one-half years in the College of Arts and Sciences are prerequisite to entrance into the College of Nursing. For further information, see the College of Nursing section of this catalog.

Pharmacy

Two years of study in the liberal arts and sciences are prerequisite to entrance into the College of Pharmacy. For further information, see the College of Pharmacy section of this catalog.

ADVISING CENTER FOR EXPLORATORY STUDENTS (ACES)

ACES is a university-wide program that provides for students the opportunity to enter the University on an exploratory basis. To be placed in contact with ACES, an applicant may indicate on the admission application that he or she cannot decide on a college, faculty, or school, and check the block by "No College Selected."

ACES uses an intrusive, developmental advising system to assist with course selection, explore self, clarify life/career goals, and integrate academic majors with career opportunities. ACES is housed in the Modern Languages Building, Room 347, and is explained in detail in the Student Services section of this catalog, under "Counseling and Advising."

CHANGES IN ADMISSION REQUIREMENTS

The University of Arizona reserves the right to depart from or supplement its published policies and to adopt additional admission requirements or change present ones, subject to the approval of the Board of Regents.

ADVANCED PLACEMENT PROGRAMS

Advanced Placement

Students who have completed college-level courses in secondary schools and have taken the Advanced Placement Examinations of the College Entrance Examination Board will be considered for advanced placement and for the granting of college credit to count toward degree requirements.

The Advanced Placement Program recognizes that many students can complete college-level courses while they are still in secondary school. The University of Arizona encourages and recognizes this achievement. The program provides course descriptions and professional consultants to help schools establish college-level courses for their stronger students. It sets, administers, and grades examinations in these courses. It sends the examination grades, together with support- ing materials, to the students' colleges, enabling the University to grant appropriate placement and credit. For University of Arizona credit policies, please see the section on Advanced Placement from High School under "Proficiency and Exemption Examinations, Credit by Examination" in the chapter entitled Academic Guidelines.

Students should contact the Office of Admissions and New Student Enrollment, consult their high school counselors, or write to the College Entrance Examination Board, Princeton, New Jersey 08540, for more details.

College-Level Examination Program

The University of Arizona grants credit for both the General Examinations and the Subject Examinations of the College-Level Examination Program of the College Entrance Examination Board.

PROGRAMS FOR SUPERIOR STUDENTS

The University of Arizona takes pride in its community of scholars and offers advanced learning opportunities to outstanding students through the Honors Center. For a description of this program and of Academic Honors and Awards conferred to outstanding students at the University, please refer to the section in this catalog titled Provisions for Superior Students.

TRANSFER STUDENTS

Application for Admission

Applications for admission may be obtained by writing or calling:

Office of Admissions and New Student Enrollment
The University of Arizona
Robert L. Nugent Building
Tucson, AZ 85721
(602) 621-3237

Students transferring from other colleges and universities are required to file with the Office of Admissions and New Student Enrollment official transcripts sent directly from all previously attended schools. Students may not disregard their records in other colleges and universities in order to apply for admission solely on the basis of their high school records. Any student who does so is subject to suspension from the University and, should requirements for a degree otherwise be met, subject to the withholding of the degree.

Admission Requirements for Transfer Students Prior to Summer and Fall 1992

A. Resident transfer applicants: A minimum overall grade-point average on all previous college work of 2.00 (C) on a 4.00 scale.

B. Nonresident transfer applicants: Admission is competitive; a cumulative grade-point average of at least 2.5 on a 4.0 scale is required to be considered for admission as a transfer student. However, actual admission will be based upon the overall qualifications of the nonresident applicant pool.

Admission Requirements for Transfer Students Effective Summer and Fall 1992

A. Resident transfer applicants: unconditional:

1. A cumulative grade-point average of at least 2.0 on a 4.0 scale in at least 12 transferable academic credits; and
2. Completion of all high school competency requirements as indicated in the table above if less than 36 transferable credits have been earned.

B. Resident transfer applicants: conditional:

1. A cumulative grade-point average of at least 2.0 on a 4.0 scale in at least 12 transferable academic credits; and
2. No more than one deficiency in a maximum of two competency areas if less than 36 transferable credits have been earned.

C. Nonresident transfer applicants: Admission is competitive; a cumulative grade-point average of at least 2.5 on a 4.0 scale is
required to be considered for admission as a transfer student. However, actual admission will be based upon the overall qualifications of the nonresident applicant pool.

All students transferring with less than 36 transferable semester units will be subject to the same curricular requirements as regular admittees from high schools and must show evidence of having fulfilled the required secondary school subject units. Such units must be completed in high school or by equal or higher work at the college level in the same manner as designated for entering freshmen.

Note: The above statements do not necessarily apply to students seeking admission to divisions of the University which may have higher entrance requirements. See the sections stating requirements for admission to the College of Architecture, the College of Business and Public Administration, the College of Education, the College of Engineering and Mines, and the College of Pharmacy.

Transfer of Credits

The University of Arizona evaluates, without prejudice, applicants for admission from regionally accredited postsecondary institutions or postsecondary institutions which are candidates for accreditation based upon the individual merits of their academic achievements. Credit in courses in which the grade received was lower than C is not transferable. Grades earned in courses taken at other institutions are not included in calculation of The University of Arizona grade-point average. Remedial, vocational, technical, highly specialized, and personal development courses are not ordinarily accepted for credit. Applicability of transfer credit to a student's academic curriculum is determined by the academic advisor in the student's major department.

Inquiries concerning the acceptance of transfer credit from foreign institutions should be directed to the Office of Admissions and New Student Enrollment, attention Foreign Credentials, which is responsible for the evaluation of foreign credit transfer.

Credits from Community Colleges

Up to 72 units may be transferred from accredited community colleges, provided these units are in courses acceptable for transfer credit. Transfer students are encouraged to complete freshman and sophomore level general education course work at their community colleges. Courses in skill development, personal assessment or enhancement, or vocational or technical training are not ordinarily transferable for University of Arizona credit. Transferability of courses of independent study, internship, or practicum must be validated by the appropriate department or college at The University of Arizona and may be restricted both in number of units transferable and in degree applicability. Students who have taken community college courses in these categories may petition the relevant college for an exception.

While all courses offered for transfer will be accepted by the University subject to the above rule, the specific lower-division requirements of various curricula vary widely. In order to complete the baccalaureate program in the normal time span, the student should consult the College catalog of this section that is appropriate for the student's curriculum, as well as the head of the appropriate university department to determine specific requirements of the program into which the student plans to transfer.

Normally a course completed in a community college whose content is offered at The University of Arizona in the upper division (carrying a course number of 300 or higher) will not be accepted in transfer as the equivalent of The University of Arizona upper-division course.

ADMISSION OF FOREIGN STUDENTS

Students who hold nonimmigrant visas should request application materials for undergraduate admission from the Office of Admissions and New Student Enrollment, attention Foreign Credentials, Robert L. Nugent Building. A $25.00 application fee is required of all undergraduate foreign students. This payment must be in the form of a check or money order drawn on a U.S. banking affiliate, and made payable in U.S. dollars to The University of Arizona. The University does not accept International Postal Money Orders. Foreign students are expected to have above average grades, must demonstrate proficiency in the English language, and must satisfy the financial guarantee requirement for each year of attendance. Foreign students are required to take either the American College Test (ACT) or the Scholastic Aptitude Test (SAT) only if they are graduating from a U.S. high school.

All foreign applicants whose native language is other than English are required to take the Test of English as a Foreign Language (TOEFL), which is given at test centers worldwide under the direction of the Educational Testing Service. A minimum, composite TOEFL score of 500 is required for full-time admission to an academic program. For test information, write: TOEFL Publications, Box 6154, Princeton, New Jersey 08541-6154. Results of the TOEFL are valid for two years. Applicants should request that TOEFL (Box 6153, Princeton, New Jersey 08541-6153) send their scores to The University of Arizona. The scores must be received before the application for admission can be considered. Newly admitted foreign students may also be required to take a locally administered English placement test upon arrival and must take such further study in English as the test results indicate is necessary. Transfer students from U.S. colleges or universities must check with their academic advisor and/or the University Composition Board to determine their upper-division and freshman English requirements.

For those lacking college-level English proficiency, the Center for English as a Second Language (CESL) on this campus offers full-time English language training. The full semester sessions carry no college credit, but satisfactory completion of CESL study (which includes taking the TOEFL examination) will meet the English proficiency requirement for admission. Request further information by writing to CESL, Room 104, CESL Building. It is recommended that international students apply for admission at least one full term prior to proposed enrollment. Inquiries concerning the acceptance of transfer credit from foreign institutions completed by U.S. and non-U.S. citizens should be directed to the Office of Admissions and New Student Enrollment, attention Foreign Credentials, before application is made for CESL study. Admission to CESL study does not guarantee admission to any academic program at The University of Arizona.

Other nonimmigrants in the vicinity may arrange to take the International TOEFL on The University of Arizona campus and should contact the Testing Office of the Student Counseling Service located in Old Main, Room 223, for registration information. Foreign students on nonimmigrant visas must submit proof of adequate financial resources to support themselves while in residence at The University of Arizona. If sponsorship is through an organization or government agency, the Office of Admissions and New Student Enrollment, attention Foreign Credentials, should be notified directly by the sponsor of the terms of scholarship support, which must include instructions if The University of Arizona is to bill for tuition and fees. The address for billing must be through an embassy or other agent in the United States; otherwise, the students must pay their own fees at registration.

Having provided the first year's expenses and having earned superior grades during at least one year of study at the University, foreign students may be considered for one of the very few foreign student tuition waiver scholarships offered by The University of Arizona. The United States Immigration Department restricts employment for pay of anyone in this country on a student visa, and nonimmigrants should not expect to supplement their income through employment.

Foreign students on nonimmigrant visas are required by the University to purchase the supplemental health insurance plan or obtain a waiver from the Student Health Service. Information and costs of this coverage are sent to those foreign students who are accepted for admission to any academic program at The University of Arizona. The cost of the insurance is included in the amount of the financial guarantee. Insurance coverage is required for each term of enrollment. Students are exempted from the supplemental health insurance plan through the Student Health Service only by showing proof of health insurance coverage comparable with that available through the University. An exemption must be processed every semester and foreign students who do not obtain the exemption during the open enrollment period for the supplemental health insurance will be required to pay the premium for that semester. Although not required, coverage for dependents is very strongly recommended.

Inquiries concerning the acceptance of transfer credit from foreign institutions completed by U.S. and non-U.S. citizens should be directed to the Office of Admissions and New Student Enrollment, attention Foreign Credentials, which is responsible for the evaluation of foreign credit transfer.

Application Deadlines

April 1 for summer and fall, and September 15 for spring. To meet the deadlines, the application and all other required official credentials and
ADMISSION TO THE UNIVERSITY

ADMISSION OF IMMIGRANT AND REFUGEE-STATUS STUDENTS

Application inquiries about undergraduate admission should be directed to the Office of Admissions and New Student Enrollment, Robert L. Nugent Building.

Applicants whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL), which is given at test centers worldwide under the direction of the Educational Testing Service. A minimum, composite TOEFL score of 500 is required for admission to an academic program. For test registration information, write: Test of English as a Foreign Language, Box 6154, Princeton, New Jersey 08541-6154.

In Tucson, arrangements may be made to take the Institutional TOEFL at The University of Arizona by contacting the Center for English as a Second Language, Room 104, CESL Building. To take the International TOEFL, contact the Testing Office of the Student Counseling Service located in Old Main, Room 223.

ADMISSION OF DISABLED STUDENTS

The requirements for admission to The University of Arizona are the same for all students. The individual with a disability utilizes the same process as the nondisabled individual.

Prospective students who are disabled are encouraged to write or call the Center for Disability Related Resources, The University of Arizona, Tucson, AZ 85721, (602) 621-3268, in conjunction with the application process. A comprehensive program of academic support, rehabilitation health, and athletics/recreational services is available.

ADMISSION OF VETERANS AND CHILDREN OF DECEASED VETERANS

The University of Arizona is fully approved for the training of students under several government educational programs for veterans and eligible dependents of deceased or disabled veterans. Eligible students, as well as those who wish to determine their eligibility, should apply at The University of Arizona, Office of Veterans’ Services, Robert L. Nugent Building, Room 7, Tucson, AZ 85721 or call (602) 621-6454.

Veterans who are making an initial application for their G.I. Bill benefits must provide the original or a certified copy of military record (DD-214). Eligible dependents who are making an initial application under Chapter 35 must provide a copy of their birth certificate and, if possible, the parent’s V.A. claim number.

Students attending under the Veterans’ Administration Vocational Rehabilitation Program must contact their vocational rehabilitation specialists prior to registration. This contact can be made through the Office of Veterans’ Services.

Additional services offered by the Office of Veterans’ Services include application for all V.A. educational benefits, professional educational counseling, tutorial assistance, and referral assistance.

Exemption of Certain Veterans from Effects of Failing Grades

By Arizona statute, in determining the admissibility to the University of a veteran, honorably discharged, who has served in the armed forces of the United States for a minimum of two years and who was previously enrolled at a university or community college in Arizona who has not attained a passing grade in any course may be considered. This policy applies to the admission decision only. Failing grades awarded at The University of Arizona remain on the record, and the graduation average is based upon the grades received in all course work attempted in residence. The student admitted or re-admitted to the University under this statute is subject to progression, retention, graduation, and other academic regulations and standards in this catalog.

Credit for Military Service

A Guide to the Evaluation of Educational Experiences in the Armed Services, published by the American Council on Education, has been adopted by The University of Arizona as a basis for evaluating training in the armed forces.

Credit for military service experiences may be acquired through standardized examinations (see credit by examination policy). Cases which fall outside of the regular policies of the University will be reviewed by the Registrar. The evaluation of military credit is completed only after a student has been admitted to the University and all required documentation has been submitted (normally, the form DD-214).

For active service terminated under honorable conditions in the Army, Navy, Marine Corps, Air Force, or Coast Guard, credit is given as follows: for a period of at least six months and less than a year, the University allows 4 units of military science; for one year or more of active service, 8 units of military science; for the rank of warrant officer earned in the service, 6 upper-division units of military science, naval science, or aerospace studies; and for a commission earned in the service at the rank of second lieutenant or higher (in the Army, Air Force, or Marine Corps), 12 upper-division units in military science, naval science, or aerospace studies. Information concerning the evaluation of military training and experience may be obtained in the Office of Admissions and New Student Enrollment.

Programs of Study

All veterans must choose a program of study and may take only those courses that fulfill the degree requirements. Proper counseling and course planning is highly encouraged. Veterans and veterans’ dependents are not allowed to enroll in course repeats, course audits, or independent study courses without the approval of the Office of Veterans’ Services.

Attendance

Veterans and veterans’ dependents are paid to attend and complete course work. If at any time the Office of Veterans’ Services is notified that either is not occurring, benefits will be reduced accordingly.

Change in Status

Any time academic progress or other status of a veteran is changed, a notice will be sent to the Veterans Administration Regional Office, within 30 days following the date of occurrence, or last day of class attendance. It is the veteran’s responsibility to notify the Veterans’ Services Office of any changes occurring in status.

Veterans’ Deferment of Tuition Payments

Veterans’ tuition deferments are available to many veterans and eligible dependent students. All deferments must be approved by the Veterans’ Coordinator.

READMISSION TO THE UNIVERSITY

Applying for Readmission

1. Students absent from the University for a semester or longer are required to apply for readmission. Applicants for readmission must meet the application deadline specified for the term in which they wish to enroll.

2. Students who have not attempted course work at other postsecondary institutions since last attendance should contact the Office of Student Information, Registration and Records to apply for readmission. Students who have attempted course work at another postsecondary institution since last attendance should contact the Office of Admissions and New Student Enrollment to apply for readmission.

3. Students who have attempted any course work at one or more other postsecondary institutions since last attendance at the University must submit official transcripts of all course work completed at other institutions, up to the current semester, prior to review of the read-
A regular student follows a prescribed curriculum leading to a degree.

Students of The University of Arizona are classified as regular or nondegree. A nondegree seeking student is not a candidate for a degree.

**Readmission Requirements**

1. Students seeking readmission who were neither on academic probation nor under disqualification upon departure from the University are eligible to return upon application for readmission, if less than 12 college-level units have been attempted at other postsecondary institutions since last attendance at the University.

2. Students seeking readmission who were neither on academic probation nor under disqualification upon departure from the University and who have attempted 12 or more college-level units at other postsecondary institutions in the interim must submit an official transcript of all coursework completed at other institutions prior to review of the readmission application. A minimum cumulative grade-point average of 2.0 on a 4.0 scale is required for course work completed at other institutions since last attendance at the University. If the transfer coursework is not completed with a minimum cumulative grade-point average of 2.0 on a 4.0 scale, the student must obtain written permission to re-enroll from the dean of the college in which he or she plans to enroll. The Office of Admissions and New Student Enrollment will process the application for readmission according to the written recommendation of the dean.

3. Students seeking readmission who left the University on academic probation or under disqualification must receive approval from the dean of the college they wish to enter prior to readmission.

**THE TRAVELING SCHOLARS PROGRAM**

The Traveling Scholars Program is designed so students may take advantage of programs or special resources available at one of the three state universities which are not available at their own institution. Any undergraduate student with a 2.5000 grade-point average or any graduate student with a 3.0000 grade-point average enrolled at Arizona State University, Northern Arizona University, or The University of Arizona may be designated a Traveling Scholar by prior mutual agreement of the appropriate academic authorities at both the sponsoring and the hosting institution. Additional information and the application form may be obtained from the Office of Student Information, Registration and Records.

**Registration**

Any student who makes use of classroom or laboratory facilities or of faculty time is required to register formally. Graduate students who have previously registered for all of the credit required for their degrees may enroll for supplementary registration in order to meet this requirement.

**CLASSIFICATION OF STUDENTS**

Students of The University of Arizona are classified as regular or nondegree.

Regular

A regular student follows a prescribed curriculum leading to a degree. All student programs must be approved by the college dean or the dean's representative.

Nondegree

A nondegree seeking student is not a candidate for a degree.

**PROCEDURES**

**New Student Orientation**

Orientation for new students is held during the summer and again in the fall and spring. New students receive information about these programs after the students have been admitted to the University. Students are encouraged to attend a new student orientation program. Students will receive placement examination testing, academic advising, introduction to campus facilities and services, and course registration.

**Registration**

Students must register for each class in which they will participate. Courses are reserved utilizing touch-tone telephone during the fall and spring semesters for the following semester. Registration is not complete until all registration fees are paid.

**Registration Deadline**

Students must be registered by the 7th day and no late registrations will be accepted after the 21st calendar day following the first day of class. Registration is not complete until registration fees, and tuition if appropriate, are paid. Failure to pay by the 21st day will result in the student not being allowed to enroll, even if the student has been attending classes. Late registration after this date will not be accepted unless the student submits a written appeal to the Registrar and can document extenuating circumstances such as medical problems (physically incapacitated and not able to be present), legal problems, or some other academic commitment which precluded enrolling prior to the 21st day (study abroad, co-op, in absentia registration). See the calendar for the academic year in the front of this catalog.

**Penalty for Late Registration**

A student who fails to complete payment of all fees prior to the first day of classes for any semester or term will be assessed a nonrefundable late fee.

**Identification Cards**

As part of the registration process, each new student at The University of Arizona must obtain a photo identification card. This card establishes the student's identity as a University of Arizona student and authorizes access to certain university facilities. The fee for an I.D. card is $5. The replacement charge for a lost or stolen I.D. card is $10.

**Statement of Financial Ineligibility**

Students with past-due debts to The University of Arizona are considered financially ineligible to register until outstanding debts are paid in full.

**Special Testing**

Students may be required to take special tests as recommended by their college dean or the Dean of Students.

**REGISTRATION ADJUSTMENTS**

**Change of Schedule**

Changes in a registration by adding or dropping courses must be initiated by the student. Complete directions are contained in the appropriate Schedule of Classes each semester.

After the last day of registration for credit, as stated in the Academic Calendar, a student may not add a course without special permission from the instructor of the course and the student's college dean.
Course withdrawals filed by the end of the fourth week of classes result in cancellation of registration in the course. Course withdrawals filed from the end of the fourth week of classes until the end of the tenth week of classes are subject to rules set forth in the section "Withdrawal Grade" under Academic Guidelines in this catalog.

The last day on which a student may drop a course is the last day of the tenth week of classes during which classes are held, except for an extraordinary reason approved by the student's college dean (in the case of undergraduate students) or by the Dean of Students (in the case of students withdrawing completely from the University). For students in the colleges of Law and Medicine, withdrawals are governed by regulations established by the respective college faculty.

Each semester students are mailed written confirmation from the Office of Student Information, Registration and Records of the courses in which they are enrolled. If this official registration record does not agree with the student's own records, it is the responsibility of the student to go to the Office of Student Information, Registration and Records and correct his or her registration. An instructor has no alternative but to assign a failing grade ("F") to a student who has not participated in the course but whose name appears on the final grade report list.

Transfer to Less Advanced Course

Students unable to meet satisfactorily the requirements of courses in which they are registered may be transferred to less advanced courses in the same department if the head of the department and the instructor of the less advanced course approve. In all such cases, the transfer shall be made within five weeks after the beginning of classes using the change-of-schedule form. In certain departments this privilege extends only through the 14th day of classes.

Change of Registration from Credit to Audit

After the fourth week of classes, a change in registration in a course from credit to audit will be permitted only if the student is doing passing work in that course and receives the approval of the course instructor and the student's college dean. No change from credit to audit will be permitted after the end of the tenth week of classes except with special permission from the student's college dean.

Change of College

Students wishing to change colleges must consult the dean's office of the college to which they wish to transfer. Change from one college to another is established by filing a change of college form with the new college. The change of college will be effective for the current term if filed within the first four weeks of classes during a regular semester. If filed after that date, the change of college will be effective the following semester.

Change of Major

A student may change his or her major by contacting his or her college dean and completing the appropriate forms.

Petitions

Undergraduate students may petition the University Petitions Committee for relief if they believe they deserve redress or exception to university rules, regulations, or policies regarding academic affairs, such as extension of incomplete grade, choice of catalog and degree requirements. Petition forms may be obtained in the Office of Student Information, Registration and Records or from the college dean. The completed form with all relevant facts and supporting evidence is submitted to the college dean for recommendation and forwarding to the Office of Student Information, Registration and Records, after which it is forwarded to the University Petitions Committee for action. The decision of the University Petitions Committee is final.

Students may also petition for redress or exception to college policies or requirements. Petitions may address a change of program, approval for a overload, substitution of course work, transfer credit, modification in degree program, or in certain instances, eligibility for registration or enrollment in the college. The necessary forms, instruc-

Limitation of Registration

Whenever lack of facilities in courses makes it necessary to limit the number of students admitted, preference will be given to students for whom these courses are required. Among these, priority is given to graduating seniors and to students having superior records in prerequisite courses, respectively.

Cancellation of Courses

The University reserves the right to cancel any course not elected by an adequate number of students.

STUDENT RETENTION

An average of 78 percent of entering freshmen return to register the first semester of the following year. After five years, approximately 55 percent of the entering class has either graduated or are still enrolled.

RELEASE OF INFORMATION

The University complies with all provisions of the Family Educational Rights and Privacy Act of 1974 dealing with the release of education records. A copy of the full text of this law is on file in the Office of Student Information, Registration and Records, the Office of the Dean of Students, and the Special Collections division of the University Library, along with the University of Arizona's policy for implementation of the act.

Academic Guidelines

SCHOLARSHIP REQUIREMENTS

Minimum Grade-Point Average Required

One of the requirements for students to be eligible to continue in the institution is that they earn minimum cumulative averages as follows:

<table>
<thead>
<tr>
<th>Total units completed in residence and accepted in transfer credit at University of Arizona</th>
<th>Minimum grade-point average based upon university credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer than 14 units</td>
<td>1.750</td>
</tr>
<tr>
<td>From 14 through 26 units</td>
<td>1.840</td>
</tr>
<tr>
<td>27 or more units</td>
<td>2.000</td>
</tr>
<tr>
<td>Graduate students (any student registered in the Graduate College), work carried for graduate credit only</td>
<td>3.000</td>
</tr>
</tbody>
</table>

For scholarship requirements in the College of Law, see the Colleges section of this catalog.

Good Standing

Good standing status denotes that a student is eligible to continue in or to return to the University.

University Credit

University credit is the term used to identify all credit offered by The University of Arizona with the exception of correspondence credit and Special Examination for Credit. Only the grades of courses taken for university credit and by Special Examination for Grade are used in calculating the grade-point average.
Definition of Unit of Credit

Utilizing the definition that an hour of work is the equivalent of 50 minutes of class time (often called a contact hour) or 60 minutes of independent-study work, university policy requires at least 45 hours of work by each student for each unit of credit. Contact hours required for specific types of courses are as follows:

1. At least 15 contact hours of recitation, lecture, discussion, seminar, or colloquium, as well as a minimum of 30 hours of student homework are required for each unit of credit.
2. Workshops require at least 15 through 45 contact hours and the appropriate number of homework hours to comprise a total of at least 45 hours of work for each unit of credit.
3. Studios require at least 30 contact hours and at least 15 hours of homework for each unit of credit.
4. Laboratory courses must maintain a minimum of 45 contact hours per unit of credit.
5. Field trips are to be counted hour-for-hour as laboratory meetings.
6. Each unit of internship or practicum must require a minimum of 45 hours of work.

Since it would be virtually impossible for a student to satisfactorily complete 45 hours of work in less than one week, the policy regarding the duration of courses maintains that a course must cover at least a one-week period for every unit of credit given. During the summer session, however, 6 units of credit might be given over a five-week period.

It is understood that, when the official university calendar deviates from these guidelines, that calendar shall prevail.

It is also understood that the hour requirements specified above represent minimums for average students and that considerable deviation in excess of these requirements may occur, particularly at the graduate level.

ACADEMIC PROGRESS, PROBATION AND DISQUALIFICATION

Academic Progress

Undergraduate students will be considered to be making normal progress toward a degree if their cumulative grade-point average for all work attempted at The University of Arizona is not less than 2.000.

Academic Warning Status

Freshman students who have completed fewer than 14 units at the University with a University of Arizona cumulative grade-point average between 1.750 and 2.000, or who have completed from 14 through 25 units at the University with a University of Arizona cumulative grade-point average of between 1.840 and 2.000 will be on academic warning status. Academic warning status invokes no academic penalties and will not be indicated on the student's permanent record, but will be indicated on the student's grade report. This status serves as a warning to students beginning their college careers that their performance is below the level required for successful completion of an academic program. Students in this status are strongly urged to seek academic counseling.

Probation

Students not meeting the standards of normal progress or academic warning status will be on probation. Students on probation are subject to such restrictions with respect to courses and extracurricular activities as may be imposed by the academic dean of the college in which the student is enrolled. Students are removed from probation upon earning the minimum cumulative grade-point average required by the table listed under "Minimum Grade-Point Average Required" above.

Disqualification

Disqualification is of two types: from a particular college in the University, or from the University. A student may be academically disqualified only after two consecutive regular semesters of not meeting the standards of normal progress (cumulative grade-point average of 2.0) or academic warning status; or under conditions described below under "Probation or Disqualification by Special Action."

The student recommended for disqualification from a particular college may seek immediate admission to another college in the University. Permission for admission to another college must be obtained in writing from the dean of college into which the student plans to transfer. The letter of permission should be presented to the Office of Student Information, Registration and Records. Ordinarily permission will be granted only if the student plans to pursue a modified program in a curriculum of the new college and has demonstrated ability warranting such action. Those who have been given college disqualification are strongly urged to seek thorough academic and vocational counseling and guidance. Failure to secure approval to transfer to another college in the University is tantamount to university disqualification and the rules governing this type of disqualification then will apply. A disqualified student may not attend the University as a nondegree student.

A student disqualified from a particular college who may have secured subsequent permission to register in another college is automatically on scholastic probation in the new college. A student may be granted college disqualification only once in his or her academic career. Any later disqualification will be considered a university disqualification.

University Disqualification

A student who receives university disqualification is restricted from registering at The University of Arizona and may return to the University only on the basis of evidence that underlying conditions have materially improved and that he or she is now capable of academic success. Students seeking readmission who left the University on academic probation or under disqualification must receive approval from the dean of the college they wish to enter prior to readmission.

Probation or Disqualification by Special Action

Upon recommendation of the dean of the college and the approval of the Deans' Council, a student may be placed on scholastic probation or may be disqualified at any time for neglect of academic work.

Credit Restrictions for Students under University Disqualification

Students who are under disqualification from the University may not take University of Arizona courses for credit or establish credit by examination during their periods of disqualification, although they may remove incomplete grades. With the permission of the college dean concerned, students who have been disqualified from the University may register for correspondence enrollment.

ENROLLMENT POLICIES

Maximum Units Allowed Per Semester

Approval of the college dean is required for any student to exceed the maximum number of units allowed per semester as indicated below. The semester load includes all work carried in residence as well as concurrent registration in correspondence, extension, high school courses or approved courses at other institutions.

<table>
<thead>
<tr>
<th>College or School</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
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<td>Health-Related Professions</td>
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<td>Nursing</td>
<td>19</td>
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<tr>
<td>Pharmacy</td>
<td>19</td>
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</tbody>
</table>

Class Standing

Class standing in the various colleges and schools, based upon the number of units completed, is given in the table below. A student's class
Incomplete Grade

The grade of I may be awarded only at the end of a semester, when all but a minor portion of the course work has been satisfactorily completed. The grade of I is not to be awarded when the student is expected to repeat the course; in such a case, the grade of E must be assigned. Incomplete grades do not enter into the calculation of the grade-point average for one year from the date of award. If the incomplete is not removed by the instructor within one year, the I grade will revert to a failing grade. For undergraduate courses, the one-year limit may be extended for cause approved by the instructor with the concurrence of the dean of the college in which the student is registered. For courses taken for graduate credit, such approval may be granted only by the Graduate Council.

Course in Progress

The grade of K may be awarded by the instructor for 900-level courses when the course continues for longer than one semester. Time-limit for completion of such work for full credit for the master's degree is six years; for the doctoral degree, ten years. K grades remain on the student's permanent record until removed with a final grade but do not enter into the calculation of the grade-point average.

The grade of K is awarded by the Office of Student Information, Registration and Records, at the end of the semester, for courses which require more than one semester for completion. It is also awarded by the Office of Student Information, Registration and Records for all supplementary registrations (930). Following the completion of the final semester or supplementary registration, the grade of CR will be awarded for the terminal semester only.

Withdrawal Grade

Students may withdraw from classes in accord with the following policies. Prior to the end of the fourth week of classes, official withdrawal (drop) of a course cancels the registration for the course; dean's approval is not required. Weeks five through ten, the grade of W is awarded to students who are passing at the time of withdrawal; the grade of E is awarded to students not passing at the time of withdrawal. Also during weeks five through ten, a dean's approval is required and the withdrawal grade shows on the student's permanent record. After the tenth week of classes, the grade of W can be awarded only with the approval of the student's academic dean, and only under exceptional circumstances. For other regulations concerning withdrawal, see the section on "Change of Schedule." The W may also be awarded in the case of complete withdrawal from the University. See "Withdrawal" under Leaving the University.

Special Grades

Grades for university-wide “house-numbered” courses, including individual studies, vary from the regular university grading system. For explanation of these grades, see the Departments and Courses of Instruction section elsewhere in this catalog.

For the grading systems available in honors individual studies courses (199H, 299H, 399H, 498H, and 499H), see the “Honors Center” in the Departments and Courses of Instruction section of this catalog.

Audit Grade

The grade of O is awarded for courses taken for audit. This grade is not awarded unless the student is registered for audit.

Averaging of Grades

For the purpose of computing grade-point averages, grade points are assigned to each grade as follows: A, 4 points for each semester unit; B, 3 points; C, 2 points; D, 1 point; and E, 0 points. To calculate the grade-point average, the unit value for each course in which a student receives one of the above grades is multiplied by the number of grade points for that grade. The sum of these products is then divided by the sum of the units of A, B, C, D, and E. The grade-point average is based only on work attempted in residence at The University of Arizona and
upon the results of Special Examinations for Grade. (See provision for "Graduation Average" in the Graduation Requirements section.)

Change of Grade

Final grades may be changed by the instructor on a change-of-grade form only if there has been an error in computation. The grade change must be approved by the head of the instructor's department and the Registrar, or by the Deans' Council if the Registrar deems it necessary. Requests for changes of grade for reasons other than errors in computation must be submitted by the student on a general petition.

Academic Renewal

Under certain circumstances an undergraduate student may petition the Registrar for academic renewal. Academic renewal allows students to have grades for a particular period of time excluded from the grade-point average. If the qualifications are met, the student may have a maximum of four consecutive semesters of course work disregarded in all calculations regarding academic standing, grade-point average, and eligibility for graduation. If summer work is to be included in the work to be disregarded, a five-week summer term shall count as one-half semester.

Eligibility for academic renewal shall be subject to the following conditions:

1. At the time the petition is filed, a minimum of five years shall have elapsed since the most recent course work to be disregarded was completed.
2. In the interval between the completion of the most recent course work to be disregarded and the filing of the petition, the student shall have completed a minimum of 30 units of regularly graded course work at the University with a minimum grade-point average of 2.500 on all work completed at the University in that interval.

The petition shall specify the semester(s) or term(s) to be disregarded. If more than one semester or term is to be disregarded, these shall be consecutive, completed within a maximum of two calendar years, with no intervening enrollments at the University. The maximum of two consecutive years may be extended by one semester if the time period includes a semester of involuntary absence by reason of disqualification.

If the petition qualifies under this policy, the student's permanent academic record shall be suitably annotated to indicate that no work taken during the disregarded semester(s) or term(s), even if satisfactory, may apply toward graduation requirements. However, all work will remain on the record, ensuring a true and accurate academic history.

Academic renewal may be effected only once during a student's undergraduate academic career and is not available to students who have completed requirements for a bachelor's degree.

Appeal of Grade

A student who feels that a grade has been unfairly awarded may appeal. A student's protest of a grade must be lodged with the course instructor not later than the end of the fifth week of classes of the first regular semester after the semester or summer terms in which the grade was awarded. Only in exceptional cases shall a grade review be processed during a summer session. The dean of the college in which the course was offered shall determine if the case is exceptional and warrants immediate review. The dean shall also have the authority to extend the time limits of the appeal process, but in no case shall the appeal process extend beyond the end of the first regular semester following the awarding of the grade without the consent of all parties involved. The dean's decision on whether or not the time constraints have been satisfied shall be final.

The aggrieved student should first confer with the instructor, stating the evidence and reasons for questioning the grade. If the instructor is a graduate assistant and this interview does not resolve the difficulty, the student should immediately take the problem to the person in charge of the course. If the instructor or the person in charge of the course is unavailable when the student initially attempts to make contact, the student should request the department head, or his or her representative, to verify the date of initial contact. Within two weeks from the initial contact, the instructor and/or the person in charge of the course, should review the matter with the student explaining the grade procedure, and show how the grade in question was determined.

If the instructor is not available during the two weeks following the date of initial contact or does not resolve the matter to the student's satisfaction, within the two-week period, the student should within one week thereafter appeal in writing to the head of the department through which the course was offered. After considering the information obtained from the student and the instructor of the course, and within two weeks of receipt of the student's appeal, the department head shall inform the instructor and the student whether or not he or she recommends a change in grade. If a change in grade is recommended, the instructor may refuse to accept the recommendation. The department head shall not have the authority to change the grade.

If the student wishes to pursue the matter further or if the department head does not act within the two-week period, the student should within one week thereafter appeal in writing to the dean of the college concerned. The dean shall convene a committee to review the case. The committee shall consist of five members, two selected from the faculty of the department of the instructor concerned, one from the faculty of another department, and two students provided by the student council of the college concerned. If the college does not have a student council, the dean shall appoint the student members, selecting full-time, upper-division undergraduates or graduate students in good academic standing.

Within the structure provided by the dean, the committee shall design its own rules of operation. The student and instructor shall represent themselves. The committee may, or may not, (a) meet separately with the student, the instructor, and the department head, (b) request each party to submit a brief written summary statement of the issue, and/or (c) interview other persons who have relevant information. The committee shall consider all aspects of the case pertaining to the grade determination in rendering its recommendation. If feasible, the committee should meet with the student and the instructor together in an attempt to resolve the differences. At the conclusion of its work, the committee shall make a written report containing its recommendations and provide copies to the student concerned, the instructor, the department head, and the dean.

The appointment, meeting, and recommendation of the committee and the final action of the dean shall be made within four weeks of the dean's receipt of the student's written appeal. Final action on the case shall be taken by the dean only after full consideration of the committee's recommendation. The dean shall have the authority to change the grade and the registrar shall accept the dean's judgment.

Formal appeal begins when the student, in writing, defers his or her case to the head of the department. If desired, the student may request written verification of receipt of his or her letters of appeal.

TIME TABLE FOR GRADE APPEALS

| Weeks 1-5: | Period during which student may initiate the grade review process. |
| Weeks 6-7: | Period for instructor to consider the student's grade request. |
| Week 8: | Period during which student may appeal to department head. |
| Weeks 9-10: | Period for department head to make his or her recommendation. |
| Week 11: | Period for student to submit an appeal to the dean. |
| Weeks 12-15: | Period for appointment, meeting, and recommendation of the appeals committee. Period for dean to make his or her decision. |

The above table indicates the maximum time periods for a normal grade review. In many cases, less time will be required. In exceptional cases, more time may be required.

Repeating a Course

Students wishing to repeat course work at The University of Arizona may elect one of the following options:

1. Establishment of Credit: Undergraduate students may repeat any course for which they have received an E or W. They may repeat this course as many times as necessary to establish credit, but may only be eligible for grade replacement once. 
2. First and Second Attempt Averaging: Undergraduate students may repeat only once any course in which they have received original grades of C or D. Grade-point average will be computed by averag-
3. **Grade Replacement:** Undergraduate students may repeat once any course in which they have earned grade-point averages of 2.000 or better. They must fail the course only after they have attained sophomore standing and only if they are enrolled under the pass-fail option. Under such registration, the only grades other than P or F during each semester in which course work will be repeated. Grade replacement forms for repeat attempts during other terms (presession, winter session, etc.) must be completed prior to the start of the term.

**Pass-Fail Option**

For certain courses, a qualified student may elect to register under the pass-fail option. Under such registration, the only grades available to the student are P (pass) or F (fail).

Undergraduate students may elect to take courses under the pass-fail option only after they have attained sophomore standing and only if they have earned grade-point averages of 2.000 or better. They must also have the approval of their advisers to register for a course under the pass-fail option.

Students registering for a course under the pass-fail option must meet the prerequisites or otherwise satisfy the instructor of their ability to take the course.

Undergraduate students may register under the pass-fail option for not more than two courses per semester up to a maximum of 12 courses. Further, they must carry a minimum of 12 units of regular grades other than P/F during each semester in which they elect courses under the pass-fail option. Any exceptions to this policy must be approved by the student's academic dean.

Courses taken under the pass-fail option must be electives only, and may not be used to fulfill major, minor, or other specified curriculum requirements.

The pass-fail option is not generally available to graduate students. The only exceptions to this proscription are: (a) admission deficiencies which the student has prior specific, written approval to take on a P/F basis (only the department head or the departmental graduate adviser may give such approval), which must be on file in the Graduate College office before registration; (b) any undergraduate nondeficiency course available for P/F grading; and (c) any course offered by the College of Law.

Each department decides which of its courses will be available under the pass-fail option. Pass-fail courses in the 500, 600, or 700 series may be offered only in law and to candidates for the M.D. degree. Further, the instructor of the course must approve of its being offered pass-fail. The instructor shall be informed by the Registrar which students are enrolled under the pass-fail option.

Students may change from pass-fail enrollment to enrollment for a regular grade, or vice versa, only during the time period prior to the last day of the fourth calendar week during which classes are held, except with special permission of the student's college dean.

If a course is taken under the pass-fail option, the grade of P or F will be permanently recorded. However, neither grade will be included in the average. If the course is passed, the units of credit will be applied toward graduation.

Notes: Pass/fail grades are the only grades available for TTE. 490a and 493b. Enrollment in these courses will not reduce the amount of work for which a student can otherwise enroll under the pass-fail option as described above.

All courses in the College of Medicine are graded on a pass-fail system for medical students.

**GENERAL EDUCATION REQUIREMENTS**

The general education program provides breadth of knowledge as a balance and complement to the depth provided by the major. The general education program is designed to accomplish several goals: First, to afford students the opportunity to learn how different disciplines define, acquire and organize knowledge; second, to enhance understanding of the reciprocal influences of Western and non-Western cultures; third, to provide a basis for an examination of values, and to develop analytic, synthetic, linguistic and computational skills useful for lifelong learning; and finally, to provide a common foundation for wide-ranging dialogue with peers, and to encourage personal qualities, such as critical and inquiring attitude, an appreciation of complexity and ambiguity, a tolerance for and empathy with persons of different backgrounds or values, and a deepened sense of one's own self. In short, the goal of the general education program is to prepare students to respond more fully and effectively to an increasingly complex world.

An overview of the general education requirements for each college is provided in the following table. This table is not intended to be exhaustive, but only to serve as a guide. Students should realize that the requirements vary across colleges and departments. For specific details on general education requirements they pertain to specific courses, see the college section of this catalog. Also, students are advised to check with college and department offices for current lists of courses that meet general education requirements.

**GENERAL EDUCATION REQUIREMENTS OF THE COLLEGES**

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<th>Category</th>
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<th>AG</th>
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<th>E&amp;M</th>
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1. See "Freshman Composition" under "University Requirements in Composition" for details on examinations and placement.
2. Language includes foreign language, communication and the language of specific professional fields.
3. Students must demonstrate proficiency at the fourth-semester level. This can be accomplished through courses (16 units) or by examination (0 units).
4. Students are required to take two courses (6 units) in at least two study areas.
UNIVERSITY REQUIREMENTS IN COMPOSITION

The University of Arizona has long regarded sound training in writing as indispensable to the academic development of an educated person; clear, intelligent writing is a skill required of all university graduates. Freshman Composition, the Upper-Division Writing-Proficiency Examination, and a writing-emphasis course are required of all students.

I. Freshman Composition

All students working toward degrees must meet the freshman composition requirement by completing one of the following sequences: Engl 100-101-102, Engl 103H-104H, Engl 106-107-108, Engl 107-108, Engl 109H. There is no exemption from the freshman composition requirement; any substitutes must be approved by the Director of Composition, Department of English. The freshman composition requirement may not be satisfied by correspondence work.

Placement in freshman composition takes into account the student's performance on two examinations: (1) A written placement essay administered at the time a student first registers for a course in freshman composition, (2) the English section of the American College Test or the Test of Standard Written English score on the Scholastic Aptitude Test. Both of these examinations require fees. Students with superior ratings based on the above examinations enroll initially in Engl 103H; students whose scores indicate inadequate preparation initially enroll in Engl 100 and pass this course before they enroll in Engl 101. International students write a placement essay and submit a score on the Test of English as a Foreign Language. Students whose scores indicate inadequate preparation initially enroll in Engl 106 and pass this course before they enroll in Engl 107. Students who earn a score of 4 or 5 on the Advanced Placement Exam administered by the College Board have the option of enrolling in Engl 109H and satisfying the requirement in one semester.

II. The Upper-Division Writing-Proficiency Examination

Every student must take the Upper-Division Writing-Proficiency Examination, which is a prerequisite to enrolling in a writing-emphasis course (see below). Students may take the exam after they have satisfied the freshman composition requirement and accumulated at least 40 but less than 75 credit hours toward their degree. Students who have accumulated more than 75 credit hours should take the Upper-Division Writing-Proficiency Examination as soon as possible. Students register for the exam with the University Composition Board. Students must have taken the Upper-Division Writing-Proficiency Examination before the application for Bachelor's Degree Candidacy will be accepted for review.

The examination may be taken only once. Results are reported to students and to their major departments. Students who earn an evaluation of unsatisfactory on the exam usually are required by their department to complete further work in composition before registering for writing-emphasis courses. They should consult with their academic advisors for specific information about their department's requirements.

III. Writing-Emphasis Classes

Every undergraduate degree program includes at least one required writing-emphasis course. Writing-emphasis courses are regular junior or senior level courses in an academic discipline in which at least half the grade awarded is determined by written work appropriate to the academic discipline. Such courses are identified with the phrase "writing-emphasis course" at the end of the course description listed in the Departments and Courses of Instruction section of this catalog. Prerequisite to a writing-emphasis course is satisfactory performance on the Upper-Division Writing-Proficiency Examination or, in the case of students whose papers are evaluated as unsatisfactory on the examination, further developmental work in writing, as prescribed by an academic advisor.

EXAMINATIONS

Mid-Semester Examinations

It is expected that all mid-semester examinations will occur during a regularly scheduled class period of the course. For those multiple-section courses in which it is impossible to offer mid-semester exam-
## AP Exams & Grades | UA Courses | Credit
--- | --- | ---
**AMERICAN HISTORY**  
4 or 5 | Hist. 106 & 107 | 6 Units
1, 2 or 3 | None | None

**ART (STUDIO)**  
3, 4 or 5 | Art-lower division credit | 6 Units
1 or 2 | None | None

**ART HISTORY**  
3, 4 or 5 | Art.H. 118 | 3 Units
1, 2 | None | None

**BIOLOGY**  
4 or 5 | Ecol.-lower division credit | 8 Units
3 | Ecol. - lower division credit | 4 Units
2 | Placement by department | None
1 | None | None

**CHEMISTRY**  
4 or 5 | Chem. 103a-103b, 104a-104b | 8 Units
3 | Chem. 103a & 104a | 4 Units
1 or 2 | None | None

**COMPUTER SCIENCES**  
3, 4 or 5 | C.Sc. 115 | 3 Units
1 or 2 | None | None

**ENGLISH LITERATURE/COMPOSITION**  
4 or 5 | Engl. Comp. lower division credit, 3 units; and 3 units, Engl. 267 | 6 Units
1, 2 or 3 | None | None

**ENGLISH LANGUAGE/COMPOSITION**  
4 or 5 | Engl. Comp. lower division credit | 6 Units
1, 2 or 3 | None | None

*1 Combination of AP composition credit and credit for English 109H with a grade of C or better satisfies the University freshman-composition requirement. Credit can be earned in either English Literature/Composition or English Language/Composition but not both.*

**EUROPEAN HISTORY**  
4 or 5 | Hist. 101 & 102 | 6 Units
1, 2, 3 | None | None

**FRENCH LANGUAGE**  
5 | Fre. 201, 202, 305a-305b | 14 Units
4 | Fre. 201, 202, 305a | 11 Units
3 | Fre. 201, 202 | 8 Units
2 | Proficiency met at 16-unit level | None
1 | None | None

**FRENCH LITERATURE**  
5 | Fre. 201, 202, 401, 402 | 14 Units
4 | Fre. 201, 202, 401 | 11 Units
3 | Fre. 201, 202 | 8 Units
2 | Proficiency met at 16-unit level | None
1 | None | None

**GERMAN**  
5 | Ger. 101, 102, 201, 202, 315a-315b | 22 Units
3 or 4 | Ger. 101, 102, 201, 202 | 16 Units
2 | Ger. 101, 102 | 8 Units
1 | None | None

**LATIN: VERGIL**  
4 or 5 | L. 202 | 4 Units
3 | Advanced Placement: Automatic satisfaction of the foreign language requirement | None
1 or 2 | None | None

**LATIN: CATO/HORACE**  
4 or 5 | L. 202 | 4 Units
3 | Advanced Placement: Automatic satisfaction of the foreign language requirement | None
1 or 2 | None | None

**MATHMATICS AB**  
3, 4 or 5 | Math. 125a or 123 | 3 Units
1 or 2 | None | None

**MATHMATICS BC**  
3, 4 or 5 | Math. 125a-125b | 6 Units
2 | Math. 125a | 3 Units
1 | None | None

**MUSIC LITERATURE**  
5 | Mus. 130a-130b | 4 Units
4 | Mus. 130a | 3 Units
3 | Mus. 107 | 3 Units
1 or 2 | None | None

**MUSIC THEORY**  
5 | Mus. 120a-120b | 6 Units
3 or 4 | Mus. 120a | 3 Units
2 | Mus. 100 | 3 Units
1 | None | None

**POLITICAL SCIENCE**  
A maximum of 9 units can be earned by AP exams.

**AMERICAN GOVERNMENT AND POLITICS**  
3, 4 or 5 | Pol. 102 | 3 Units
1 or 2 | None | None

**COMPARATIVE GOVERNMENT AND POLITICS**  
3, 4 or 5 | Pol. 140 | 3 Units
1 or 2 | None | None

**PHYSICS B**  
3, 4 or 5 | Phys. 102a-102b | 6 Units
1 or 2 | None | None

**PHYSICS C - Electricity and Magnetism**  
4 or 5 | Phys. 116 | 4 Units
1, 2 or 3 | None | None

**PHYSICS C - Mechanics**  
4 or 5 | Phys. 110 | 4 Units
1, 2 or 3 | None | None

**SPANISH LANGUAGE**  
5 | Span. 201, 202, 301a-301b | 14 Units
4 | Span. 201, 202, 301a | 11 Units
3 | Span. 201, 202 | 8 Units
2 | Proficiency met at 16-unit level | None
1 | None | None

**SPANISH LITERATURE**  
5 | Span. 201, 202, 302, 3 upper division credit | 14 Units
4 | Span. 201, 202, 320 | 11 Units
3 | Span. 201, 202 | 8 Units
2 | Proficiency met at 16-unit level | None
1 | None | None

*1 If a student earns a grade of 5 in both the Spanish Language exam and the Spanish Literature exam, he/she will be given credit for Span. 201 and 202, 301 a-301b and 320, plus 3 units of upper division literature credit for a total of 20 units. If a student earns a grade of 4 in both the Spanish Language exam and the Spanish Literature exam, he/she will be given credit for Span. 201, 202, 301a, and 320 for a total of 14 units.*

### II. College-Level Examination Program (CLEP)

The examinations offered under the CLEP were designed primarily to allow people who may not have been formal students for many years to achieve college-level credit for knowledge acquired through self-
education and experience. By successful performance on CLEP examinations, many have been encouraged to pursue further a college or university education.

Additionally, these examinations are seen increasingly as of value to students formally engaged in degree programs, as a means of satisfying certain course or area requirements, or for earning extra course credits, without having to enroll formally in the courses. General and subject exams must be taken by UA students prior to the completion of the 55 units. Transfer students must take general and subject examinations before finishing 55 units or before completing two regular semesters at the University. Students should consult their academic advisors or the offices of their college deans for more information.

All CLEP examinations are available through the Counseling and Testing Service (CTS) in Tucson. A limited list of CLEP examinations is also available through the testing centers in Tempe and Flagstaff. Resident students at the University of Arizona should contact the CTS at the Student Resources Center for additional information.

The University of Arizona accepts for college credit both the General and Subject examinations of the CLEP, providing satisfactory scores are attained. Scores of 500 or better on the General examinations will entitle the student, upon registration at the University, to 6 units of credit in each of the following General examinations: (1) English Composition; (2) Mathematics; (3) Natural Sciences; (4) Social Sciences-History; and to four units of credit for Humanities.

From 3 to 16 units of credit, depending upon the examination, may be earned by scores of 50 or better on Subject examinations (41 for College French Levels I and II and College Spanish Levels I and II). The number of units of credit earned is listed in parentheses following the corresponding test indicated below.

American Government (3)
American History I (Early Colonization to 1877) (3)
American History II (1865 to Present) (3)
American Literature (6)
Analysis of Interpretation of Literature (6)
Calculus w/Elementary Functions (5)
College Algebra (3)
College Algebra-Trigonometry (5)
College Composition (6)
Computers & Data Processing (3)
Educational Psychology (3)
English Literature (6)
Foreign Language
College French I (8)
College French II (8 or 16)
College Spanish I (8)
College Spanish II (8)
Freshman English (6)
General Biology (8)
General Chemistry (6)
General Psychology (3)
Human Growth & Dev. (3)
Introductory Business Law (3)
Introductory Macroeconomics (3)
Introductory Microeconomics (3)
Introductory Micro- and Macro-economics (3)
Introductory Marketing (3)
Introductory Sociology (3)
Trigonometry (2)
Western Civilization I (Ancient Near East to 1648) (3)
Western Civilization II (1648 to Present) (3)

Other examinations will be added as they become available.

Note: A maximum of 6 semester hours of general elective credit will be allowed for completion of one or more of the following: Subject Examination in College Composition, Subject Examination in freshman English, General Examination in English Composition. Whether this credit will satisfy the University freshman English requirement is determined by the Director of Composition following interview and written performance.

CLEP credit in English, in composition or literature, may not be applied toward either an English major or minor.

For both prospective and currently enrolled students utilizing CLEP examinations, credit will not be awarded in subjects at the same level. In addition, resident students will not be awarded credit through CLEP for courses equivalent to, or at a lower level than, other courses they have already established in formal course work.

Passing scores for subjects credited through the CLEP are recorded simply as CR (credit), and may not necessarily be stated in terms of a specific course equivalent. No record is made of failing scores.

III. Exemption or Proficiency Examinations

A number of colleges and departments regularly offer exemption or proficiency examinations covering introductory or basic areas of their disciplines. These examinations are designed and graded by the individual departments. No credit is awarded on the basis of successful performance on these, but they allow a student two privileges: (a) the opportunity of enrolling in advanced-level courses in the area of proficiency; or (b) the opportunity of satisfying various college or departmental "area" or proficiency requirements without taking prescribed courses.

Proficiency or exemption examinations for many courses are available to any student currently enrolled in a degree program at the university. Capable students wishing to increase their elective freedom are encouraged by university policy to examine the opportunities provided through the various proficiency examinations.

At the discretion of the department, the proficiency examination may include laboratory projects or other evidence of satisfactory skills in addition to or instead of the written examination. A fee is normally charged for these examinations.

FOREIGN LANGUAGE PROFICIENCY EXAMINATIONS — It is possible for students to meet the language requirements in whole or in part by passing a noncredit proficiency examination at the two- or four-semester level.

Foreign students will be allowed credit by transfer in languages not normally taught in the United States college years.

The completion of the course levels set in this paragraph satisfies the requirement: N.E.S. 404b (Arabic); Chn. 402 (Modern Chinese); Fren. 202, 302b; Ger. 202; Gk. 202; Ju.S. 403b (Hebrew); Ita. 202, 302b; Jpn. 202 (Japanese); Lat. 202; N.E.S. 405b (Persian); Port. 206, 301b; Russ. 201a or 201b; Span. 202, 206, or 373.

The proficiency examination at the required level in a foreign language fulfills the language requirement in colleges requiring a foreign language. Passing a course for which the required level is prerequisite also establishes proficiency in that language. Credit may not be earned merely by passing the proficiency examination.

PROCEDURES AND GENERAL REGULATIONS FOR EXEMPTION OR PROFICIENCY EXAMINATIONS

1. Proficiency or exemption examinations are available only to students enrolled in degree programs.
2. In no case does passing an exemption or proficiency examination lower the total number of units required for the bachelor's degree.
3. In normal circumstances, a student may not take a proficiency examination for the same course more than twice.
4. Proficiency or exemption examinations are normally given early in the semester or during summer orientation. The student must contact the appropriate department concerned for additional information and instructions.
5. Students wishing to sit for a proficiency or exemption examination in a language not normally taught must contact the Office of the Dean of Arts and Sciences for information.
6. The exemption or proficiency examinations are administered only on the University of Arizona campus.
7. The results of exemption or proficiency examinations, if successful, are reported in writing directly to the Office of Student Information, Registration and Records, with a copy to the student.
8. The remarks portion of the student's academic record will be annotated with a statement indicating the student passed the proficiency examination at the appropriate level.

IV. Special Examination for Credit or Grade

Any student currently enrolled or previously withdrawn in good standing at the University of Arizona may earn credit toward an undergraduate degree through the use of special examinations. The responsibility for preparing for these examinations rests entirely with the student; faculty members are under no obligation to assist with such preparation.
Undergraduate courses currently offered by the University and designated in the catalog "CDT" may be taken for credit by examination. Courses designated "GRD" may be taken for grade by examination or credit by examination. Other courses generally have been excluded from this option; at department discretion, however, any course may be made available for grade by examination or credit by examination.

**OPTIONS**

1. Special Examination for Credit: Passing grades, recorded as "CR" (credit), become a permanent part of the student's record but are not used in computing the cumulative grade average. Failing grades are not recorded.
2. Special Examination for Grade: All grades, whether passing or failing, are permanently recorded and used in computing the cumulative grade average.

**LIMITATIONS**

1. The credit so earned may not duplicate units already presented for admission to the University, either collegiate or subcollegiate.
2. The credit may not be in a course which is equivalent to, or more elementary than, another course in which the student is enrolled or for which the student has already received credit. The head of the examining department has the responsibility of determining the application of this limitation in each student's case.
3. No credit may be earned by this type of examination for beginning or intermediate language courses in the native language of the applicant.

Special examinations are constructed and administered by the department concerned. They are designed to reflect and explore the scholastic equivalent of the course, and are more comprehensive than the usual "final exam." The examinations may be written or oral, or both, and they may include course projects, laboratory projects, written reports, or other evidence of proficiency.

**PROCEDURES**

1. Applications for Special Examination for Credit or Special Examination for Grade may be obtained from the Registrar.
2. The application must be approved by the student's advisor.
3. The examining instructor and the head of the examining department must determine the eligibility of the applicant and sign the application.
4. The application is returned to the Registrar, and the $21-per-unit fee is paid to the University Cashier. No department may schedule a special examination until notified by the Cashier that the fee has been paid.
5. The examination is scheduled by the faculty member responsible, normally during the same semester in which the application is made.
6. The grade (CR or letter grade) is reported to the Registrar. The examination, together with the student's graded examination paper and any appropriate evaluations of oral performance or projects, is then filed with the department for at least one year.
7. The student may change the type of special examination for those courses designated "GRD" in the catalog any time before the scheduled hour of the examination by filing a new application. No additional fee will be charged.

**GRADUATE CREDIT FOR SENIORS**

A senior within 15 units of completing requirements for graduation may register for graduate work if recommended by the head of the department and approved by the Dean of the Graduate College. A petition for graduate credit in excess of senior requirements must be filed with the dean at the time of registration or within 10 days thereafter. The number of units of graduate credit for which a student may petition is limited to the difference between the 16-unit maximum of the Graduate College and the number of units needed to complete bachelor's degree requirements.

The Dean of the Graduate College will not approve a petition unless the senior has a grade average of 3.000 or better on all work already completed in the University, is proceeding toward graduation as directly as possible, and does not propose a semester load to exceed 16 units. Under such a petition, seniors may enroll in 500-level courses.

**ABSENCES**

Students are expected to be regular and punctual in class attendance. The University believes that students themselves are primarily responsible for attendance. Instructors will provide students with written statements of their policies with respect to absences. Excessive or extended absences from class is sufficient reason for the instructor to recommend to the college dean that the student be administratively dropped from the course. For those courses in which enrollment is limited, missing the first class session may be interpreted as excessive absence. If this action is filed by the end of the fourth week of classes, it will result in cancellation of registration in the course. If the student is administratively dropped after the end of the fourth week of classes, it will result in a failing grade being awarded in that course.

The student is encouraged to notify the Office of the Dean of Students when an absence from class of one week or more is unavoidable. The office will maintain a file of such reports available to instructors upon request.

**DISHONEST SCHOLASTIC WORK**

The Code of Academic Integrity places full responsibility on the student for the content and integrity of all academic work submitted as homework, examinations, etc. The first step in dealing with an alleged violation of the code is a conference with the faculty member. The second may be a student-faculty conference with the Dean of Students. More serious cases or student appeals of a student-faculty hearing may be referred to the University Hearing Board. Additional information or a copy of the complete code may be obtained from the Office of the Dean of Students.

**LEAVING THE UNIVERSITY**

**Withdrawal**

A withdrawal from the University is defined as leaving the University by dropping all classes and carrying zero units. Students are allowed seven days to complete the withdrawal process after initiating the procedure in the Dean of Students Office; however, no withdrawal may be initiated after the last day of classes of any semester and must be completed before the beginning of the final examination period. Consult the Schedule of Classes for detailed instruction and deadlines.

**Dismissal from Courses or from the University**

Reprehensible conduct or failure to comply with university regulations may result in a student's dismissal from a course or from the University at any time. The Dean of Students Office is responsible for this procedure. Such action may be posted on the student's academic record. Students suspended from the University are denied student privileges during the period of suspension, and may not register for correspondence work except with permission of the dean of the college in which they have previously registered. They may not enroll in Extended University courses, nor establish credit by examination during the period of suspension.

**Medical Withdrawal**

Medical withdrawal is initiated from the Student Health Service. Adequate medical documentation must be supplied by the student. Students who withdraw from the University for medical reasons and who are medically encumbered must have their readmissions approved by the Student Health Service.
Retroactive Withdrawal

Under appropriate circumstances a student may petition for withdrawal after completion of classes for a term. If the student has experienced severe physical or psychological stress of such nature as to prevent satisfactory completion of course work in the semester or term in question, the student may petition for retroactive withdrawal for all courses taken that semester or term. This petition must be accompanied by adequate documentation.

Transcripts

Official University of Arizona transcripts are issued to other institutions, offices or agencies designated in writing by the student. (See "Transcript Fee" in Expenses and Fees section.)

Graduation Requirements

THE UNIT SYSTEM

Credit for a degree is based upon a unit system. The unit of credit is the semester hour. The unit system is described under "Scholarship Requirements" in the Academic Guidelines section. Minimum units required for bachelor's degrees are:

<table>
<thead>
<tr>
<th>Degree</th>
<th>Units Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bachelor of Architecture</td>
<td>166</td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
</tr>
<tr>
<td>in Art</td>
<td>125</td>
</tr>
<tr>
<td>in Education</td>
<td>125</td>
</tr>
<tr>
<td>in Media Arts</td>
<td>125</td>
</tr>
<tr>
<td>in Music</td>
<td>128</td>
</tr>
<tr>
<td>in Theatre Arts</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Fine Arts (except major in Art)</td>
<td>127</td>
</tr>
<tr>
<td>Education</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Landscape Architecture</td>
<td>130</td>
</tr>
<tr>
<td>Bachelor of Music:</td>
<td></td>
</tr>
<tr>
<td>Major in Performance (Guitar)</td>
<td>130</td>
</tr>
<tr>
<td>Major in Performance (Keyboard)</td>
<td>131</td>
</tr>
<tr>
<td>Major in Performance (String Instrument/Harp)</td>
<td>130/129</td>
</tr>
<tr>
<td>Major in Performance (Voice)</td>
<td>130</td>
</tr>
<tr>
<td>Major in Performance (Wind Instrument/Percussion)</td>
<td>130</td>
</tr>
<tr>
<td>Major in Jazz Studies</td>
<td>128</td>
</tr>
<tr>
<td>Major in Music Education (Choral)</td>
<td>132</td>
</tr>
<tr>
<td>Major in Music Education (Instrumental)</td>
<td>133</td>
</tr>
<tr>
<td>Major in Composition</td>
<td>132</td>
</tr>
<tr>
<td>Bachelor of Science</td>
<td></td>
</tr>
<tr>
<td>in Aerospace Engineering</td>
<td>136</td>
</tr>
<tr>
<td>in Agricultural and Biosystems Engineering</td>
<td>134</td>
</tr>
<tr>
<td>in Agriculture</td>
<td>130</td>
</tr>
<tr>
<td>in Business Administration</td>
<td>125</td>
</tr>
<tr>
<td>in Chemical Engineering</td>
<td>136</td>
</tr>
<tr>
<td>in Civil Engineering</td>
<td>136</td>
</tr>
<tr>
<td>in Computer Engineering</td>
<td>134</td>
</tr>
<tr>
<td>in Education</td>
<td>125</td>
</tr>
<tr>
<td>in Electrical Engineering</td>
<td>131</td>
</tr>
<tr>
<td>in Energy Engineering</td>
<td>133</td>
</tr>
<tr>
<td>in Engineering Mathematics</td>
<td>129</td>
</tr>
<tr>
<td>in Engineering Physics</td>
<td>131</td>
</tr>
<tr>
<td>in Family and Consumer Resources</td>
<td>130</td>
</tr>
<tr>
<td>in Geological Engineering</td>
<td>136</td>
</tr>
<tr>
<td>in Geosciences</td>
<td>136</td>
</tr>
<tr>
<td>in Health Sciences:</td>
<td></td>
</tr>
<tr>
<td>Major in Exercise Sciences</td>
<td>125</td>
</tr>
<tr>
<td>Major in Health Education</td>
<td>128</td>
</tr>
<tr>
<td>Major in Medical Technology</td>
<td>129</td>
</tr>
<tr>
<td>Major in Occupational Safety and Health</td>
<td>128</td>
</tr>
<tr>
<td>Major in Physical Education</td>
<td>126</td>
</tr>
<tr>
<td>in Hydrology</td>
<td>137</td>
</tr>
<tr>
<td>in Industrial Engineering</td>
<td>131</td>
</tr>
</tbody>
</table>

CHOICE OF CATALOG

Students maintaining continuous enrollment may graduate according to the curricular requirements of any one catalog in force between their first fall or spring term at the University of Arizona or an Arizona community college and graduation from the University. A student may establish continuous enrollment through registration in and completion of a minimum of one course in a regular semester or summer term. If a student fails to meet this minimum enrollment standard for three consecutive regular terms and the intervening summer terms, the catalog in force at the time of re-enrollment at the University or an Arizona community college will be considered to be the initial catalog for purposes of graduation. For determining continuous enrollment, registration at the University of Arizona or an Arizona community college shall be considered equivalent.

TIME LIMIT FOR OBSOLETE COURSE WORK

In areas of study in which the subject matter changes rapidly, material in courses taken long before graduation may become obsolete or irrelevant. A student's major department has the authority to refuse to accept, for the purpose of satisfying graduation requirements, any course completed earlier than 10 years before the date of graduation. Students whose programs include courses that will be more than 10 years old at the expected time of graduation should consult with their major department at the earliest possible time, to determine acceptability of such courses.

GRADUATION AVERAGE

A graduation average of 2.000 for all university credit course work undertaken and for any work satisfied by the Special Examination for Grade is required for the bachelor's degree. Note: The graduation grade average is based only on credit earned in residence at the University of Arizona.

MAJOR AVERAGE

The colleges of Architecture, Arts and Sciences, Business and Public Administration, Education, Engineering and Mines, Nursing, and Pharmacy as well as the School of Health-Related Professions and certain departments require an average of 2.000 or better for all university credit work undertaken in the major field or for any work satisfied by the Special Examination for Grade if in the major.

UNIVERSITY CREDIT REQUIREMENT

A minimum of 30 units of university credit from The University of Arizona is required for the bachelor's degree. It is further required that 18 of the final 30 units offered toward the degree be university credit. Various departments have specific university-credit requirements for their majors, and students should consult individual departmental information sections for this information. For a definition of university credit, see "University Credit" under Academic Guidelines elsewhere in this catalog.
UPPER-DIVISION UNIT REQUIREMENT

Students graduating under the 1991–93 catalog or subsequent catalogs are required to have a minimum of 42 upper-division units (300-, 400-, 500-level courses) for graduation. By action of the faculty, this schedule for implementation of the upper-division unit requirement supersedes the effective date previously designated in the 1989–91 catalog, which required 42 units of upper-division credit for all students graduating in December 1991 and thereafter.

CORRESPONDENCE STUDY

A maximum of 60 units toward a bachelor's degree may be earned through correspondence instruction and/or credit by examination.

APPLICATION FOR BACHELOR'S DEGREE CANDIDACY

The University awards degrees three times annually: in May, in August and in December. Candidates for bachelor's degrees are required to file at the degree certification section of the Student Information, Registration and Records office for degree candidacy according to the following schedule:

<table>
<thead>
<tr>
<th>Date of Degree</th>
<th>Application to be filed no later than</th>
</tr>
</thead>
<tbody>
<tr>
<td>May</td>
<td>May 1 of the year preceding graduation</td>
</tr>
<tr>
<td>August</td>
<td>Aug. 1 of the year preceding graduation</td>
</tr>
<tr>
<td>December</td>
<td>Dec. 1 of the year preceding graduation</td>
</tr>
</tbody>
</table>

Students must have taken the Upper-Division Writing-Proficiency Examination before the application for Bachelor's Degree Candidacy will be accepted.

For information regarding fees for filing an application for degree candidacy, see “Graduation Expenses” under Expenses and Fees.

CHANGES IN DEGREE-APPLICATION INFORMATION

Once the application has been filed, applicants are required to notify the degree-certification section promptly of subsequent changes in the following information: (1) anticipated date of graduation; (2) degree, major, minor, catalog being used; (3) name, local address and telephone number, permanent address. Failure to do so may result in delay in awarding of degree.

COMPLETION OF DEGREE REQUIREMENTS IN ABSENTIA

Degree candidates who find it necessary to leave The University of Arizona and complete final course requirements through correspondence or transfer work are required to notify the degree-certification section of such plans, preferably before leaving the University. In any case, the degree-certification section must be notified of the intent to complete the degree in absentia no later than one month before the desired degree date.

SECOND BACHELOR'S DEGREE

Candidates for a second bachelor's degree at The University of Arizona must offer no fewer than 30 units in addition to the units required for the first degree, and must meet all requirements for the second degree. The additional units may be completed concurrently with those applying on the first degree; however, at least 30 units of university credit must be completed for each degree.

AVERRAGING OF GRADE FOR FINAL NON-UNIVERSITY CREDIT COURSE

Students who lack not more than a one-semester course toward the fulfillment of curriculum and minimum-graduation-average require-ments, may apply, as the final course to complete the degree, a single one-semester course either in residence at another accredited institution or in correspondence work through the University of Arizona. Permission must be obtained from the academic dean, prior to enrolling for the course, to apply the grade received in such a course toward the graduation average. This provision may be applied also to the required separate average of 2.0000 in the major field if prior permission is obtained from the major professor and the academic dean.

CLEARANCE OF ACCOUNTS

Degree candidates are required to clear any indebtedness to the University before completion of degree requirements will be officially certified or the diploma released.

Expenses and Fees

The Board of Regents reserves the right to change all fees and charges without notice if necessary. Fees cited in the catalog are based on information available at the time of publication. Students wishing current information on registration charges and fees should contact the Registrar's Office.

The University cannot extend credit. Therefore, all students must have sufficient funds upon entering to defray their immediate expenses. An estimate of the average amount required for the first two regular semesters, covering room, board, registration, tuition, incidental fees, books and supplies is $5,550 for residents of Arizona. For nonresidents, the estimated amount is $10,556.

CLASSIFICATION OF PERSONS FOR TUITION PURPOSES

The Arizona Board of Regents is required by law to establish for the universities under its jurisdiction and control uniform guidelines and criteria for the classification of students for payment of tuition. Attention is invited to relevant provisions of the constitution, statutes, and laws of Arizona, including Sections 3 and 6, Article 7 of the Constitution (which provisions have been held by the Supreme Court of Arizona to govern domicile for all purposes), Sections 15-1625, 15-1626, and 15-1801 through 15-1807 of the Arizona Revised Statutes, as amended.

A. A person who does not qualify to enroll as an in-state student must pay a nonresident tuition, in addition to other established fees and charges that are required for all students. An out-of-state student must pay an out-of-state tuition fee each semester in addition to a registration fee.

B. The general rule is that in order to obtain in-state status for tuition purposes, a student must establish his/her domicile in Arizona at least one year immediately prior to the last day of regular registration for the semester in which the student proposes to attend the University. Arizona domicile occurs when a person is physically present in Arizona with the intention of making Arizona his or her permanent home.

There are certain exceptions from the general rule. A student may also be eligible for in-state status if he or she can establish that, on or before the last day of regular registration, he or she meets one of the following criteria:

1. Dependent. The student and his or her parent are domiciled in Arizona but have not met the one year durational requirement, and the parent is entitled to claim the student as a dependent for federal and state tax purposes.

2. Transferred Employee. The student is domiciled in Arizona, but has not met the one year durational requirement, and is an employee or spouse of an employee transferred to Arizona by his or her employer for employment purposes.

3. Military. The student is not domiciled in Arizona, but is a member of the U.S. Armed Forces stationed in Arizona pursuant to military orders or is a member's spouse or dependent child as defined in A.R.S. section 43-1001.

4. Native American. The student is not domiciled in Arizona, but is a member of a Native American tribe whose reservation land lies...
C. Mere presence of a person in the State of Arizona for one year does not necessarily establish a domicile for classifying that person as an in-state resident. No person shall be deemed to have gained or lost a domicile by reason of his or her presence or absence while a student at any institution of learning.

D. The person must have his or her domicile determined prior to registration and payment of fees. The responsibility of registration under proper status is placed upon the individual. Prompt filing of the required domiciliary information will enable the University to determine classification prior to registration. The Board of Regents has promulgated a publication entitled: Summary of Tuition Classification Policies, which is incorporated by reference in this catalog, and the attention of all persons concerned with classification for tuition purposes is directed to this publication available in the office of the domicile classification officer in Room 313, Administration Building. (These materials include: (a) definitions related to domicile; (b) guidelines, rules, and regulations applied to determine domicile; and (c) information on procedures for appeal.)

An affidavit must be completed and filed prior to any decision concerning domicile. The affidavit is required upon original registration or upon a desired change in classification or after an absence for a semester or more.

In all cases where the records indicate that the student's domicile is not in Arizona, out-of-state tuition will be assessed. Any student found to have made a false or misleading statement concerning his or her domicile shall be subject to dismissal from the University.

E. Classification officers of the University shall be designated to determine domicile. If there is any question as to domicile, the matter should be brought to the attention of the classification officers and passed upon prior to registration and payment of fees. The same classification officers can, during the registration period published by the University or at other times, pass upon the domicile of a person.

F. The President of the University shall appoint one or more appeals committees to hear the cases of individuals who believe that the decision regarding their domicile is not consistent with the laws of the State of Arizona or the summary promulgated by the Arizona Board of Regents. An appeal shall be filed in the office of the domicile classification officer. It shall be written, signed by the student, and accompanied by a sworn written statement of all facts relative to the matter. Notice of appeal shall be filed at any time within 35 days from the last day of registration published by the University. The person appealing shall have the right to appear and testify before the committee and to be represented by an advisor.

### 1991-92 EXPENSES AND FEES — PER SEMESTER

<table>
<thead>
<tr>
<th>ARIZONA RESIDENTS:</th>
<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Number of Units</td>
<td>AFAT Fees</td>
<td>Recreation Fee</td>
<td>Tuition &amp; Registration</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>$3</td>
<td>$80</td>
<td>$253</td>
<td>$256</td>
</tr>
<tr>
<td>2</td>
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<td>$160</td>
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<tr>
<td>6</td>
<td>$3</td>
<td>$480</td>
<td>$843</td>
<td>$846</td>
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<tr>
<td>7 or more</td>
<td>$6</td>
<td>$764</td>
<td>$1,529</td>
<td>$1,532</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NONRESIDENTS:</th>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Number of Units</td>
<td>AFAT Fees</td>
<td>Recreation Fee</td>
<td>Tuition &amp; Registration</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>$3</td>
<td>$289</td>
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<tr>
<td>3</td>
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<td>$903</td>
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<tr>
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<td>$3</td>
<td>$1,156</td>
<td>$1,179</td>
<td>$1,182</td>
</tr>
<tr>
<td>5</td>
<td>$3</td>
<td>$1,445</td>
<td>$1,468</td>
<td>$1,471</td>
</tr>
<tr>
<td>6</td>
<td>$3</td>
<td>$1,734</td>
<td>$1,757</td>
<td>$1,760</td>
</tr>
<tr>
<td>7</td>
<td>$6</td>
<td>$2,022</td>
<td>$2,045</td>
<td>$2,048</td>
</tr>
<tr>
<td>8</td>
<td>$6</td>
<td>$2,311</td>
<td>$2,334</td>
<td>$2,337</td>
</tr>
</tbody>
</table>

1Expenses and fees for 1992-93 were not available at the time of catalog printing. All fees are subject to change.
2The Arizona Financial Aid Trust (AFAT) fee will not be refunded once classes begin. AFAT is subject to change without notice.

### Payment of Fees

All fees are payable prior to the first day of classes for any semester or term. The University accepts checks for the amount due at the time of registration but cannot advance cash on checks. The University cannot accept installment payments, and all fees for the semester must be paid in full at the time of registration. The registration of a student whose check is returned by the bank unpaid is considered incomplete, and a $15 fee will be assessed. Late and collection fees are also assessed if payment is not received within 12 calendar days.

### Concurrent Enrollment—Nonresident Tuition

It is unlawful for any nonresident student to register concurrently in two or more public institutions of higher education in this state, including any university, college, or community college, for a combined student credit-hour enrollment of seven semester hours or more without payment of nonresident tuition at one of such institutions.

Any nonresident student desiring to enroll concurrently in two or more public institutions of higher education in this state, including any university, college, or community college, for a combined total of more than six semester hours, who is not subject to nonresident tuition at either of such institutions shall pay the nonresident tuition at the institution of his or her choice in an amount equivalent to nonresident tuition at such institution for the combined total of semester hours for which the nonresident student is concurrently enrolled.

### The Arizona Financial Aid Trust (AFAT)

The Arizona Legislature approved a program of student aid, the Arizona Financial Aid Trust, which became effective in the 1989-90 academic year. This program represents the culmination of efforts by student governments on state campuses, the Arizona Student Association, the Arizona Board of Regents and the State Legislature. This program enables currently enrolled students in Arizona universities to receive additional financial aid and provides for the creation of a long-term endowment to assist future generations of Arizona students. As a result of the authorizing legislation and action by the Arizona Board of Regents, an Arizona Financial Aid Trust fee will be assessed to all students who register for any fall, spring and summer term.

### Recreation Center Fee

In 1985, the students passed a referendum to charge themselves a mandatory $25 per semester fee to construct a recreation center at The University of Arizona. The Arizona Board of Regents and the University administration then approved bonding authority for the construction of the facility. The decision required that the recreation center fee be charged only after the facility became available for use. Construction began on the facility in June of 1989, and the facility opened in fall semester 1990.

### Special Course Fees and Deposits

Special course fees and deposits are applicable only under certain specific conditions and must be approved by the Provost and/or the Arizona Board of Regents. Fees for off-campus field trips, specialized equipment or facilities, private instruction, expendable materials and refundable deposits for equipment entrusted to students' care may be...
assessed. Special course fees are identified in the Schedule of Classes for the term in which the course is offered. See the list below for special fees or deposit courses which were approved at the time of the printing of this catalog.

<table>
<thead>
<tr>
<th>Course</th>
<th>Fee</th>
<th>Course</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anth. 442a</td>
<td>$250</td>
<td>Art 472</td>
<td>$20</td>
</tr>
<tr>
<td>Anth. 442b</td>
<td>$250</td>
<td>Art 473</td>
<td>$50</td>
</tr>
<tr>
<td>Anth. 642a</td>
<td>$250</td>
<td>Art 487</td>
<td>$35</td>
</tr>
<tr>
<td>Anth. 642b</td>
<td>$250</td>
<td>Art 541</td>
<td>$25</td>
</tr>
<tr>
<td>Art 104</td>
<td>$20</td>
<td>Art 545</td>
<td>$25</td>
</tr>
<tr>
<td>Art 241</td>
<td>$25</td>
<td>Art 546</td>
<td>$20</td>
</tr>
<tr>
<td>Art 250</td>
<td>$20</td>
<td>Art 550</td>
<td>$25</td>
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<tr>
<td>Art 251</td>
<td>$20</td>
<td>Art 551</td>
<td>$20</td>
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<tr>
<td>Art 253</td>
<td>$20</td>
<td>Art 553</td>
<td>$20</td>
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<tr>
<td>Art 255</td>
<td>$20</td>
<td>Art 555</td>
<td>$20</td>
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<tr>
<td>Art 264</td>
<td>$25</td>
<td>Art 565</td>
<td>$25</td>
</tr>
<tr>
<td>Art 265</td>
<td>$25</td>
<td>Art 566</td>
<td>$25</td>
</tr>
<tr>
<td>Art 271</td>
<td>$20</td>
<td>Art 567</td>
<td>$25</td>
</tr>
<tr>
<td>Art 273</td>
<td>$45</td>
<td>Art 569</td>
<td>$25</td>
</tr>
<tr>
<td>Art 287</td>
<td>$35</td>
<td>Art 571</td>
<td>$20</td>
</tr>
<tr>
<td>Art 341b</td>
<td>$25</td>
<td>Art 573</td>
<td>$50</td>
</tr>
<tr>
<td>Art 341c</td>
<td>$25</td>
<td>Art 587</td>
<td>$40</td>
</tr>
<tr>
<td>Art 343a</td>
<td>$25</td>
<td>Art 656</td>
<td>$20</td>
</tr>
<tr>
<td>Art 343b</td>
<td>$25</td>
<td>Art 673</td>
<td>$50</td>
</tr>
<tr>
<td>Art 346</td>
<td>$25</td>
<td>Art 687</td>
<td>$40</td>
</tr>
<tr>
<td>Art 350</td>
<td>$20</td>
<td>Chem. 102a</td>
<td>$15</td>
</tr>
<tr>
<td>Art 351</td>
<td>$20</td>
<td>Chem. 102b</td>
<td>$15</td>
</tr>
<tr>
<td>Art 353</td>
<td>$20</td>
<td>Chem. 104a</td>
<td>$15</td>
</tr>
<tr>
<td>Art 355</td>
<td>$20</td>
<td>Chem. 104b</td>
<td>$20</td>
</tr>
<tr>
<td>Art 356</td>
<td>$20</td>
<td>Chem. 243a</td>
<td>$25</td>
</tr>
<tr>
<td>Art 363</td>
<td>$25</td>
<td>Chem. 243b</td>
<td>$25</td>
</tr>
<tr>
<td>Art 364</td>
<td>$25</td>
<td>C.E. 394a</td>
<td>$30</td>
</tr>
<tr>
<td>Art 365</td>
<td>$25</td>
<td>Cr. L. 101</td>
<td>$260</td>
</tr>
<tr>
<td>Art 366</td>
<td>$25</td>
<td>Cr. L. 102</td>
<td>$260</td>
</tr>
<tr>
<td>Art 367</td>
<td>$25</td>
<td>Cr. L. 201</td>
<td>$260</td>
</tr>
<tr>
<td>Art 371</td>
<td>$20</td>
<td>Ex.S.S. 137a</td>
<td>$10</td>
</tr>
<tr>
<td>Art 373</td>
<td>$45</td>
<td>Ex.S.S. 137c</td>
<td>$35</td>
</tr>
<tr>
<td>Art 387</td>
<td>$35</td>
<td>Ex.S.S. 137d</td>
<td>$35</td>
</tr>
<tr>
<td>Art 441</td>
<td>$25</td>
<td>Ex.S.S. 159c</td>
<td>$30</td>
</tr>
<tr>
<td>Art 445</td>
<td>$25</td>
<td>Geos. 103</td>
<td>$15</td>
</tr>
<tr>
<td>Art 446</td>
<td>$25</td>
<td>Geos. 104</td>
<td>$15</td>
</tr>
<tr>
<td>Art 456</td>
<td>$20</td>
<td>Geos. 412</td>
<td>$369</td>
</tr>
<tr>
<td>Art 464</td>
<td>$25</td>
<td>Geos. 413</td>
<td>$369</td>
</tr>
<tr>
<td>Art 465</td>
<td>$25</td>
<td>Hydr. 414a</td>
<td>$66</td>
</tr>
<tr>
<td>Art 466</td>
<td>$25</td>
<td>Hydr. 414b</td>
<td>$66</td>
</tr>
<tr>
<td>Art 467</td>
<td>$25</td>
<td>Hydr. 514a</td>
<td>$66</td>
</tr>
<tr>
<td>Art 469</td>
<td>$25</td>
<td>Hydr. 514b</td>
<td>$66</td>
</tr>
<tr>
<td>Art 471</td>
<td>$20</td>
<td>Musi.—All performance studies: one hour lesson per week, $60; one-half hour lesson per week, $40.</td>
<td></td>
</tr>
</tbody>
</table>

*Additional special fees may be necessary according to student need for materials.

**Music Fees**

A fee of $40 each semester for one hour per week or $60 per semester for a one-hour-per-week private lesson in applied fields of piano, organ, voice, band, or orchestral instrument is charged. A music major registering for more than one weekly lesson will pay a maximum fee of $60 each semester.

**Music Instrument Rental**

Students enrolled for individual instruction may rent instruments, if available, for a rental fee each semester. The complete schedule of rental fees is listed in the Departments and Courses of Instruction section of this catalog under "Music."

**Audit Fee**

Fees for audit units are the same as regular credit units, including the nonresident tuition, if applicable.

---

**Late Payment/Registration Fee**

A student who fails to complete payment of all fees prior to the first day of classes for any semester or term will be assessed a nonrefundable late fee of $25.

**SUMMARY OF MINIMUM ANNUAL ESTIMATED EXPENSE FOR FULL-TIME CAMPUS STUDENTS, 1990-91**

The Board of Regents reserves the right to change all fees and charges without notice, if necessary.

**ARIZONA RESIDENTS:**

- **Registration fee**: $1540.00
- **Residence halls, average rate**: $1536.00
- **Meals in university cafeteria**: $1900.00
- **Books and supplies**: $574.00
- **Total minimum annual expense**: $5550.00

**NONRESIDENTS:**

- **Registration fee & tuition**: $6546.00
- **Residence halls, average rate**: $1536.00
- **Meals in university cafeteria**: $1900.00
- **Books and supplies**: $574.00
- **Total minimum annual expense**: $10,556.00

All students should add to this list incidental personal expenses as needed. The residence hall reservation deposit is $150. Students taking military science should add a deposit of $25.

All fees, except residence hall rent and deposit, are due and payable as the final step in the registration procedure. See the current semester's Schedule of Classes for specific billing and payment instructions.

**Residence Hall Fees**

Residence hall rent must be paid in accord with the Residence Hall Deposit Schedule for the term in which the course is offered. See the list below for the current year and months of assignment. Deposits on rooms will not be refunded for cancellations after June 1 preceding the fall semester, nor after December 15 for the second semester.

**RESIDENCE HALL RATES, EFFECTIVE 1990-91**

<table>
<thead>
<tr>
<th>Residence Halls</th>
<th>Entire Academic Year Payment</th>
<th>Fall Semester Payment</th>
<th>Spring Semester Payment</th>
<th>Spring Semester ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hopi, Sierra</td>
<td>$1060.00</td>
<td>$636.00</td>
<td>$424.00</td>
<td>$636.00</td>
</tr>
<tr>
<td>Arizona-Sonora</td>
<td>$1400.00</td>
<td>$840.00</td>
<td>$560.00</td>
<td>$840.00</td>
</tr>
<tr>
<td>Apache-Santa Cruz</td>
<td>$1500.00</td>
<td>$900.00</td>
<td>$600.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Graham-Greenlee</td>
<td>$1500.00</td>
<td>$900.00</td>
<td>$600.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Kaibab-Huachuca</td>
<td>$1500.00</td>
<td>$900.00</td>
<td>$600.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Intern't House</td>
<td>$1550.00</td>
<td>$900.00</td>
<td>$600.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Maricopa</td>
<td>$1500.00</td>
<td>$900.00</td>
<td>$600.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Navajo-Pinal</td>
<td>$1500.00</td>
<td>$900.00</td>
<td>$600.00</td>
<td>$900.00</td>
</tr>
<tr>
<td>Manzanita-Mohave</td>
<td>$1540.00</td>
<td>$924.00</td>
<td>$516.00</td>
<td>$924.00</td>
</tr>
<tr>
<td>Cochino</td>
<td>$1600.00</td>
<td>$960.00</td>
<td>$560.00</td>
<td>$960.00</td>
</tr>
<tr>
<td>Babcock (std. dbl.)</td>
<td>$1620.00</td>
<td>$972.00</td>
<td>$548.00</td>
<td>$972.00</td>
</tr>
<tr>
<td>Gila, Yavapai</td>
<td>$1645.00</td>
<td>$987.00</td>
<td>$585.00</td>
<td>$987.00</td>
</tr>
<tr>
<td>Yuma, Cochise</td>
<td>$1645.00</td>
<td>$987.00</td>
<td>$585.00</td>
<td>$987.00</td>
</tr>
<tr>
<td>Coronado</td>
<td>$1750.00</td>
<td>$1050.00</td>
<td>$670.00</td>
<td>$1050.00</td>
</tr>
<tr>
<td>Sun Terrace &amp; 1 br</td>
<td>$1800.00</td>
<td>$1080.00</td>
<td>$720.00</td>
<td>$1080.00</td>
</tr>
<tr>
<td>Corleone Apts 2 br</td>
<td>$1700.00</td>
<td>$1020.00</td>
<td>$680.00</td>
<td>$1020.00</td>
</tr>
</tbody>
</table>
The fee for the examination is $10.

All freshmen are required to take the English Placement Examination.

**English Placement Examination**

Work in certain departments. This deposit, less the value of apparatus broken by the student, is returned upon completion of the course.

**Breakage Deposit**

A breakage deposit is required of each student registered for laboratory work in certain departments. This deposit, less the value of apparatus broken by the student, is returned upon completion of the course.

**English Placement Examination**

All freshmen are required to take the English Placement Examination. The fee for the examination is $10.
REFUNDS OF TUITION AND FEES

All refunds and deposits that may be due a student will be first applied to encumbrances owed the University. Refunds due will be forfeited unless called for on or before the following June 30.

Tuition, Registration, Music and Special College Fees

Refunds are scheduled as follows:

<table>
<thead>
<tr>
<th>Schedule of Refunds*</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>21-25</th>
<th>There-</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>days</td>
<td>days</td>
<td>days</td>
<td>days</td>
<td>days</td>
</tr>
<tr>
<td></td>
<td>100%</td>
<td>80%</td>
<td>60%</td>
<td>40%</td>
<td>20%</td>
<td>none</td>
</tr>
<tr>
<td>less $10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The refund schedule begins with the first day of class and applies to weekdays only (Mon.-Fri.). Sufficient time must be allowed for final clearance of registration fee payment checks before refunds will be made.

Cancelled Registration

A student whose registration is cancelled because of academic failure the preceding semester will be refunded registration fees in full. A student on the delinquent scholarship report for the first semester (failing to maintain the grade average required for his or her class and thereby automatically placed on probation) who completes registration for the second semester may, upon filing a withdrawal within two weeks of such registration, be refunded fees in full. This refund must be approved by the Registrar.

Scholarships and Financial Aid

The University of Arizona provides access to a full range of federal, state, and privately donated financial aid funds to its students through the Office of Student Financial Aid (OSFA). Assistance is available to students based on financial need, academic merit, and program of study. The application process for financial aid begins with the completion of a need-based application for student financial aid. In addition, the University of Arizona Scholarship Application must be completed to apply for scholarships.

In 1989-90, the Office of Student Financial Aid administered $96 million in aid, which assisted 20,300 students at the University. Awards are competitive, so early application is urged. Students should apply as soon as possible after January 1 of the year in which they will begin their academic career. The application forms are widely available from high school counselors, community colleges, and the OSFA. Students must file a separate application for the Stafford Loan Program, as described below.

FEDERAL AID PROGRAMS

Federal aid programs comprise over 75 percent of the total aid available through the University of Arizona. For undergraduate students, the base of funding begins with the Pell Grant Program. For graduate students, the Stafford Loan usually is the first source of funding.

Supplemental Education Opportunity Grants

The SEOG Program is a direct grant to undergraduate students demonstrating exceptional financial need. Eligibility is determined by the Office of Student Financial Aid.

College Work Study

The College Work Study Program allows students to defray part of their cost of education through work experience. Many job placements are career related, offering both valuable experience and income to the student. The recipient may work up to 20 hours per week in an on-campus or off-campus placement.

Health Professions Student Loans

The Health Professions Student Loan Program is intended to assist medical and pharmacy students in meeting their educational expenses. Loans are at five percent interest with a nine-month grace period after graduation before repayment to the University begins. The amount of the loan award is determined on the basis of the student's calculated need.

Nursing Student Loans

Loans are available to students enrolled in the College of Nursing at an interest rate of five percent. The amount of the loan is determined on the basis of the student's financial need, and repayment of the loan begins six months after the student leaves school.

Pell Grants

The Pell Grant Program is funded by the federal government in order to provide primary access for students for their undergraduate degrees. Eligibility is established by the federal government and students are funded appropriately to their dependency status, living accommodations, and enrollment level.

Stafford Loans (Formerly Guaranteed Student Loan Program)

The Stafford Loan Program is available to both graduates and undergraduates to meet educational expenses. Loans are made by local lending institutions, including banks, credit unions, and other financial institutions. The loans are federally insured for repayment and lenders are paid a subsidy on the interest rate as long as the student is enrolled in school. Repayment at eight percent interest begins six months after the borrower is no longer enrolled in school at least half time and continues over a five-to-ten-year repayment period. Students must complete a need-based application form to determine eligibility.

Perkins Loans (Formerly National Direct Student Loans)

The Perkins Loan allows students to borrow for undergraduate or graduate education at five percent interest. The amount of the loan is determined on the basis of financial need and repayment begins nine months after the borrower is no longer enrolled in school. Various deferment provisions for service, death or disability are available.

Supplemental Loans for Students and Parent Loans for Students

The federal SLS and PLUS programs are available to undergraduate and graduate students. The interest rate is up to 12 percent and repayment begins 60 days after the loan is taken. Students whose families show no financial need can participate in these programs. A separate application is required.

The loans listed in this section can be considered for consolidation into a single repayment by qualified agencies. Contact OSFA for details.

INSTITUTIONAL STUDENT AID

Employment

Various departments on campus employ students in non-work-study positions to perform a variety of functions. The employing department decides on the selection of the student. Student financial aid recipients must be aware that institutional earnings from all sources are required to be reported to the Office of Student Financial Aid. In limited circumstances, students' financial aid packages may require adjustment in order to coordinate the earnings with other offers of aid.

Scholarships, Waivers and University Grants

Academic scholarships are offered on the basis of financial need, grade-point average, leadership qualities, and community service.
Funds are provided by private donors to The University of Arizona. Most scholarships are intended for undergraduate students who are residents of the State of Arizona. Scholarship selection is dependent on the student's overall achievement and may be limited to specific fields of study. Through submission of a single application, the student applicant will be considered for all of the scholarships available. Students should also contact their individual departments or colleges regarding funds which may be available through those sources.

Waivers and university grants are used to support students who have academic talent and financial need. Each year waivers of resident registration fees are offered to a number of students based on academic achievement, talent and/or need. Students are encouraged to apply using a need-based application form. Top ranking Arizona high school seniors will be considered for waivers and scholarships once they are identified by their respective high school. A limited number of nonresident waivers also exist.

Temporary Loans

The Temporary Loan Program is intended to assist students with short-term funding problems. Generally, loan amounts are limited to $150 to assist students in meeting extraordinary costs for a 90-day period of time or the last day of classes, whichever comes first. Registration loans are also available for students for whom financial aid is pending but not yet paid at the time of registration.

All students are encouraged to apply for financial aid, regardless of their parents' financial status. The broad range of financial aid resources available to the Office of Student Financial Aid provides access to a variety of levels. Students who do not have financial need may still qualify for academic scholarships, temporary loans, or other programs. Therefore, please feel free to contact the Office of Student Financial Aid for further information. In addition, each high school and community college in the State of Arizona has available a copy of the catalog of scholarships at The University of Arizona for students' review.

Provisions for Superior Students

THE HONORS CENTER

The quest for excellence is continuously nourished at The University of Arizona. The University Honors Center provides students with a unique opportunity to join this quest for excellence in an atmosphere that is both personal and stimulating.

Admission to Honors is limited to those students who have distinguished themselves academically. Incoming freshmen must rank in the top 5% of their class or achieve an ACT score of 30 or a combined SAT of 1300. Transfer students must have accumulated a 3.5 grade-point average on a 4.0 scale. Once admitted to the program, honors students are provided with a personalized educational opportunity that focuses attention on small classes, usually within the range of 12-15. Classroom sessions are structured such that there is heavy emphasis on the development of verbal skills, writing, and problem solving. A variety of honors seminars, colloquia, introductory departmental courses, studio workshops, and independent studies are available. There is ample opportunity for personalized research and laboratory work. In addition, students are able to participate in a program of faculty-student dialogues, peer-help sessions for incoming freshmen, tutoring, a semester abroad program where students spend five months studying in London, Paris, or Seville and a series of monthly honors forum luncheons designed to bring students and faculty together to interact informally and to listen to prominent scholars discuss some of their research. In most instances, a student's experience in the program is culminated with the completion of a special honors project conducted during the senior year.

Participation in Honors affords students a number of special privileges. For those Arizona residents, admission to the Honors Program carries with it eligibility for a Regents Fee Waiver Scholarship. Honors students are provided with extended library benefits, use of special study areas in the libraries, and access to the Honors Center Common Room.

The thrust of the Honors Program is to permit students to extend the boundaries of their minds beyond the scope of the ordinary university experience. It seeks to provide opportunities which enhance the development of the whole person — that individual who is sensitive, humane, knowledgeable, inquisitive, and who seeks a clearer understanding of the past, present, and future.

Further information may be obtained by contacting the Honors Center, Slonaker House, 621-6901.

ACADEMIC HONORS AND AWARDS

University Academic Honors

Honors are bestowed as recognition of outstanding academic achievement and as a means to further encourage sound scholarship. They are awarded to every undergraduate student attaining the required proficiency. All academic honors become part of the official record and are noted on the transcript. For some awards, students also receive plaques and certificates. The University of Arizona supports academic achievement and is pleased to recognize and reward undergraduate students whose performance merits special attention.

Dean's List

Three categories are awarded every semester based on units completed for credit and letter grade (excluding all Pass/Fail and "S" grades). Also, all grades of "I" must be made up before the honor is bestowed.

1. **Dean's List with Distinction** is based on 15 units and a 4.000 grade-point average.
2. **Dean's List** is based on 15 units and a grade-point average of 3.500-3.999.
3. **Honorable Mention** is based on 12 units of 3.500 and above grade-point average.

Students awarded these academic honors receive a certificate at the Honors Convocation the following fall. This recognition becomes part of the official record and appears on the transcript.

Academic Distinction

Two categories are awarded annually based on units completed for credit and letter grade (excluding all Pass/Fail and "S" grades). Also, all grades of "I" must be made up before the honor is bestowed.

1. **Highest Academic Distinction** is based on 30 units and a 4.000 grade-point average.
2. **Academic Distinction** is based on 30 units and a grade-point average of 3.500-3.999.

Students awarded these academic honors are recognized at the Honors Convocation the following fall. Those students with a 4.000 grade-point average receive plaques. Those students with a 3.500-3.999 grade-point average receive certificates. These honors become part of their official records and appear on their transcripts.

Graduation with Academic Distinction

Three categories are awarded for superior scholarship in work leading to the bachelor's degree. This honor, based upon graduation grade-point average, becomes part of the official record, is awarded upon graduation and appears on the transcript and diploma of the recipient.

1. **Summa Cum Laude** is awarded to candidates whose grade-point average is 3.900 or higher.
2. **Magna Cum Laude** is awarded to candidates whose grade-point average is 3.700-3.899.
3. **Cum Laude** is awarded to candidates whose grade-point average is 3.500-3.699.

To be eligible for distinction at graduation, bachelor's degree candidates must have completed at least 60 units in undergraduate residence at the University of Arizona, with letter grades that carry a grade-point value in a minimum of 45 units. Also, in computing the above grade-point averages, only work in residence is considered.
For Juris Doctor degrees, summa cum laude is awarded to candidates whose grade average is 3.5 or higher; magna cum laude, to candidates whose average is 3.499 to 3.2500; cum laude, to candidates whose average is 3.249 to 3.0000. In computing these averages, only work carrying university credit and applicable to the Juris Doctor degree is considered. To be eligible for distinction at graduation, Juris Doctor degree candidates must have completed at least 40 units of such work.

Graduation with Honors

Graduation with Honors is bestowed on students who have completed all requirements of the University-wide Honors Program. This academic recognition becomes part of the official record and is noted on the transcript and diploma of the recipient. Honors students also wear a special stole at graduation.

Other Awards and Honors

Other awards and honors in recognition of outstanding academic achievement are bestowed through the various colleges and departments. Also, colleges and departments offer participation in discipline-based honor societies and associations. Interested students should contact departmental and college advisors.

Student Services

ACADEMIC ADVISING

Academic advising makes a valuable contribution to the academic success of all students. The University of Arizona is committed to providing accurate information and thoughtful guidance to students throughout their course of study. Academic advisors make available information on academic requirements, procedures, and regulations; career and graduate education opportunities; and student services on campus. Advisors are also skilled listeners who can assist students in defining or clarifying their educational and career goals. Faculty members, professional advisors, and students' peers participate in the University's multifaceted advising program. Students bear the responsibility of seeking out and making use of the academic advising services available at The University of Arizona.

Dean of Students Office

The student's life outside the classroom is an integral part of the learning experience. Through services and staff, the Dean of Students Office provides support and advisement to students in gaining a sense of belonging, developing knowledge and skills, choosing informed attitudes in a diverse community, and developing self-responsibility. Programs in this area are administered by the Office of Student Activities and Organizations, Greek Life, International Student Center, Center for Disability Related Resources, Center for Off Campus Students, Student Publications, Bookstore, and Veterans' Affairs.

Additionally, the Dean of Students Office is responsible for the enforcement of university policies and procedures, including the Student Code of Conduct, the Code of Academic Integrity, and the Policy on the Use of the Campus and First Amendment Rights. Students seeking to withdraw from the University may consult the Dean of Students Office.

The Dean of Students staff works to help students build their campus community, assists with the resolution of problems, and advocates for new student programs. Office staff are frequently resources for students, parents, and faculty for the successful resolution of problems. The Dean of Students Office is available to serve the total university community and is located on the second floor of Old Main.

Student Resource Center

The Student Resource Center, located in the Old Main Building, houses three separate departments aimed at strengthening the students' academic efforts. The main goal of these programs is to increase the likelihood that students will do well academically from the moment they are admitted as students. A description of these programs and their locations follows:

LEARNING SKILLS—The primary emphasis is to provide services which assist students in becoming efficient and effective independent learners who are committed to academic excellence. The classes and workshops are offered throughout the semester. Topics include time management, examination preparation, success in math and science, notetaking, money-management and preparation for the Upper-Division Writing Proficiency Exam.

Tutoring is offered to university students in three ways (1) Tutor Share, a for-fee small group tutoring program; (2) The Tutoring Services Index, a listing of qualified UA students who offer private for-fee tutoring; (3) Free large-group review sessions in select high-risk courses. Old Main 129, 621-1206.

Students with diagnosed learning disabilities may receive additional assistance through the Strategic Alternative Learning Techniques (SALT) program, which provides academic planning, tutors, supervised study tables, computer-assisted instruction, and special exam administration. Old Main 101, 621-1242.

COUNSELING AND TESTING SERVICES—The mission of Counseling and Testing Services (CTS) is the provision of counseling and testing services for students in order to enable them to take fullest advantage of their college experiences.

CTS is staffed by psychologists providing counseling to students with personal, relationship problems, or other issues such as chronic indecision, procrastination and severe anxiety that get in the way of their academic success. Services include individual and group counseling, couples counseling, crisis intervention, career counseling, consultation with faculty and staff regarding student well-being, and outreach programs and workshops provided in residence halls, Student Union Building, and to student groups by request.

CTS also offers a self-help library containing books, audiotapes and video tapes on topics as self-esteem, relationships, addictions, and emotional well-being. All services are free and confidential. Old Main 200J, 621-7595.

The Testing Office provides most out-of-class testing services needed by students at The University of Arizona including Math Readiness Testing for entering students, national and state qualifying exams (PPST, GRE, LSAT, GMAT, MCAT, ACT, and others) as well as preparation courses for some of these exams, College Level Examination Programs (CLEP) which may be taken to earn credit by examination in 40 subject areas, and Vocational Interest Testing to assist students in planning their majors. Old Main 223, 621-7589.

CAREER SERVICES—The Career Services Department provides a comprehensive career development and placement program for students and alumni. Through workshops, counseling, and a variety of programming, the staff assists individuals with their needs regarding career and life planning, part-time and seasonal survival jobs, career-related experience, as well as permanent professional employment.

Career Development services include a resource library housing videotapes, printed occupational and job hunting materials, and employer information; computerized DISCOVER and SIGI guidance programs; a career course; career guidance workshops; and career counseling. An annual Career Week, held in September signals the start of the recruiting season and allows students and employers to meet informally.

The Job Center has hundreds of part-time and seasonal opportunities for students, their spouses, and alumni. Over 1400 employers list on- and off-campus positions annually.

A Cooperative Education program is available for students who want to secure paid, career-related experience prior to completing their degree. Work assignments are made with nationwide employers during the semester and/or summer. While students are away from campus working, the Co-op Office maintains their enrollment active with the University, and assists them with university-related business.

Placement assistance is provided through workshops on job search strategies including resume and cover letter writing and interviewing techniques; a mock interviewing program; and on-campus recruiting. Over 450 businesses, government agencies, and school districts interview candidates for permanent positions each year. Old Main 106, 621-2719.
Center for Disability Related Resources (CDRR)

Center for Disability Related Resources (CDRR) is located at 1277 N. 4th Avenue. The CDRR is designed to provide a referral service to people who are disabled and to provide them with information and resources that may be available to them. The CDRR is also designed to provide a support network for people who are disabled and to provide them with assistance in accessing community resources.

The Summer Programs

The Summer Program at the University of Arizona offers a variety of classes and activities for students. These classes and activities are designed to help students prepare for the upcoming school year, to help them get a taste of what college is like, and to help them develop skills that will be useful in their future careers.

American Student Affairs

American Student Affairs (ASA) is located in Old Main, 1st Floor, Room 201. ASA provides a variety of services to students, including academic advising, career counseling, and personal and health services. ASA is also responsible for organizing and coordinating a variety of events and activities for students.

The Office of Minority Student Affairs (OSMA)

The Office of Minority Student Affairs (OSMA) is located in the Administration Building, 4th Floor, Room 203. OSMA provides a variety of services to minority students, including academic advising, career counseling, and personal and health services. OSMA is also responsible for organizing and coordinating a variety of events and activities for minority students.

POLICIES AND SERVICES

The University of Arizona is committed to providing a safe and healthy environment for all students, faculty, and staff. To this end, the university has established a number of policies and services to ensure the health and safety of its community.

The Admissions Office

The Admissions Office is located in the Administration Building, 1st Floor, Room 201. The Admissions Office is responsible for processing applications for admission to the university, as well as for providing information about the application process and the requirements for admission.

The Financial Aid Office

The Financial Aid Office is located in the Administration Building, 2nd Floor, Room 203. The Financial Aid Office is responsible for processing applications for financial aid, as well as for providing information about the financial aid process and the requirements for financial aid.

The Office of Student Affairs

The Office of Student Affairs is located in the Administration Building, 3rd Floor, Room 205. The Office of Student Affairs is responsible for providing a variety of services to students, including academic counseling, personal counseling, and health services.

The University Police

The University Police is located in the Administration Building, 4th Floor, Room 207. The University Police is responsible for maintaining the safety and security of the university campus, as well as for providing assistance to students, faculty, and staff.

The Student Health Center

The Student Health Center is located in the Administration Building, 2nd Floor, Room 209. The Student Health Center is responsible for providing a variety of health services to students, including medical care, counseling, and health education.

The Office of the Registrar

The Office of the Registrar is located in the Administration Building, 1st Floor, Room 209. The Office of the Registrar is responsible for maintaining the academic records of students, as well as for providing information about academic policies and procedures.

The Office of the Provost

The Office of the Provost is located in the Administration Building, 3rd Floor, Room 211. The Office of the Provost is responsible for providing leadership and direction for the academic programs of the university, as well as for overseeing the development of new academic programs.

The Office of the President

The Office of the President is located in the Administration Building, 4th Floor, Room 213. The Office of the President is responsible for providing leadership and direction for the overall operations of the university, as well as for overseeing the development of new programs and initiatives.

The University of Arizona

The University of Arizona is located in Tucson, Arizona. The university is committed to providing a high-quality education to its students, as well as to providing opportunities for research and for the dissemination of knowledge.

The University of Arizona is a public research university that offers a wide range of academic programs, including undergraduate and graduate programs in a variety of fields. The university is also committed to providing opportunities for students to pursue research and to engage in service learning and community outreach.

The University of Arizona is a land-grant institution, and it is one of the 20 largest universities in the United States. The university is also a member of the University of Arizona System, which includes the University of Arizona, Arizona State University, and the University of Arizona Health Sciences.

The University of Arizona is a member of the Association of American Universities (AAU), which is an organization of the leading research universities in the United States. The AAU is committed to advancing research and to providing opportunities for students to pursue research.

The University of Arizona is also a member of the Western Association of Universities and Colleges (WASC), which is an independent regional accreditation body. The WASC is committed to advancing research and to providing opportunities for students to pursue research.

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Center for Off-Campus Students

The Center for Off-Campus Students introduces off-campus students to the academic, social, cultural, and recreational programs available through the University. It also serves as a bridge linking off-campus students to the many on-campus resources supported through the Student Affairs Division such as career planning, tutoring, counseling, and leadership development. Involvement and interaction with other off-campus students are promoted and encouraged. Location: Student Union, Rooms 101, 105.

Helpline

Supported by ASUA, this service is designed to help people help themselves by providing them with resources upon which they can draw. Helpline is located on the second floor of the Student Union in Room 209A and can be contacted at 621-1000 for crisis help and referral.

CLINICAL SERVICES

The Student Health Service

The Student Health Service helps students maintain their physical and mental health, and is a campus resource for counseling on health problems. Regularly enrolled students become eligible for care at the beginning of the semester for which registration fees have been paid. Continuing students and those registered during the spring semester but not registered for either, or both, summer sessions may become eligible upon payment of the Optional Eligibility Fee. Every student born after December 31, 1956, must submit proof of having been administered measles and rubella vaccines since 1980. These vaccines are available at the Student Health Center for a charge. Additionally, every student is requested to complete a Health Evaluation Form (which includes other immunizations) during their initial visit to the Health Center.

SERVICES—In general, the services available at the Student Health Center approximate those of the family physician. The Student Health Service offers an essentially prepaid plan of limited, defined benefits. Charges are made for laboratory tests, x-ray services, physical therapy, special clinics and for prescriptions filled at the Student Health Service pharmacy. Charges may be paid at the Student Health Service Business Office before 5:00 p.m. on the day they are incurred or will be automatically added to your university account and must then be paid at the Bursar's Office. Visa and MasterCard are accepted. During regular school sessions, general medical care is provided; however, the Student Health Service is unable to provide all services during summer sessions, spring break and semester breaks. The Student Health Center is closed on weekends and university holidays.

Special clinics available at the Student Health Center include orthopedics, dermatology, allergy, immunization, sports medicine and minor surgery. Chronic and pre-existing illnesses, as well as problems requiring complex therapeutic and rehabilitative care, may require outside consultation and referral to the local medical community. In such cases, where services exceed the benefits of the prepaid program, the cost must be assumed by the student. Occasionally, an illness involving hazard to self or others may require temporary withdrawal from the University.

MENTAL HEALTH—The Mental Health Section of the Student Health Service is a voluntary, confidential counseling service open to all students who are eligible for care at the Student Health Service. The Mental Health Section offers skill-building workshops to promote positive, active mental health, as well as short-term individual, couple and group therapy.

HEALTH PROMOTION AND EDUCATION—Health educators and student peer educators are available for individual counseling and group presentations on sexuality, nutrition, fitness, alcohol and other drugs, and other health and wellness topics. Health Promotion also maintains a Wellness Outpost in the Student Recreation Center. Drop-in services include body composition, fitness and nutrition analysis, cholesterol screening and blood pressure checks. Stop by our lobby for a copy of the Health Enhancement Activity Schedule which lists Student Health Service support groups, skill-building workshops and classes.

INSURANCE—A supplemental health insurance plan for students is available to those regularly enrolled at the University who meet eligibility requirements. Since these requirements are subject to change, check with the Student Health Service to verify your eligibility. This insurance is not required for services at the Student Health Center, but is intended to help offset direct cost of extended medical care.

MEDICAL RECORDS—The relationship between a Student Health Service clinician and a student is a personal one and professional confidence is carefully maintained. Release of information may be obtained only by specific written authorization from the student concerned.

Speech-Language and Hearing Clinics

Located in the Speech Building on the main campus, the clinics function both as a service center for persons with communication difficulties and as a training site for graduate students under supervision in the Department of Speech and Hearing Sciences. Both clinics are committed to the provision of quality and state-of-the-art service. The program is accredited by the Education Standards Board of the American Speech-Language-Hearing Association.

Both clinics offer a full array of services to students, staff and faculty at The University of Arizona and to both children and adults in the community. The Speech-Language Clinic offers evaluation and remediation of articulation, language, voice, including abnormalities in quality, pitch, or loudness, and fluency (stuttering) disorders, as well as accent and dialect reduction. Individual and group therapy sessions are offered. Specialized instrumental testing is available.

Services in the Hearing Clinic include assessment of hearing; selection and dispensing of hearing aids; training in use of amplification; counseling relative to alternate communication devices; as well as procurement of earmolds and maintenance of amplification systems.

For information regarding fees, consult the Speech-Language and Hearing Clinics. The clinics may be reached at 621-7070.

STUDENT UNION MAIL ROOM

Students living in campus dormitories will be assigned a Student Union mail box after being assigned to a dorm. Returning residence hall students who had Student Union boxes in the spring semester will have them automatically reserved for the next year only by paying their residence hall deposit before July 1 and checking in with the Student Union Mail Room. Any student who has not been given residence hall assignments before coming to the University and whose local address is uncertain, should have his or her mail directed to General Delivery, Main Post Office, Tucson, Arizona, 85710, until a definite residence is determined. Immediately after the student has established a definite residence, he or she should send change-of-address cards to all individuals and organizations from which he or she may expect to receive mail. These cards are available at the Student Union Mail Room. There are a limited number of boxes available to rent to students who live off campus. These must be applied for in person at the Student Union Mail Room.

United Parcel Service (UPS) deliveries should be addressed directly to the student's hall of residence.

THE UNIVERSITY LIBRARIES

The University Library system contains almost 9,000,000 items, including books, periodicals, microforms, maps, government publications, manuscripts, and nonbook media. Basic holdings cover all fields of instruction, and there are especially strong collections in anthropology, geology, arid lands, Spanish and Latin American language and literature, American agriculture, southwestern American, Arizona, 20th century photography, history of science, science fiction, and 16th and 17th century British and American literature. The library is a member of the Center for Research Libraries and the Association of Research Libraries. The library is also a member of the AMIGOS Bibliographic Network and through that and other agencies can borrow materials for student and faculty research on interlibrary
ARCHITECTURE LIBRARY—This specialized library houses a collection with emphasis on the topics of design, architectural history and theory, building technology, and desert architecture and design communications, including over 14,000 cataloged volumes, 120 periodicals and over 27,000 slides for architecture faculty use. This library is open to the University community and general public on a reference basis.

Housing Facilities, Student Conduct and Campus Life

HOUSING FACILITIES

The University recognizes the importance of residence hall living as an integral part of the total educational program. The residence halls provide a living/learning environment that reflects responsible citizenship and concern for others and offers opportunities for individual growth and development. A broad range of programs is offered in the residence halls which provide opportunities to form friendships, heighten self-awareness, increase autonomy and broaden perspectives on the world. Integral in a community living environment are community standards of behavior. Students who choose the option of living in a residence hall are expected to conform to the community standards.

The residence halls are fully staffed by live-in personnel. The hall directors and resident assistants are skilled in all facets of community living. Students should feel free to seek assistance from a staff member on any type of problem or question which may arise. Faculty fellows are also available in several halls to serve as academic resources for residents.

Residence Hall Facilities

Twenty residence halls are clustered in four separate residential communities on campus and offer a variety of living options to approximately 5,000 students. The options include both single-sex halls and co-ed halls; various locations; a range of rental rates and a variety of architectural styles.

Rooms in the residence halls are completely furnished. Students are requested not to bring additional furniture with them but do need to provide their own pillows, blankets, sheets, pillowcases, bedspread and towels. Students care for their own rooms. Custodial service is provided for other portions of the halls.

Six residence halls are accessible for wheelchairs and have other special equipment for disabled students: Cochise, Coconino, Corleone, Yuma, Hopi, and Yavapai. All halls are wheelchair accessible into the lobby/lounge area and main floor areas.

RESIDENCE HALL AGREEMENT AND OCCUPANCY OF ROOMS—All students applying for a residence hall are required to sign a Residence Hall License Agreement for the full length of the term for which application is being made. The occupancy agreement terms are concurrent with the regular university academic sessions. Students may apply for the academic year; spring semester only and/or one or all of the summer sessions. Exceptions to the occupancy requirements are provided in the terms and conditions of the Agreement.

The rental rate does not cover occupancy during the Christmas recess. All halls are closed during the Christmas recess with the exception of International House, Sun Terrace, Corleone, and Babcock. All halls are kept open for students during the Thanksgiving and spring recesses. Additionally, limited facilities are available to continuing students, at additional charge, during periods between the beginning and end of the academic years and the summer sessions.

Only the students assigned to a specific room may occupy that room. Room changes within a hall must be approved in advance by the hall director of that hall. When necessary, students may be required to move to another room to consolidate unassigned space or exercise the option of occupying unassigned space in their room at additional cost. Students may transfer from one residence hall to another only with advance approval from the Department of Residence Life.

The University reserves the right to change the residence of any student, or to deny or cancel accommodations in cases where such action is deemed desirable.
Students are required to vacate their rooms and check out of the hall within 24 hours after their last final exam, withdrawal, suspension, academic disqualification or dismissal from the hall.

**RESIDENCE HALL RESERVATION**—In order to apply for a residence hall room, the student must first be officially admitted to the University. Accompanying the notification of admission is the Residence Hall License Agreement, Terms and Conditions of that Agreement and description with rental rates of the halls. Students desiring a reservation should complete the application/agreement form and return it with the required deposit to the Department of Residence Life. Do not send cash. The University cannot be responsible for any cash deposits sent through the mail. Make checks payable to the University of Arizona. Room deposits may not be submitted until notice of admission is received from the Admissions Office. The room deposit, in addition to being a guarantee against cancellation of housing application, applies against damage or loss to university property or to other debts to the University. It does not apply to the rent. The deposit is refunded when a student leaves the residence hall, if all charges for loss or damage and debts to the University have been paid.

Notification of residence hall assignments for the fall is mailed to applicants beginning mid-April. Failure to provide required deposit confirmation payment within two weeks of assignment notification will result in cancellation of reservation and forfeiture of deposit. Demand may exceed available space; therefore, immediate application upon admission is encouraged. Priority for assignment is based on the date the Residence Hall Agreement and deposit are received by the Department of Residence Life.

Residence in halls is ordinarily restricted to students registered for 12 or more units of regular university work and is not open to noncredit, nondegree, or correspondence students. Exceptions must be approved by the Department of Residence Life.

**Christopher City Apartments**

The University of Arizona operates the Christopher City Apartments for students with families and single students, and University faculty and staff. The 418 apartments are conveniently located in northeast Tucson about a 15-minute drive from campus. Most apartments offer a breathtaking view of the nearby Santa Catalina Mountains.

The city bus system provides a direct line between campus and Christopher City that runs frequently. Monthly and semestersely bus passes are available at discounted rates. Recreational and educational sites are in nearby State Parks. Grocery stores, postal services, a public park, a YMCA and the elementary school are some of the services located within a one-and-a-half-mile radius of the complex.

Children attend schools in TUSD #1. Christopher City is a unique and diverse community of cultures that provides family support and a safe environment. The complex features a state-licensed cooperative preschool for children ages 2-5. A 24-hour staff is on site to assist you or your family. Ample parking, 24-hour laundry facilities, and spacious play areas are enjoyed by all residents. The community center is the focus of activities for residents and includes meeting rooms, study rooms, a weight room, a lounge/game room, and a 70-foot pool and wading pool.

All apartments are single-story with a patio and garden area. Apartments include window coverings, electric appliances and garbage disposal, and carpeting. Furnished or unfurnished apartments are available. Monthly rent includes the cost of air conditioning, heat, and water. For current rates on specific apartment types, please contact the Christopher City Apartments Office. Pets are not permitted in the complex.

For an application or further information about Christopher City, contact: Christopher City Apartments, 3401 N. Columbus Blvd., Tucson, Arizona, 85712, (602) 327-5918.

**Housing Off the Campus**

Listings of off-campus housing are available in the Associated Students office (above the Bookstore) through the ASUA Tenant’s Association. Numerous listings are also given in Tucson’s daily newspapers.

**Change of Address**

It is the student’s responsibility to keep the University informed at all times of his or her current Tucson address. Change-of-address forms are available in the Office of Student Information, Registration and Records.

**The University Cafeteria**

The University operates numerous dining facilities in the Student Union Memorial Building, as well as a dining hall located in the Park Student Center on the corner of Fifth Street and Park Avenue.

The University reserves the right to prescribe rules under which its students shall board in the University cafeteria, with private families, in fraternity and sorority houses, or elsewhere, whether these rules are or are not published in the General Catalog.

**STUDENT CONDUCT**

**General Responsibility**

When a student accepts admission to The University of Arizona, the University assumes that the student thereby agrees to conduct himself or herself in accordance with its community standards. The University reserves the right, on the recommendation of the Dean of Students and with the approval of the President, to terminate at any time the enrollment of a student who violates these standards. Evidence of unsatisfactory citizenship may be an overt violation of a specific standard, or social behavior that is not acceptable.

For a detailed statement of university regulations, refer to the Student Code of Conduct and the Rules for the Maintenance of Public Order.

**Use of Narcotic Drugs**

The University provides information required under the Drug Free Schools and Communities Act of 1989. This information appears each semester in the Schedule of Classes. The use by a student, or the sale, possession, or giving as a gift by him or her of narcotic drugs, sedatives, stimulants, psychotherapeutic drugs, psychodelic agents of any variety, prescription drugs other than as may be prescribed by a physician for the student’s individual use, or of any of the foregoing in violation of federal or state law, is incompatible with and inimical to the social, health, and safety standards and educative purposes of the University, and shall be cause for disciplinary measures, including suspension or expulsion, regardless of action or inaction by civil authorities with respect to violations of the law above mentioned.

**Use of and Conduct upon University Property**

The grounds and properties of the three universities of the State of Arizona are owned by the state through the Arizona Board of Regents for the use and benefit of the respective institutions. Such properties are devoted to and maintained for the sovereign function of supplying higher education to the people, and are not places of unrestricted public access.

Neither the State nor the Board is obligated to furnish or supply in such grounds and properties a forum or locale for the commission of crime, disorders, violence, injuries to persons or property, or the incitement or encouragement thereof, or any conduct or activity whatsoever which will interfere with or is harmful, disruptive, or inimical to the educative function aforesaid.

Accordingly, in the light of the foregoing and in the exercise of the jurisdiction and control vested in it by law, the Arizona Board of Regents has formally adopted and promulgated the following ordinance and regulation:

No person or persons may enter upon the grounds, buildings, roadways, or properties of the University of Arizona, Arizona State University, or Northern Arizona University, nor may a person or persons there be or remain, for the purpose of or in the actual or threatened commission of, any one or more of the following: a breach of the criminal laws (state or national); violent, obscene, or disorderly conduct; injury to or destruction of property; interference with free access, ingress, or egress; injury to person or persons; seizure or exercise of unpermitted control of properties of the institution; trespass; conduct harmful, obstructive, or disruptive to, or which interferes with, the educational process, institutional functions, contractual arrangements, or the public peace and tranquility; conduct likely to foment uproar or violence; or the
incitement, support, encouragement, aid, or abetment of any or all of the foregoing.

Access to, enjoyment of, and presence upon or within the areas aforesaid are conditioned upon compliance with the foregoing ordinance and regulation. Any and all persons not in compliance with the foregoing, or in threatened or actual violation thereof, will be denied entry to or upon such areas, or will be evicted therefrom, as the case may be. More specific details regarding conduct appropriate to a university campus are found in the separately published Student Code of Conduct and Rules for the Maintenance of Public Order.

CAMPUS LIFE

Parking and Transportation

Parking and Transportation Services (PTS) is committed to helping the University community by offering a comprehensive program of transportation services. PTS strongly encourages the use of transportation alternatives, such as buses and bicycles, to preserve the campus environment, improve air quality in Tucson, and because there is a high demand for parking and a limited supply of space on campus. PTS also encourages prospective students to contact its office prior to enrollment so it can provide assistance on transportation alternatives available to students.

BICYCLES—Parking and Transportation encourages safe, courteous bicycling. Its programs are designed to emphasize safety and education. Designated bicycle parking areas are provided around residence halls and all other campus buildings. Additionally, paths are provided for bicyclists. Bicycle riding is prohibited on sidewalks and at other signed areas. Free bicycle registration is available Monday through Friday (excluding University holidays) at Parking and Transportation Services, Alternative Modes Division, 1516 E. Sixth Street, 8:30 A.M.–4:30 P.M. Registering a bicycle is a proven deterrent to theft by providing a means of identification. Registration also helps to identify lost or stolen bicycles and is necessary for some insurance claims.

CITY BUSES—The bus pass program is designed to encourage public transit instead of automobile usage. Parking and Transportation Services offers special discounted semester or annual bus passes during the months of January and August (some restrictions apply). If the sales campaign has ended before your arrival on campus, monthly and twenty-rider bus passes are available year round at the Parking Permit Office and Sam’s Place located in the Student Union. Take advantage of this inexpensive and convenient alternative to parking problems. For more information, call (602) 621-1800.

MOTORCYCLES/MOPEDS/MOTORBIKES—Parking and Transportation encourages you to use this mode of transportation by providing convenient parking locations around campus. Parking permits are required. Please call (602) 621-3137 for more information.

MOTORIZED VEHICLES—Students are permitted to bring motor vehicles to the University. Because campus parking permits are limited, it is recommended that new students apply for a permit as soon as they have received notification of admission. Failure to do so may result in a delay in obtaining a permit for campus parking lots. (Preference in assignments is given to continuing permit holders. Remaining permits are issued to new students and employees on a first come, first served basis.) There are several categories of parking permits offered on this campus. Fees vary based on the level of service.

Parking permits are required year round (including academic recess periods, between semesters and summer sessions) from 7:00 a.m. to 5:00 p.m., Monday through Friday, unless the lot is posted otherwise. Parking and traffic limitations may be imposed when campus parking facilities are used for special events. On these occasions notification is posted at lot entrances and informational fliers may be placed on vehicles in the affected lot. (Example: Vehicles parked near the football stadium on game days must be relocated to perimeter lots on the west side of campus.) Application materials may be picked up at Parking and Transportation Services, Permit Division. To obtain by mail, please send a self-addressed, legal-sized envelope to:

Parking and Transportation Services
Permit Office
The University of Arizona
1508 E. Sixth Street
Building 98
Tucson, Arizona 85721
(602) 621-3137

RIDESHARING—Save money on maintenance and gasoline costs by carpooling. The University provides access to a carpool match list to team you up with others who live near you. Call (602) 621-1800 for more information.

SHUTTLE SERVICE FROM DESIGNATED PARKING LOTS—The University offers a free campus shuttle as a direct link from many of the outlying parking areas on to campus. Check the shuttle stops for times of operation of call (602) 621-1800 for more information.

Eligibility for Cocurricular Activities

Cocurricular activities relate directly to and encompass membership in university-recognized student organizations and groups, professional honorary, coordinating councils, service groups, and special events and projects. Intercollegiate athletics for men and women (NCAA and PAC-10) are governed by their own standards of eligibility for participation.

UNIT REQUIREMENT—Any undergraduate student who is currently enrolled in the University, may participate in these activities. However, where specified in these activities, a student may be required to meet additional qualifications and criteria for membership or participation.

All elected or appointed officers of these activities to be eligible to hold these leadership positions must at the time of their election or appointment meet the minimum grade point of 2.0. Graduate students, work carried for graduate credit only, 3.0. To participate in cocurricular activities, students must be enrolled in the University for a minimum of seven (7) units throughout their term of office.

When a student continues in office from one semester to the next, the student must have successfully completed a minimum of 7 units the previous semester. Graduate students must be enrolled in the University for a minimum of 3 units throughout their term of office, and must have successfully completed 3 units the previous semester to continue in office from one semester to the next. For the purposes of this paragraph, satisfactory completion in the case of a course taken for undergraduate credit requires the earning of A, B, C, D, S, or P. The faculty advisor of the cocurricular activity or organization shall review and confirm the above stated requirements for the elected or appointed persons at the time of any election or appointment and forward this written confirmation to the chairperson of the Cocurricular Activities Review Committee.

Exceptions to these provisions must be approved by a review committee made up of three students appointed by the President of the ASUA and three faculty members appointed by the Vice President for Student Affairs. More specific details regarding eligibility are found in the Student Handbook.

INTERCOLLEGIATE ATHLETIC POLICY—Intercollegiate athletics are sponsored primarily as an aid to the educational purposes of the University. Full control of all phases of this program remains with and is administered by the faculty and staff of the University. Students participating in athletics must have conformed to normal entrance requirements and must maintain acceptable progress toward a college degree.

Requirements for participation in and regulations covering conduct of intercollegiate athletics are administered under standards set by the Arizona Board of Regents, the National Collegiate Athletic Association, and the Pacific-10 Conference.

Scholarships awarded to properly qualified students who participate in athletics are administered by a committee of the Office of Student Financial Aid under standards applying to all such awards. All funds for the support of the athletic program, regardless of source, are ac-
counted for by the University Comptroller and are included in the annual audits.

Associated Students

The student body is organized under the title, Associated Students of the University of Arizona (ASUA). The purpose is to enable students to assume the privileges and responsibilities of self-government, and the direction and management of student activities and enterprises. Governing authority of the association is vested in the Student Executive Council, the Senate, and the Student Courts.

The functions of the ASUA are classified under publications, activities, committees, special events, and operations.

Official publications of the Associated Students are the Arizona Daily Wildcat (newspaper), the Desert (yearbook), Summer Wildcat (summer newspaper), Student Handbook, Campus Calendar, Student and Faculty-Staff Directory, and the Renters' Handbook.

Just a few activities receiving financial support from the Associated Students through the ASUA Senate are: the debate team, moot court team, the Army and Air Force ROTC Drill Teams, Camp Wildcat, Helpline, the African American Student Alliance, Movimiento Estudiantil Chicano de Aztlan, the Amerind Club, and various international-student organizations. Examples of sports clubs receiving financial support include rodeo, soccer, lacrosse, and bowling.

Student government acts as a liaison and communications vehicle with students, faculty, administration, regents, and legislature through the following programs and services: Speakers Board, Spring Fling, Concerts, Voter Action, Public Affairs, Escort Service, Legal Aid, Student Health Advisory Committee, Switchboard, Academic Affairs, Graduate Student Association, Inter Club Council, Student Honor Action Council, Scholarship Committee, Tenants Association, and Women's Center.

The ASUA Executive Council appoints students to several all-university committees such as Campus Community Relations, Cultural Events, Parking and Traffic, and Registration Procedures.

Office of Student Activities and Organizations

The Office of Student Activities and Organizations is responsible for the planning, promotion and implementation of a number of cocurricular activities. These include the following areas: The Office of Greek Life, which manages fraternities and sororities; Family Weekend activities; and organization administration, which includes registration and recognition.

Additionally, this office coordinates the Project Volunteer Program and the Student Leadership Development Program, which includes peer leadership activities, retreats, skill building workshops and academic course work.

The office also provides advising to ASUA programs and services, including concerts and Spring Fling, Opening of school social activities, known as Discovery Days, are also planned and coordinated by this office.

Fraternities and Sororities

Fraternity and sorority membership is an adjunct to a university education. It takes over where the University's role leaves off in the classroom. It is an experience in living together and sharing maintenance, self-government, and personal relations in a community that profits socially and intellectually. In addition, fraternities and sororities offer opportunities for leadership, campus participation, community involvement and involvement as alumni/alumnae. They organize the social lives of their members to promote their educational objectives. Mutual selection based upon congeniality and common purposes forms the basis for these organizations. The University of Arizona recognizes the need for the total growth of the individual during his or her academic experience and, therefore, has made a strong commitment to organized activities such as social fraternities and sororities. These groups are considered university-recognized student organizations and, therefore, are subject to policies and regulations set by the University for recognized clubs and organizations.

FRATERNITIES—Alpha Epsilon Pi, Alpha Gamma Rho, Alpha Kappa Lambda, Alpha Phi Alpha, Alpha Tau Omega, Beta Theta Pi, Delta Chi, Delta Tau Delta, Kappa Alpha Order, Kappa Alpha Psi, Kappa Sigma,

Lambda Chi Alpha, Omega Delta Phi, Phi Delta Theta, Theta Gamma Delta, Phi Kappa Psi, Pi Kappa Alpha, Sigma Alpha Epsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Tau Kappa Epsilon, Zeta Beta Tau.

SORORITIES—Alpha Chi Omega, Alpha Delta Pi, Alpha Epsilon Phi, Alpha Kappa Alpha, Alpha Omicron Pi, Alpha Phi, Chi Omega, Delta Delta Delta, Delta Gamma, Delta Sigma Theta, Gamma Phi Beta, Kappa Alpha Theta, Kappa Kappa Gamma, Pi Beta Phi, Sigma Delta Tau, Sigma Kappa, Zeta Tau Alpha.

Honor Societies, Professional and Other Organizations

SCHOLASTIC HONOR SOCIETIES

Alpha Chi Sigma - Chemistry
Alpha Zeta - Agriculture
Beta Alpha Psi - Accounting
Beta Gamma Sigma — BPA
Gamma Sigma Delta - Agriculture
Honors Student Association
Kappa Delta Pi — Education
Omicron Nu - Family and Consumer Resources
Phi Beta Kappa - Liberal Arts and Sciences
Phi Delta Kappa — Education
Phi Eta Sigma - Freshman Men
Phi Kappa Phi - All Colleges
Pi Lambda Theta — Education
Pi Omega Pi - Business Education
Pi Sigma Alpha - Political Science
Sigma Delta Pi - Spanish
Sigma Theta Tau
Tau Beta Pi - Engineering

PROFESSIONAL ORGANIZATIONS

Agricultural Business Club
Alpha Epsilon Delta - Premedical
Alpha Kappa Psi - BPA
Alpha Tau Alpha - Agricultural Education
American Home Economics Association
American Institute of Architects
American Institute of Chemical Engineers
American Institute of Industrial Engineers
American Institute of Mining, Metallurgical and Petroleum Engineers
American Marketing Association
American Medical Student Association
American Nuclear Society
American Pharmaceutical Association
American Society of Agricultural Engineers
American Civil Engineers
American Society of Interior Designers
American Society of Landscape Architects
American Society of Mechanical Engineers
American Water Resources Association
Angel Flight
Animal Sciences Graduate Students
Anthropology Club
Arizona Association of Student Nurses
Arnold Air Society
Associated Students of Agricultural Engineering and Agricultural Mechanics
Audio Engineers Society
BPA Student Council
Black Engineering Science Students Today
College of Agriculture Student Council
Coordinated Council of Nursing Students
Cosmopolitan Club
Fashions Dimensions Club
Featherless Bipeds (Philosophy)
Food Science Club
Higher Education Students Organization
History Graduate Association
Kappa Beta Pi - Law, Women's Association  
Kappa Psi - Pharmacy  
Lambda Alpha Beta  
Library Students Association  
Linguistics Circle  
MBA Student Association  
Management Information Systems Association  
Minority Pre-Law Association  
Movimiento Estudiantil Chichano de Aztlán (M.E.Ch.A.)  
Muslim Student Association  
Natural Resources Student Association  
Personnel Club  
Phi Alpha Theta  
Phi Beta Lambda  
Phi Chi Theta  
Phi Delta Chi - Pharmacy  
Phi Delta Phi - Law, Men  
Pi Alpha Alpha  
Pi Lambda Theta - Education  
Plant Pathology Club  
Pre-Veterinary Science Club  
Public Administration Students Association  
Recreation Club  
Sigma Alpha Lota - Music, Women  
Sigma Delta Chi - Journalism  
Society for Range Management  
Society of Automotive Engineers  
Society of Criminal Justice  
Society of Physics Students  
Society of Professional Journalists  
Society of Reliability Engineers  
Soils Club  
Student Chapter of the Wildlife Society  
Undergraduate Geology Club  
University of Arizona Dietetics Club  
University of Arizona Student Nurse's Association

DEPARTMENTAL ORGANIZATIONS—A number of university departments have organizations, some open to all students taking courses in the department, some limited to majors in the department, and some with only elected membership.

STUDENT LEADERSHIP AND SERVICE SOCIETIES

Arizona Allegiance  
Arizona Ambassadors  
Blue Key - Seniors  
Bobcats - Seniors  
Chain Gang - Juniors  
Chimes - Juniors  
Circle K Club  
Hosts and Hostesses  
Mortar Board - Seniors  
Optimi  
Order of Omega - Fraternity/Sorority members  
Phi Lambda Theta  
Preludes - Freshman  
Primus - Freshman  
Sophs - Sophomores  
Spires - Sophomores  
Student Alumni Association  
Wranglers - Undergraduates

Religious Activities

Organizations on the campus which are designed to foster the spiritual, intellectual, and social interest of various religious faiths or denominations are: Ambassadors for Christ, American Baptist Campus Ministry, Arizona Student Pagans, Bahá'í Community of Tucson, Baptist Student Union, Beal Center, Campus Christian Center, Campus Crusade for Christ, Chabad Student Organization, Chi Alpha, Christian Science Organization, Christians in Action, the Church of Jesus Christ of Latter-Day Saints, Episcopal Campus Ministry, Fellowship of Christian Athletes, Graduate Christian Fellowship, Hillel Jewish Student Organization, Humanists, Inspiration, International Student Fellowship, Intervarsity Christian Fellowship, Islamic Center at Tucson, Latter-Day Saint Student Association, Little Chapel of All Nations, Lutheran Campus Ministry, Muslim Students Association, Newman Catholic Student Center, Nichiren Shoshu of America, Quaker University Organization, Sikh Dharma, Student International Meditation Society, Student Satsangs, Unitarian Universalists, United Campus Christian Ministry, United Methodist Campus Ministry, Wesley Foundation and the Wildcats for Christ. For further information please contact the respective organization.

Special Cultural Opportunities

UNIVERSITY ARTIST SERIES—The University of Arizona Artist Series has become the pacesetter for diversified programs in music, dance, and theatre with outstanding national and international artists and companies. The programs provide a unique opportunity for the entire student body to experience more deeply the fine arts, and supplement regular instruction for students working more directly with music, dance, and drama. The programs also serve as a cultural outreach to the Tucson community and surrounding area, often providing master classes and special workshops in addition to the performances.

The programs are consistent with the University's overall goals of higher education. Special ticket arrangements are available for the regular student body (all students registered for at least seven units). Dates are carefully coordinated with other activities on campus and allow for selective special events throughout the season.

UNIVERSITY OF ARIZONA MUSEUM OF ART—The museum presents a continuous series of temporary exhibitions that complement the museum's excellent permanent collection which spans the Middle Ages through the 20th century. (For further information, see the Divisions of Research and Special Public Service section.)

ARIZONA STATE MUSEUM—Open to students and the public. Prehistoric and recent Indian cultures of Arizona and the Southwest are interpreted through permanent exhibitions. Special temporary exhibitions are presented throughout the year.

THE UNIVERSITY OF ARIZONA POETRY CENTER—A 1960 gift of Ruth Stephan, the rapidly growing poetry collection numbers over 22,000 items, has an extensive collection of literary magazines and poetry readings on tape, and is available daily for use by students, faculty and the community. The collection includes poetry of all ages and various nations, with emphasis on contemporary poetry in English. It also includes books about poetry and poets. The Poetry Center regularly sponsors campus readings by nationally known poets and writers.

THE ANNIE W. RIECKER LECTURESHIP FOUNDATION—Established in 1953 by Mrs. Eleanor Riecker Ritchie as a memorial to her mother, the original endowment of $10,000 has been increased by the contribution of a friend of the University to a total of $15,000. The income provides for one lecture during each academic year, delivered by a visiting speaker approved by the Board of Regents. The subject of the lecture is one of interest to the faculty and student body but not a part of any formal university course. The first Riecker Memorial Lecture was delivered during the academic year 1954-55.

DRAMA SERIES—The Department of Theatre Arts offers a University Theatre Season each year. The Mainstage Series presents classical, contemporary and musical theatre productions showcasing versatile theatre artists which are an integral extension of the educational process. The Studio Series is primarily an outlet for student talent with an eclectic repertoire designed to promote the professional growth of the students.

MUSIC SERIES—The School of Music offers a wide range of special programs throughout the year, many of them free to the public. Concerts by university orchestras, bands, choirs, and jazz ensembles are held in Centennial Hall, while faculty and student solo and chamber recitals as well as smaller ensemble concerts are held in Crowder Hall. Selected concerts by guest artists and opera productions by the School of Music's Opera Theatre are offered at a nominal cost to all students and faculty.
Through special arrangements with the University, the following organizations offer programs of interest to faculty and students periodically throughout the year:

ARIZONA EARLY MUSIC SOCIETY — Sponsors concerts by ensembles and soloists performing medieval, Renaissance, and Baroque music.

ARIZONA FRIENDS OF MUSIC — These concerts present distinguished chamber music ensembles.

FESTIVAL IN THE SUN — The festival is a major international series of events celebrating the arts in the American Southwest.

The artistic mission of the festival is to present world-class international artists and Tucson's resident professional artists to as diverse an audience as possible, and to foster artistic initiative by commissioning new works by major artists. The festival highlights Turning Points — artists, works and/or events which have challenged the perception and course of an individual artistic discipline.

The educational mission of the festival is to provide students and the general public an opportunity to participate in a variety of educational events such as master classes, lectures, demonstrations, and workshops that are related to the artistic programming. Whenever possible, the programming is integrated into the academic life of The University of Arizona campus.

Campus Recreation

Physical fitness, recreational pursuits and social interaction are vital components of each student's education process. The Department of Campus Recreation, a unit within the division of Student Affairs, currently offers opportunities for intramurals, sports clubs, outdoor recreation, aquatics, fitness and aerobics, and open recreation.

The facilities include the newly completed state-of-the-art Student Recreation Center. The Center encompasses more than 160,000 square feet of indoor and outdoor space including two gymnasia, an indoor jogging track, 7,000 square-foot exercise room, two 3,000 square-foot aerobics/multipurpose rooms, 14 racquetball courts, 2 squash courts, 2 sand volleyball courts, and olympic-sized outdoor swimming pool, juice bar, and wellness center. The center is open from 6:00 a.m. to 12:00 midnight Monday through Friday, 8:00 a.m. to 8:00 p.m. Saturday, and 10:00 a.m. to 12:00 midnight Sunday.

Although it is the most visible component of the Department of Campus Recreation, the Student Recreation Center is only one of the facilities which include historic Bear Down Gymnasium, which houses 3 courts, weight room and bicycle shop; Park Fitness Center with aerobics area and weight room; Bear Down Field; Wildcat Fields; and the newly constructed Fifth Street Park, which houses 2 sand volleyball courts, concert area and grass area for informal recreation.

The Department of Campus Recreation offers a wide variety of organized and informal activities to students, faculty and staff. The intramural program includes competitive activities in 26 sports for men, 25 sports for women, and 8 coeducational activities.

The Outdoor Adventures Program offers a wide variety of recreational trips such as alpine and cross-country skiing, hiking, biking, cave exploring, and scuba diving. The center also offers an equipment rental and resource center where students can rent backpacking and hiking equipment, tents, portable volleyball sets and a myriad of other equipment.

The Student Recreation Center is the home for University Sports Clubs. There are currently 46 sports clubs ranging from such diverse sports as rugby and hockey, to table tennis, hiking and a variety of martial arts clubs.

Informal recreation is also a vital component of campus life. Opportunities for pick-up basketball, volleyball and other activities are available, as well as numerous weight rooms, a jogging track, PAR course, field space, and others.

Information about any of these programs can be obtained at the Department of Campus Recreation offices, Student Recreation Center, 1400 East 6th Street; or by calling 621-4709.

Intercollegiate Athletics

The Intercollegiate Athletics Department at the University of Arizona conducts a challenging program in 8 sports for men and 9 for women: baseball (M), basketball (M/W), cross country (M/W), football (M), golf (M/W), gymnastics (W), softball (W), swimming and diving (M/W), tennis (M/W), track and field (M/W), and volleyball (W). The University is a member of the NCAA, and both the men's and women's programs are conducted under NCAA rules and participate in NCAA championships.

The University of Arizona is a member of the Pacific-10 Conference. In addition to the men's and women's teams from the University of Arizona, the conference includes Arizona State University, University of California at Berkeley, University of California at Los Angeles, University of Oregon, Oregon State University, Stanford University, University of Southern California, University of Washington, and Washington State University.

The President of the University appoints an advisory committee on intercollegiate athletics, which consists of the Director of Athletics, the faculty representative to the NCAA, members of the faculty, alumni members, and students.
Major Fields for Bachelor’s Degrees

Major work leading to a bachelor’s degree is offered in each of the following fields:

- accounting
- aerospace engineering
- agricultural & biosystems engineering
- agricultural & biosystems technology
- agricultural economics
- agricultural education
- agriculture (general)
- agronomy
- animal sciences
- anthropology
- architecture
- art education
- art history
- art (studio)
- astronomy
- atmospheric sciences
- biochemistry
- biology (general)
- business administration
- business economics
- chemical engineering
- chemistry
- civil engineering
- classics
- communication
- computer engineering
- computer science
- creative writing
- criminal justice administration
- dance
- dramatic theory
- early childhood education
- earth science*
- East Asian studies
- ecology & evolutionary biology
- economics
- electrical engineering
- elementary education
- energy engineering
- engineering mathematics
- engineering physics
- English
- entomology
- entrepreneurship
- exercise sciences
- extended English*
- family studies
- finance
- fine arts studies (general)
- food science
- French
- geography
- geological engineering
- geosciences
- German
- Greek
- health education
- health & human services administration
- history
- home economics (general)
- home economics education
- horticulture
- hydrology
- industrial engineering
- interdisciplinary studies
- interior design
- Italian
- jazz studies
- journalism
- Judaic studies
- landscape architecture
- language arts—social studies*
- Latin
- Latin American Studies
- linguistics
- management information systems
- marketing
- materials science & engineering
- mathematics
- mechanical engineering
- media arts
- medical technology
- merchandising & consumer studies
- Mexican American studies
- microbiology
- mining engineering
- molecular & cellular biology
- music
- (music) composition
- music education
- (music) performance
- musical theatre
- Near Eastern studies
- nuclear engineering
- nursing
- nutritional sciences
- occupational safety & health
- operations management
- optical engineering
- personnel management
- philosophy
- physical education
- physics
- plant sciences
- political science
- Portuguese
- psychology
- public management
- range management
- real estate
- regional development
- rehabilitation
- religious studies
- Russian
- Russian & Soviet studies
- secondary education**
- social studies*
- sociology
- soil & water science
- Spanish
- speech & hearing sciences
- systems engineering
- theatre arts education
- theatre production
- veterinary science
- watershed management
- wildlife & fisheries science
- women's studies

* Teaching majors only.
**Students wishing to teach at the secondary school level must select a subject area teaching major (see the College of Education section of this catalog).
## Abbreviation Guide

The abbreviations listed below are used throughout this catalog to refer to the disciplines indicated:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Full Name</th>
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</thead>
<tbody>
<tr>
<td>A.A.s.</td>
<td>African-American Studies</td>
</tr>
<tr>
<td>a.e.c.</td>
<td>Agricultural Economics</td>
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<tr>
<td>a.ed.</td>
<td>Agricultural Education</td>
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<tr>
<td>a.b.e.</td>
<td>Agricultural &amp; Biosystems Engineering</td>
</tr>
<tr>
<td>a.b.t.</td>
<td>Agricultural &amp; Biosystems Technology</td>
</tr>
<tr>
<td>A.in.s.</td>
<td>American Indian Studies</td>
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<tr>
<td>a.m.e.</td>
<td>Aerospace and Mechanical Engineering</td>
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<tr>
<td>acct.</td>
<td>Accounting</td>
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<td>agri.</td>
<td>Agriculture</td>
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<td>anat.</td>
<td>Anatomy</td>
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<td>anes.</td>
<td>Anesthesiology</td>
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<td>anth.</td>
<td>Anthropology</td>
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<td>appl.</td>
<td>Applied Mathematics</td>
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<td>art.</td>
<td>Art</td>
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<td>astr.</td>
<td>Astronomy</td>
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<td>atmo.</td>
<td>Atmospheric Sciences</td>
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<td>b.ad.</td>
<td>Business Administration</td>
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<td>Biochemistry</td>
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<td>Biophysics</td>
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<td>biol.</td>
<td>Biology</td>
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<td>ch.</td>
<td>Chemical Engineering</td>
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<td>chem.</td>
<td>Chemistry</td>
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<td>Chn.</td>
<td>Chinese Studies</td>
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<td>class.</td>
<td>Classics</td>
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<td>comm.</td>
<td>Communication</td>
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<tr>
<td>coun.</td>
<td>Counseling and Guidance</td>
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<tr>
<td>cp.lt.</td>
<td>Comparative Literature and Literary Theory</td>
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<tr>
<td>cr.l.</td>
<td>Critical Languages</td>
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<tr>
<td>dnc.</td>
<td>Dance</td>
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<tr>
<td>E.A.s.</td>
<td>East Asian Studies</td>
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<tr>
<td>e.c.e.</td>
<td>Electrical and Computer Engineering</td>
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<tr>
<td>e.m.</td>
<td>Engineering Mechanics</td>
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<tr>
<td>ecol.</td>
<td>Ecology and Evolutionary Biology</td>
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<tr>
<td>econ.</td>
<td>Economics</td>
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<tr>
<td>ed.a.</td>
<td>Educational Administration</td>
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<tr>
<td>ed.p.</td>
<td>Educational Psychology</td>
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<td>educ.</td>
<td>Education</td>
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<td>Engl.</td>
<td>English</td>
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<td>engr.</td>
<td>Engineering</td>
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<td>ento.</td>
<td>Entomology</td>
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<td>env.</td>
<td>Environment and Behavior</td>
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<td>ex.s.s.</td>
<td>Exercise and Sport Sciences</td>
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<tr>
<td>f.a.</td>
<td>Fine Arts</td>
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<tr>
<td>f.c.m.</td>
<td>Family and Community Medicine</td>
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<tr>
<td>f.c.r.</td>
<td>Family and Consumer Resources</td>
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<tr>
<td>f.s.</td>
<td>Family Studies</td>
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<td>fin.</td>
<td>Finance and Real Estate</td>
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<td>Fre.</td>
<td>French</td>
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<tr>
<td>g.e.n.</td>
<td>Geological Engineering</td>
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<td>gen.</td>
<td>Genetics</td>
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<td>geog.</td>
<td>Geography and Regional Development</td>
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<td>geos.</td>
<td>Geosciences</td>
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<td>Ger.</td>
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<td>gerontology.</td>
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<td>h.ed.</td>
<td>Higher Education</td>
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<tr>
<td>h.e.d.</td>
<td>Home Economics Education</td>
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<tr>
<td>h.p.e.</td>
<td>History and Philosophy of Science</td>
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<tr>
<td>h.r.p.</td>
<td>Health-Related Professions</td>
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<tr>
<td>h.w.r.</td>
<td>Hydrology and Water Resources</td>
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<td>hist.</td>
<td>History</td>
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<td>Health Education</td>
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<td>Honors</td>
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<td>Humanities</td>
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<tr>
<td>i.d.</td>
<td>Interior Design</td>
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<td>Medical Education</td>
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<td>Ita.</td>
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<td>Journalism</td>
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<td>Japanese Studies</td>
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<td>Jus.</td>
<td>Judaic Studies</td>
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<td>L.A.s.</td>
<td>Latin American Studies</td>
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<tr>
<td>l.ar.</td>
<td>Landscape Architecture</td>
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<tr>
<td>l.rc.</td>
<td>Language, Reading and Culture</td>
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<td>Lat.</td>
<td>Latin</td>
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<td>la.</td>
<td>Law</td>
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<td>li.s.</td>
<td>Library Science</td>
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<td>ling.</td>
<td>Linguistics</td>
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<td>m.a.p.</td>
<td>Management and Policy</td>
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<td>M.A.s.</td>
<td>Mexican American Studies</td>
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<td>m.c.b.</td>
<td>Molecular and Cellular Biology</td>
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<td>m.c.s.</td>
<td>Merchandising and Consumer Studies</td>
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<td>m.i.s.</td>
<td>Management Information Systems</td>
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<td>m.ta.</td>
<td>Military Aerospace Studies</td>
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<td>m.s.e.</td>
<td>Materials Science and Engineering</td>
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<td>Media Arts</td>
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<td>Medical Technology</td>
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<td>micr.</td>
<td>Microbiology and Immunology</td>
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<tr>
<td>mktg.</td>
<td>Marketing</td>
</tr>
<tr>
<td>m.p.</td>
<td>Mineralogy</td>
</tr>
<tr>
<td>mn.e.</td>
<td>Mining Engineering</td>
</tr>
<tr>
<td>mn.ec.</td>
<td>Mineral Economics</td>
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<tr>
<td>nurs.</td>
<td>Nursing</td>
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<tr>
<td>o.p.h.</td>
<td>Occupational Safety and Health</td>
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<tr>
<td>ob.g.</td>
<td>Obstetrics and Gynecology</td>
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<tr>
<td>oph.</td>
<td>Ophthalmology</td>
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<td>Optical Pathology</td>
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<td>pcol.</td>
<td>Pharmacology and Toxicology</td>
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<td>ped.</td>
<td>Pediatrics</td>
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<tr>
<td>ph.pr.</td>
<td>Pharmacy Practice</td>
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<tr>
<td>ph.s.</td>
<td>Pharmaceutical Sciences</td>
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<td>Pharmaceutical Sciences (College of Medicine)</td>
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<td>Plant Sciences</td>
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<td>Psychological Sciences</td>
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<td>r.n.r.</td>
<td>Renewable Natural Resources</td>
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<tr>
<td>R.S.s.</td>
<td>Russian and Soviet Studies</td>
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<td>ra.m.</td>
<td>Range Management and Radiology</td>
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<td>Russ.</td>
<td>Russian and Slavic Languages</td>
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<tr>
<td>s.a.e.</td>
<td>Special Education and Rehabilitation</td>
</tr>
<tr>
<td>s.i.e.</td>
<td>Systems and Industrial Engineering</td>
</tr>
<tr>
<td>s.w.</td>
<td>Soil and Water Science</td>
</tr>
<tr>
<td>soc.</td>
<td>Sociology</td>
</tr>
<tr>
<td>sp.h.</td>
<td>Speech and Hearing Sciences</td>
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<tr>
<td>Span.</td>
<td>Spanish</td>
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</tr>
<tr>
<td>t.f.e.</td>
<td>Teaching and Teacher Education</td>
</tr>
<tr>
<td>t.ar.</td>
<td>Theatre Arts</td>
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<tr>
<td>tox.</td>
<td>Toxicology</td>
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<tr>
<td>v.sc.</td>
<td>Veterinary Science</td>
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<tr>
<td>w.s.</td>
<td>Women's Studies</td>
</tr>
<tr>
<td>w.m.</td>
<td>Watershed Management</td>
</tr>
</tbody>
</table>
College of Agriculture
Forbes Building, Room 306
(602) 621-7621

The College of Agriculture provides professional education for a wide range of career opportunities in agriculture, natural resources, and in family and consumer resources. The various curricula offer professional preparation for careers in agri-business, government, public service agencies, retail and service industries, human health institutions, the food service and processing industry, financial institutions, youth development agencies, conservation and environmental organizations, farming and ranching, research, extension, communications and education. A broad education in a professional knowledge area is combined with foundation courses in the natural and social sciences, communications and the humanities to develop a well-rounded academic experience. College responsibilities include instruction, research and extension. The academic units of the college include ten departments and two schools. The departments are Agricultural Economics; Agricultural Education; Agricultural and Biosystems Engineering, Animal Sciences; Entomology; Nutrition and Food Science; Plant Pathology; Plant Sciences; Soil and Water Science; and Veterinary Science. The School of Renewable Natural Resources is organized into four programs: Watershed Resources; Landscape Resources; Range Resources; and Wildlife and Fisheries Resources. The School of Family and Consumer Resources is organized into three programs: Family Studies; Educational and Professional Studies; and Merchandising, Consumer Studies, and Design. The college also participates in the management of the university departments of Biochemistry, Microbiology and Immunology, and Molecular and Cellular Biology where several college faculty hold joint appointments.

DEGREES

The college offers the Bachelor of Science in Agriculture, the Bachelor of Landscape Architecture (B.L.A.), the Bachelor of Science in Family and Consumer Resources, and the Bachelor of Science in Renewable Natural Resources. Bachelor of Science degree programs in biochemistry, microbiology, and molecular and cellular biology are offered through the College of Arts and Sciences (see the College of Arts and Sciences section of this catalog). Each student is assigned a faculty advisor who provides undergraduate guidance and counseling.

The College of Agriculture offers graduate studies leading to both the Master of Science and the Doctor of Philosophy degrees with majors in a large number of disciplines. In addition, a Master of Agricultural Education, a Master of Home Economics Education, and a Master of Landscape Architecture are available.

University credit may be earned in certain graduate courses at the University of Arizona facilities away from Tucson.

UNDERGRADUATE MAJORS

Agricultural Economics
Agricultural Education
Agronomy*
Animal Sciences
Entomology*
Family Studies
Food Science*
General Agriculture*
General Home Economics
Home Economics Education
Horticulture*

Interior Design*
Landscape Architecture*
Merchandising &
Consumer Studies
Nutritional Sciences
Plant Sciences
Range Management
Soil & Water Science
Veterinary Science
Watershed Management
Wildlife & Fisheries Science

*These majors are currently under review. For further information regarding the status of these majors, consult the college.

UNDERGRADUATE MINORS

Minor programs of study are available to undergraduates. The list of approved minors in the College of Agriculture are:

Agricultural Economics
Animal Sciences
Entomology
Nutritional Sciences
Plant Sciences

Range Management
Soil & Water Science
Watershed Management
Wildlife & Fisheries
Science

 Students interested in minors in the College of Business and Public Administration (BPA) may select a structured minor in general business administration, finance, human services administration, marketing, personnel management, or public management. Math. 117R/S and Econ. 200 are prerequisites to the minors in the College of Business and Public Administration. Students following the course requirements for a minor must meet the Advanced Standing Policy of the BPA college to enroll in upper-division courses. Student advising on BPA minors is available in the Student Advising and Assistance Center, Office of Instruction, College of Agriculture, Forbes Building or the Student Advising Office, School of Family and Consumer Resources.

Course requirements for the College of Business and Public Administration minors are

GENERAL BUSINESS ADMINISTRATION—Acct. 200, 210; M.I.S. 111; 12 units from the following: Stat. 275, M.A.P. 305, 320, Econ. 300, 330, Fin. 311, Mktg. 361.

FINANCE—Acct. 200, 210; Fin. 311; Econ. 330; 9 units from the following: Fin. 412, 421, 422, 431; Econ. 442.

MARKETING—Acct. 200; Mktg. 361; 15 units from the following: Mktg. 364, 365, 370, 456, 458, 470.

HEALTH AND HUMAN SERVICES ADMINISTRATION—Acct. 200; M.A.P. 330, 15 units from the following: M.A.P. 348, 360, 365, 454, 463, 466.

PERSONNEL MANAGEMENT—Acct. 200; Stat. 275; M.A.P. 330; 12 units from the following: M.A.P. 305, 413, 430, 432, 433, 480; Soc. 326; Psyc. 385; Comm. 412.

PUBLIC MANAGEMENT—Acct. 200, 272; Stat. 275; M.A.P. 330; 9 units from the following: M.A.P. 330, 401, 405, 410a, 411, 413, 432, 480.

Students interested in minors in the humanities, social and behavioral science or the sciences need to consult the section on minors in the College of Arts and Sciences.

A minimum of 20 units of course work must be completed with a grade-point average of 2.00 or better to successfully complete a minor. A minimum of 12 units must be upper-division course work. Twelve credit hours of course work must be in residency at the University of Arizona. Consult the appropriate school or department listings in this catalog for additional information about minors. Completion of a minor is not required for graduation in the College of Agriculture.

SPECIAL UNDERGRADUATE ACADEMIC PROGRAMS

Agricultural Business Curriculum

The agricultural business curriculum allows students to integrate agricultural economics and business courses in their plans of study. Successful completion of the study plan requires 20 units of course work in agricultural economics and business, with 12 units from the upper division. For details, consult the Department of Agricultural Economics.

Environmental Sciences Emphasis

The emphasis in environmental sciences is available under the major in soil and water science. It provides students with the opportunity to integrate courses in biology, chemistry, physics, and agriculture with a set of courses involved in the study of environmental quality of our land and water resources. For details, consult the Department of Soil and Water Science.
Race Track Industries Option

Students may select the race track industries option under the major in animal sciences. The option requires the completion of specialized courses in race track industries, in conjunction with business courses. For details, consult the Department of Animal Sciences.

GENERAL CURRICULUM

All undergraduate students in the College of Agriculture are required to complete a general education program of study for a Bachelor of Science in Agriculture, a Bachelor of Science in Family and Consumer Resources, a Bachelor of Science in Renewable Natural Resources, or a Bachelor of Landscape Architecture.

The purpose of the general education curriculum is to establish an educational foundation that will assist students in their development as productive and effective citizens and prepare them to engage in independent and critical thought using creative and analytical skills. The general education program is also designed to develop in students an appreciation for and understanding of world cultures, societal and institutional standards and interrelationships, cultural heritage, institutional and humanistic values, the natural sciences, and the arts and humanities.

The bachelor of science degrees require the completion of a minimum of 130 units including all course requirements detailed in the general education curriculum and the program of study in the major. A minimum of 42 units of upper-division course work must be completed by a student with the satisfactory completion of a writing-emphasis course in the major. All undergraduates must complete the Writing Proficiency Examination administered by the University Composition Board and earn a grade-point average of at least 2.000 on all work undertaken in the major field of study.

General Education Program

I. Basic Skills and Proficiencies
Each student must complete the course requirements identified in the following subject areas. A minimum total of 18 units of course work must be completed to fulfill the group requirements in basic skills and proficiencies.

A. Freshmen Composition
All students must enroll in one of the following four sequences:
1. English 100, 101 and 102
2. English 101 and 102
3. English 103H and 104H (Honors)
4. English 106, 107 and 108 (Foreign students)

B. Communication
Students must complete a minimum of 6 units of course work from an approved list of courses published in the College of Agriculture Curriculum Guidesheet.

C. Mathematics
College Algebra (Math. 117R/S) or any 3-unit mathematics course numbered above 117R/S is required.

D. Computer Skills
Students must complete a minimum of 3 3 units of course work from an approved list of courses published in the College of Agriculture Curriculum Guidesheet.

II. Study Areas
The study areas are designed to introduce students to subject matter from a variety of academic disciplines in the colleges of Arts and Sciences and Agriculture. Students are required to select course work in a minimum of five study areas from the following groups: (A) Western Civilization; (B) Biological and Life Sciences; (C) Physical and Environmental Sciences; (D) Individuals, Societies, and Institutions; (E) Non-Western Civilization; and (F) Arts, Literature and Language. These course requirements may be fulfilled during any semester of the undergraduate years. Students need to consult with their school and department academic advisors for specific course sequences to fulfill requirements in each study area. A minimum total of 32 units of course work must be completed to fulfill the group requirements in the study areas.

A. Western Civilization (6-9 units)
Under this study area, students examine western civilization as a collective heritage of ideas, values, literacy and artistic expressions and political, social, economic and scientific changes.

B. Biological and Life Sciences (8 units)
Courses presented in this study area introduce students to the language and practices of the science of life systems. Students examine the methods used to post and test hypotheses and the logic involved in developing theories through the scientific method.

C. Physical and Environmental Sciences (8 units)
Under this study area, students investigate the dimensions of sciences concerned with the physical laws of nature and the ecological systems of our global habitat. The methods used in scientific thought and quantitative methods of analysis are presented to students.

D. Individuals, Societies and Institutions (6-9 units)
Courses in this area systematically examine individual and collective behavior, and explore the basic concepts and theories used in analysis of personal, social, cultural, political, economic, philosophical, religious and scientific issues.

E. Non-Western Civilization—other cultures (3 units)
Students are introduced to the values, traditions and development of non-western and ethnic cultures.

F. Arts, Literature and Language (6 units)
The purpose of this study area is to provide opportunities for students to explore the processes of creativity in the arts and recognize the communicative and cultural values of art, literature and languages.

General Requirements
Bachelor of Science in Agriculture

II. Study Areas

A. Western Civilization

B. Biological and Life Sciences

C. Physical and Environmental Sciences

D. Individuals, Societies and Institutions

E. Non-Western Civilization

F. Arts, Literature and Language

Upper-Division Writing-Proficiency Examination

Minimum 32

II. Study Areas

A. Western Civilization

B. Biological and Life Sciences

C. Physical and Environmental Sciences

D. Individuals, Societies and Institutions

E. Non-Western Civilization

F. Arts, Literature and Language

Upper-Division Writing-Proficiency Examination

Minimum 32

III. Major

Minimum 5

IV. Electives and/or Minor

Minimum 16-53

V. Minor

Minimum 21-64

Approved courses listed on the Curriculum Guidesheet. Consult an academic advisor for specific course requirements. Students earning an "unsatisfactory" result on the exam will be required to complete additional writing course work.

Students are required to complete a minimum of five study areas.

Students are required to complete one course that includes lab work.

Students are required to complete a writing-emphasis course in the major.

GENERAL INFORMATION

The College of Agriculture participates in several international programs. Country activities include projects in Cape Verde, Brazil, Morocco, Mexico, Senegal, Lesotho, Mauritania, and Egypt. Interaction with Peace Corps, the Agency for International Development, and the U.S. State Department through the Office of International Programs provides unique opportunities for student and faculty evaluation of world resource problems.

FELLOWSHIPS, SCHOLARSHIPS, AND AWARDS—The college awards numerous scholarships and fellowships to undergraduate and graduate students enrolled in programs of study in agriculture, natural resources, and family and consumer resources.

OUTSTANDING SENIOR AWARDS—Each year the faculty selects an outstanding senior in each department and school.

DEAN'S LIST—This honor is reserved for students who carry no fewer than 15 units of work in a semester and attain a grade-point average of 3.5000 or better.

SCHOLASTIC SOCIETIES—The college recognizes the scholarship societies of Alpha Tau Alpha, Alpha Zeta, Gamma Sigma Delta, and Kappa Omicron Nu.

HONORS PROGRAM—The college participates in the university-wide Honors Program.

INTERNSHIP—The College of Agriculture provides internship opportunities to qualified students who wish to receive training and practice in actual service with technical, business, or government establishments.

PEACE CORPS—The Peace Corps office at the University of Arizona is a function of the Office of International Agriculture Programs in the College of Agriculture. The Peace Corps Office provides international volunteer placement counseling and processes Peace Corps and United Nations Volunteer Program applications from university students and staff.

COOPERATIVE EDUCATION—The college participates in the University Cooperative Education Program.

SCHOOL OF FAMILY AND CONSUMER RESOURCES

The School of Family and Consumer Resources is concerned with personal and group values that are desirable outcomes of successful family life through the use of personal, family, and social resources for the attainment of these values. It deals with social, economic, aesthetic, technological, managerial, health, and ethical aspects of family relations, child development, clothing, housing, and interior design.

The undergraduate program has as its major objectives: (1) general education for personal and family living, (2) specialization in various aspects of family and consumer resources in preparation for professional positions, and (3) courses to enrich the professional preparation of students in other colleges.

The school is organized into three programs: Family Studies; Educational and Professional Studies; and Merchandising, Consumer Studies, and Design.

The school offers the degree of Bachelor of Science in Family and Consumer Resources with majors in family studies (emphasizing human development, interpersonal relations, and family living); interior design; merchandising and consumer studies; home economics education (secondary education track or family life education track); and general home economics.

Students enrolled in majors in the School of Family and Consumer Resources may elect to choose a minor subject area with the approval of the student's advisor. For information on minors in the College of Business and Public Administration, see "Undergraduate Minors" elsewhere in the College of Agriculture section. An extension/nonformal education option to supplement the student's major is also available to all students in the School of Family and Consumer Resources. Students taking this option must take A.Ed./H.E.E. 220; H.E.E. 428; F.C.R. 493; and F.C.R. 496; plus two elective courses from the approved list available from the student's advisor.

Requirements for the various curricula appear within the division offering the major (see Departments and Courses of Instruction section of this catalog). The course requirements listed with each curriculum are patterned from the outline below for the Bachelor of Science in Family and Consumer Resources degree.

General Requirements

Bachelor of Science in Family and Consumer Resources

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UNITs</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Basic Skills and Proficiencies</td>
<td></td>
</tr>
<tr>
<td>Freshmen Composition</td>
<td>6-9</td>
</tr>
<tr>
<td>Communications</td>
<td>6</td>
</tr>
<tr>
<td>Mathematics</td>
<td>3</td>
</tr>
<tr>
<td>Computer skills</td>
<td>3</td>
</tr>
<tr>
<td>Upper-Division Writing Proficiency Exam</td>
<td>2</td>
</tr>
</tbody>
</table>

II. Study Areas (Complete five study areas)

A. Western Civilization (Art.H 117, 118 for I.D.) | 6-9 |
B. Biological and Life Sciences (incl. lab) | 8 |
C. Physical and Environmental Sciences (Chem. or Phys. (4) for M.C.S. and I.D.) | 8 |
D. Individuals, Societies and Institutions (Psys. 101; Econ. (6) for M.C.S.) | 6-9 |
E. Non-Western Civilization | 3 |
F. Arts, Literature and Language (Art 101 or 241 for M.C.S.; Art 101 and 102 for I.D.; S.E.R. 370a-370b recommended for F.S.) | 6 |

III. Foundation, Major and Minor

50-80

IV. Electives

0-30

Total Units Required for Graduation 130

1/Groups I and II comprise the general education requirement for the College of Agriculture. Students must complete a minimum of 18 units in Group I and 32 units in Group II from a college-approved list.

2/Students awarded an unsatisfactory mark must complete an additional writing course from a college-approved list.

3/These courses can be used to satisfy lower-division general education requirements.

Family and Consumer Resources Organizations

Family and Consumer Resources student organizations are The University of Arizona Student Chapter of The American Society of Interior Designers; Fashion Dimensions Club; Arizona Association Marriage and Family Therapists: Kappa Omicron Nu; and the Office of Student Counseling, Advising and Recruiting (OSCAR).

SCHOOL OF RENEWABLE NATURAL RESOURCES

The principal goals of the school are (1) to provide students with educational opportunities that will enable them to assume positions of responsibility and leadership in management, planning, design and study of renewable natural resources; and (2) to provide a foundation of basic general education that will enable graduates, regardless of their professional pursuits, to function as responsible citizens in their communities.

The school is organized into four programs: Watershed Resources; Landscape Resources; Range Resources; and Wildlife and Fisheries Resources.

The school offers the degrees of Bachelor of Science in Renewable Natural Resources with majors in watershed management, range management, and wildlife and fisheries science and the Bachelor of Landscape Architecture with a major in landscape architecture. Minors are available in watershed management, range management, and wildlife and fisheries science.

Specific requirements for the various curricula appear with the majors listed under Renewable Natural Resources (see Departments and Courses of Instruction section).
General Requirements
Bachelor of Science in Renewable Natural Resources
and Bachelor of Landscape Architecture

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UNITS</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B.S.</td>
<td>B.L.A.</td>
</tr>
<tr>
<td>I. Basic Skills and Proficiencies¹</td>
<td>6-9</td>
<td>6-9</td>
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<td>Freshman Composition</td>
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<td>3</td>
</tr>
<tr>
<td>Comm. 100, 102</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Comm. Elec. (oral or writ. Engl.)</td>
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<td>3</td>
</tr>
<tr>
<td>Mathematics or Statistics²</td>
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<td>3</td>
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<tr>
<td>Computer Science Elective³</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Upper-division writing-proficiency exam⁴</td>
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<tr>
<td>II. Study Areas (Complete five of six areas)⁵</td>
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<td></td>
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<tr>
<td>Western Civilization</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Biological and Life Sciences (incl. lab)</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Physical and Environmental Sciences</td>
<td>8</td>
<td>8</td>
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<tr>
<td>Individuals, Societies and Institutions</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Non-Western Civilization</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Arts, Literature and Languages</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>III. Major and College</td>
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<td></td>
</tr>
<tr>
<td>Major &amp; R.N.R. subjects</td>
<td>42</td>
<td>47</td>
</tr>
<tr>
<td>S.W. 200, 201</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Electives⁶</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>IV. Electives—At least 9 units must be outside the College of Agriculture.</td>
<td>130</td>
<td>130</td>
</tr>
</tbody>
</table>

¹ Groups I and II comprise the general education requirement for the College of Agriculture. Students must complete a minimum of 18 units in Group I and 32 units in Group II from a college-approved list.
² The mathematics or statistics requirement may be fulfilled by Stat. 275 or by any mathematics department course except 101, 116, 202, or 405. Math. 101, 116, 202, or 405 may be listed in Group IV.
³ The computer science requirement may be fulfilled by an approved course or by demonstrated skill in the use of computers.
⁴ Students awarded an unsatisfactory mark must complete an additional writing course from a college-approved list.
⁵ Students in R.N.R. must complete a minimum of 8 units of chemistry, 4 units of ecology or molecular and cellular biology, Econ. 201a, and 6 units of biological or physical science as part of the Study Areas. B.L.A. students must complete a minimum of 4 units of chemistry, 3 units of ecology or molecular and cellular biology, Econ. 201a, 3 units of biological or physical science, and 2 additional units of mathematics as part of the Study Areas.
⁶ Must be from any program of R.N.R. or F.C.R. or from any department in the College of Agriculture.

Honors Information

The school encourages outstanding students to participate in the University-wide Honors Program.

Student Organizations

Students in the school are encouraged to actively participate in their respective student chapters of national organizations and to attend and participate in national and local meetings of the professional societies whenever possible.

Active student chapters of the Society of American Foresters, the Society for Range Management, the Wildlife Society, the American Fisheries Society, and the American Society of Landscape Architects are available to students in the school. The Natural Resource Student Association is an organization open to graduate and undergraduate students with an interest in natural resources. This group is active in many activities associated with the school's programs.

College of Architecture

Architecture Building, Room 104
(602)621-6751

Architecture is the art and science of building. As a meeting place of the arts and sciences, it is innately interdisciplinary and has continuing vitality as a field of study or a life career. Students of architecture investigate both the broad relationships between human and natural forces and the relationships between materials and technologies required to realize architecture as built form. The college program is organized with the design studio as the element of focus.

Today, the architect may be involved with the design of a new community, a complex of buildings, an individual structure, or the smallest details of interior space. Architects may also be involved in programming and pre-design activities, site analysis, financial feasibility, user needs, analysis, management, administration, and related issues. The College of Architecture prepares students to participate in this broad spectrum of challenges in the shaping of our built environment.

DEGREES

The College of Architecture offers a five-year program leading to the professional degree Bachelor of Architecture. The program is organized around courses in five areas of study: history, theory, design and communication, technologies, practice and management, and breadth electives. The first year is preprofessional. The professional years are composed of two parts: a three-year core (second, third and fourth years), and the fifth year, which includes design studio options and a senior project. Fourth- and fifth-year design studio options are offered in desert architecture, preservation, community design, computer-aided design, building design, entrepreneurial architecture, design competitions, and energy-conscious design. Offerings are limited by faculty availability and vary each year. New options may be introduced.

The college also offers a program of study leading to the Master of Architecture degree. Areas of emphasis in the graduate program are desert architecture (including preservation and community design), design communication and computer-aided architecture. Two years of full-time study are normally recommended; however, students with a five-year Bachelor of Architecture degree from an accredited school of architecture may be able to complete the degree in less time. See the Graduate Catalog for additional information.

REQUIREMENTS

Admissions

Preprofessional Year (First Year)—See "Admission to Particular Colleges and Schools" in the Admission to the University section of this catalog. Admission to full standing in the College of Architecture requires all entering first-year students to present 15 units of acceptable high school credit as follows:

<table>
<thead>
<tr>
<th>Subject</th>
<th>High School Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>English</td>
<td>4</td>
</tr>
<tr>
<td>Algebra I</td>
<td>1</td>
</tr>
<tr>
<td>Plane Geometry</td>
<td>1</td>
</tr>
<tr>
<td>Algebra II</td>
<td>1</td>
</tr>
<tr>
<td>American History and Social Studies</td>
<td>2</td>
</tr>
<tr>
<td>Physics or Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>Laboratory Science¹</td>
<td>1</td>
</tr>
<tr>
<td>Electives</td>
<td>4</td>
</tr>
</tbody>
</table>

¹Physics and Chemistry preferred.

Students deficient in one or more of the high school courses listed above will be permitted to enter the College of Architecture. Applicants with a deficiency in intermediate algebra should take Math. 116. All entrance deficiencies must be removed prior to admission to the professional phase of the program.

Applicants are advised to include among their electives additional courses in mathematics, such as trigonometry and advanced algebra.
Students who have made a decision to pursue professional education in architecture are strongly advised to seek admission to the College of Architecture at their first opportunity in order to minimize the time required to complete the professional degree. Students in the preprofessional year may not enroll in required professional phase courses except upon petition to the Student Affairs Committee. Preprofessional students may, however, enroll in architecture elective courses.

**PROFESSIONAL PHASE (SECOND-FIFTH YEARS)**—Admission to the professional phase is selective and competitive. The number of students admitted is limited by the resources of the college. Selections are made only once per year in early summer for the fall term. Cumulative and architecture grade-point averages above 3.0 are normally required for admission.

Students must apply to the College of Architecture for admission into the professional phase. To be considered for professional phase admission, students must have completed all preprofessional courses, except electives, be in good academic standing (both cumulative and architecture), have removed any high-school deficiencies, and have filed an application with the college.

Minimum requirements in the professional phase include courses in five areas of study:

1. **Design and Communication**—201, 202, 301, 302, 401, 402, 451, 452 (6 units each), 212, 222 (3 units each)—54 units.
2. **Practice and Management**—270, 439, 459 (3 units each), 226, 227 (2 units each)—13 units.
3. **Architectural Technologies**—235, 236, 318, 328, 335, 336, 418, 428 (3 units each)—24 units.
4. **History and Theory**—324, 334 (4 units each), 484 (2 units), plus 6 units of Architectural History options—16 units.
5. **General Education Electives**—fine arts (3), social sciences and humanities (6), science and technology (6), business, management and government (6), open (9), architecture (6)—36 units.

**TRANSFER STUDENTS**—Applicants who are applying for transfer from other colleges or universities must present the same high school units as required for admission to the preprofessional year and also must meet the general university and college admission requirements as stated in this catalog. Except in cases of exceptional merit, transfer credit for required College of Architecture courses will be allowed only for work taken in an architectural program that is accredited by the National Architectural Accrediting Board.

Transfer applicants applying for advanced standing must forward a portfolio of their work to the College of Architecture at the time their application for admission is sent to the Admissions Office. The portfolio should include unofficial copies of all transcripts.

Students transferring from community colleges, other disciplines, or programs not accredited by NAAB will normally be required to spend a minimum of one semester in the preprofessional year and should consider enrolling at mid-year, in January, if they wish to be considered for admission to the professional phase for the following August. Prospective transfer students should correspond directly with the college for advice regarding their status. Selections for professional phase admission are made only once per year in summer for the fall term. College resources do not allow mid-year admission into the first semester of the professional phase.

**APPLICATION DEADLINES**—Students apply to the Office of Admissions and New Student Enrollment. Applications received by November 1 receive priority service. April 1 is the deadline for out-of-state freshman applicants. Students seeking advanced placement or admission to the professional phase should also correspond directly with the college for additional deadlines, information, and applications.

**GRADUATE STANDING**—Prospective graduate students must apply directly to the Graduate College. For graduate standing admission requirements refer to the Graduate College.

**Advancement**

For advancement in any particular course sequence in the professional phase, individual course prerequisites must have been satisfied, and a cumulative grade-point average of 2.00 or better must have been maintained for the preceding academic year. For advancement to the final year, the student must have completed all requirements in the lower years.

**Preprofessional Year Required Curriculum**

(Recommended Sequence)

### FIRST YEAR

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject</td>
<td>Units</td>
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<tr>
<td>Eng. 101</td>
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<tr>
<td>Math. 117R/S</td>
<td>3</td>
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<tr>
<td>Math. 118</td>
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</tr>
<tr>
<td>Arch. 118 or 112</td>
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<tr>
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</tr>
<tr>
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<td>Total</td>
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**Professional Phase Required Curriculum**

(Recommended Sequence)

### SECOND YEAR

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<tr>
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<td>Arch. 201</td>
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</tr>
<tr>
<td>Arch. 212</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 226</td>
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</tr>
<tr>
<td>Arch. 235a</td>
<td>3</td>
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<tr>
<td>Elective1 or Arch. 270</td>
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### THIRD YEAR

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<td>Arch. 318</td>
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<tr>
<td>Arch. 401</td>
<td>6</td>
</tr>
<tr>
<td>Arch. 418b</td>
<td>3</td>
</tr>
<tr>
<td>Arch. 439a</td>
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</tr>
<tr>
<td>Arch. Hist. Optionb,c</td>
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<tr>
<td>Elective1</td>
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### FIFTH YEAR

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<td>Subject</td>
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<td>Arch. 451</td>
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<tr>
<td>Arch. 459</td>
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<td>Arch. 484</td>
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<td>Elective4</td>
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<td>17</td>
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1. One 3-unit calculus course may be used to meet the algebra and trigonometry requirement. High school courses may not be used to meet the math requirement except AP calculus with college credit.
2. Electives are not required for admission to the Professional Phase.
3. Course may be taken in another year but must be completed prior to entrance to the fifth year.
4. A total of 36 units of electives are required and must be selected from 4 general areas of knowledge (Fine Arts, Humanities, Science, Business) plus open and architecture electives. Refer to the Elective Group List, available from the college, for guidance.
5. Architectural History Options include the following: Arch. 404, 414, 424, 434, 496c.
RESOURCES AND ACTIVITIES

Facilities

The activities of the college are housed in the Architecture Building, which was constructed in 1966 and expanded in 1970 and 1978. It is a three-story facility that houses the majority of the design studios, classrooms and seminar rooms, a large and completely equipped audio-visual lecture hall, model shop, photographic darkroom, faculty offices, exhibition areas, archives and the college library. The library has an extensive collection of books and periodicals about architecture and related environmental design fields. An important and active part of this resource is the 35mm slide collection covering the historical and contemporary architecture of the world.

Accreditation and Affiliations

The program is fully accredited by the National Architectural Accrediting Board. The Bachelor of Architecture degree is recognized and accepted by licensing agencies as the first professional degree leading to architectural licensing as recommended by the National Council of Architectural Registration Boards. The College of Architecture is affiliated with the Association of Collegiate Schools of Architecture and recognizes a student chapter of the American Institute of Architecture Students. There is a regular liaison with the Southern Arizona Chapter of the American Institute of Architects and the Arizona Society of Architects, both of which lend support to the college.

Placement Services

Arizona graduates tend to work nationally and internationally. The College regularly receives requests from firms in all regions of the country seeking to employ Arizona graduates. These are referred to fifth year students who arrange their own interviews. Some firms come to the college to interview graduating seniors. Other firms offer third and fourth year students summer internships with the goal of hiring those students upon graduation. Many fifth year students target a specific city or region of the country and arrange interviews during the spring break of the fifth year. The University Career and Placement Service also provides employment assistance for fifth year and former students. Positions are normally available for all graduates willing to relocate.

Scholarships and Financial Aids

All architecture majors are eligible to apply for university scholarships and aid. In addition, for students in the professional phase of the program there are special College of Architecture scholarships, as well as a short-term loan fund. For further information, refer to the section on Scholarships and Financial Aids.

Awards and Honors

Outstanding student accomplishments are recognized each year through the presentation of a number of awards, including the Outstanding Graduating Senior Award, the National School Medal of the American Institute of Architects, the Henry Adams Fund Award, the National Society Medals of Alpha Rho Chi and Faculty Commendation Awards. The Dean's List citation goes to all students who attain a grade average of 3.500 or better for a semester while carrying no fewer than 15 units of work. For further information on Dean's List citations, see "Honors, Awards and Prizes" in Provisions for Superior Students section of this catalog.

Student Guidance

Each entering student is assigned a faculty advisor who is available for guidance and counseling throughout the academic year. The faculty advisers maintain regular office hours and students are encouraged to review their progress and problems with their advisors.
Faculty of Science

Gould-Simpson Building, Room 1025
(602) 621-4090

The Faculty of Science develops new knowledge about the world and its interrelations and about means of inquiry in significant areas of science as well as interdisciplinary areas involving science. It provides students, colleagues worldwide, and the public with knowledge, understanding and appreciation of the history, findings, applications, and methods of inquiry of science needed to work and participate effectively in resolving the issues of our time. The undergraduate programs in science disciplines produce students who are capable of entering graduate programs at the best universities and who enter careers in business and government. Non-science majors are introduced to science through a general education program geared to showing the connection of science to other intellectual areas.

DEPARTMENTS: Astronomy, Atmospheric Sciences, Biochemistry, Chemistry, Computer Science, Ecology and Evolutionary Biology, Geosciences, Mathematics, Microbiology and Immunology, Molecular and Cellular Biology, Physics, Planetary Sciences, Speech and Hearing Sciences, Statistics

MAJORS AND DEGREES:
- Astronomy (B.A., B.S.)
- Atmospheric Sciences (B.S.)
- Biochemistry (B.A., B.S.)
- Chemistry (B.A., B.S.)
- Computer Science (B.S.)
- Ecology and Evolutionary Biology (B.A., B.S.)
- General Biology (B.S.)
- Geosciences (B.S. in Geosciences)
- Interdisciplinary Studies (B.A.)
- Mathematics (B.A., B.S.)
- Microbiology (B.S.)
- Molecular and Cellular Biology (B.S.)
- Physics (B.S.)
- Speech and Hearing Sciences (B.S. in Speech and Hearing Sciences)

HONOR SOCIETIES, PROFESSIONAL AND HONORARY ASSOCIATIONS:
- Alpha Chi Sigma—Chemistry
- American Geophysical Union—Atmospheric Sciences
- American Meteorological Society—Atmospheric Sciences
- National Student Speech-Language-Hearing Association—Speech and Hearing Sciences
- Phi Mu Alpha Sontonia Fraternity of America—Men's National Professional Music Society
- Pi Kappa Delta—National Speech Honor Society
- Sigma Alpha Iota—Women's National Music Honor Society
- Tau Beta Sigma—Band Fraternity for Women
- Theta Alpha Phi—Honorary Fraternity for Theatre Arts

Faculty of Humanities

Modern Languages Building, Room 345
(602) 621-1044

The humanities sustain the ongoing conversations of different cultures across time about what human meaning has been — and might be. The Faculty of Humanities therefore offers programs dedicated to literacy, language-learning, and cross-cultural understanding. Its courses promote critical and creative thinking by (1) cultivating literacy in its many forms, especially in writing and in the analysis of various literatures; (2) opening up other languages to non-native speakers; and (3) developing greater understanding of the histories, varieties, and transformations of different human cultures. The Faculty is composed of seven departments of language and literatures, as well as several interdisciplinary programs, and offers degrees in over thirteen languages. It also supports special emphases in creative writing, English and a second language, religious studies, comparative cultural and literary studies, and classical archaeology, as well as public programs offered by the Poetry Center and the Humanities Seminars.

DEPARTMENTS: Classics, East Asian Studies, English, French and Italian, German, Russian and Slavic Languages, Spanish and Portuguese

COMMITTEES: Religious Studies, Critical Languages, Humanities

MAJORS AND DEGREES:
- Classics (B.A.)
- Creative Writing (B.A.)
- East Asian Studies (B.A.)
- English (B.A.)
- French (B.A.)
- German (B.A.)
- Greek (B.A.)
- Interdisciplinary Studies (B.A.)
- Italian (B.A.)
- Latin (B.A.)
- Portuguese (B.A.)
- Religious Studies (B.A.)
- Russian (B.A.)
- Spanish (B.A.)

*Listed under English
**Listed under Classics

HONOR SOCIETIES, PROFESSIONAL AND HONORARY ASSOCIATIONS:
- Delta Phi Alpha National Honorary—German
- Dobro Slovo—Russian and Slavic Languages
- Phi Beta Kappa—National Honor Society
- Pi Delta Phi—French
- Sigma Delta Pi—Spanish and Portuguese

Faculty of Social and Behavioral Sciences

Douglass Building, Room 200W
(602) 621-1112

The study of human beings, individually and in social groups, unites the departments and programs of the Faculty of Social and Behavioral Sciences. It provides traditional undergraduate majors; it provides a broad understanding of the social and behavioral sciences to the University community; and it trains research-oriented graduate students. The Faculty promotes fundamental research in individual behavior, cultural expression, social organization, theory and values, and public and private policy. The Faculty serves a public constituency through consulting with professional organizations, working with local, state and regional organizations on specific issues, and providing expert information and advice to public policy makers.

DEPARTMENTS: Anthropology, Communication, Geography and Regional Development, History, Journalism, Linguistics, Near Eastern Studies, Philosophy, Political Science, Psychology, Sociology

SCHOOL: Graduate Library School

COMMITTEES: African American Studies*, American Indian Studies*, Judaic Studies, Russian and Soviet Studies, Women's Studies
The Office of Academic Services (OAS) is administered by the Assistant Dean. It serves the college by providing general education advising. The OAS is also responsible for the college’s degree programs, which are divided into several categories: Arts, Humanities, Science, and Social and Behavioral Sciences in addition to professional programs. The OAS also handles college grade appeals.

The Office of the Coordinating Dean coordinates the Faculties of Fine Arts, Humanities, Science, and Social and Behavioral Sciences in areas of common interest, e.g., general education, college-wide advising, and undergraduate curriculum.

The Office of the Associate Dean is the administrative unit charged with developing and overseeing the college's undergraduate curriculum. An important component of the undergraduate curriculum is the general education program, encompassing seven areas of learning that ensure breadth of undergraduate work. This office also handles college grade appeals.

The Office of Academic Services (OAS) provides academic advising for all majors, as well as transfer students, undeclared students, and students interested in interdisciplinary studies program, special programs, and preprofessional programs. Students interested in the following special programs should consult an advisor in the Office of Academic Services:

**INTERNATIONAL MANAGEMENT/THUNDERBIRD**—The College and the American Graduate School of International Management (Thunderbird) offer a cooperative program emphasizing humanitarian and technical education in preparation for international careers. The student takes University courses required for admission to Thunderbird. Then, the student may complete the eighth semester at Thunderbird and apply courses completed there to the UA Bachelor of Arts degree as well as to Thunderbird’s Master of International Management degree.

**PROFESSIONAL STUDENT EXCHANGE PROGRAM**—This program, sponsored by the Western Interstate Commission for Higher Education and administered by the Arizona Board of Regents, enables Arizona students to enroll in one of five professional programs in other states at essentially the same expense to the student as residents of the state in which the school is located. The five programs are dentistry, occupational therapy, veterinary science, optometry, and osteopathy. The osteopathy program is through a separate (bilateral) contract with an osteopathic college. To qualify for the programs, students must maintain at least average grades in their preprofessional work and must have been legal residents of Arizona for the last five years prior to entrance into the professional school. Students receiving such assistance are required to return to Arizona to practice, or to repay a portion of the funds expended in their behalf, including interest.

**FOREIGN SERVICE CAREERS**—The United States Foreign Service is America’s diplomatic, consular, commercial and overseas cultural and information service. Acceptance into the service is based on written and oral examination. The written examination consists of seven areas: English usage, economics, administration, political science, consular information, cultural affairs and commerce. Students pursuing a foreign service career should obtain as broad an educational background as possible. Course work should include, but not be limited to: (1) English language skills with stress placed on an ability to speak and write persuasively, and to analyze and defend policies and proposals; (2) Foreign language competency in at least one language; and (3) knowledge in economics, political science (particularly international relations), area studies in geography and history of a chosen area, and U.S. government and history.

Students interested in more information should consult with the foreign service advisor in the Department of Political Science or an advisor in the Office of Academic Services.

**3/2 PROGRAM**—This is a cooperative academic plan developed by the College of Arts and Sciences and the College of Business and Public Administration, and approved by the Graduate College. The 3/2 Program offers highly qualified students in the College of Arts and Sciences the opportunity to earn both an undergraduate and the Master of Business Administration degrees in five years. The student first completes three years of course work, meeting general education requirements, selected prerequisite courses and the requirements of the major field of study. The Graduate Management Admissions Test (GMAT) is taken, and application to the 3/2 Program is made during the second semester of the junior year. Qualified students are accepted for the senior year with continued study in 30 units of designated MBA courses. The 30 MBA units are used within the undergraduate degree program as the minor, as elective units, or as excess units. Upon completion of all degree requirements, the baccalaureate degree is awarded. Admission to the Graduate College to complete the MBA is based upon compliance with Graduate College requirements and procedures, and a minimum grade-point-average of 3.00 in the 30 units of completed MBA classes.

Additional information is available through advisors in the Office of Academic Services, and in the Graduate Professional Programs Office, College of Business and Public Administration.

**HEALTH PROFESSIONS PROGRAM**—The Prehealth Professions Program provides an advisor for students interested in medicine, dentistry, optometry, podiatry, osteopathy, and physical therapy. The pro-
gram also makes available peer advisors and a library of catalogs and other resource materials.

The program assists freshmen and sophomores with selection of classes, seniors choosing medical schools, and older students returning to complete professional school entrance requirements. The advising of premed students takes a broadly humanistic approach that includes study abroad, majoring in a life science, and fostering lifelong avocations such as art, music or archaeology.

More than 65 percent of our applicants to medical schools are successful in gaining acceptance. Successful medical school applicants have an average 3.5 undergraduate GPA, score between 9 and 10 in the MCAT, and range in age from 19 to 43. More than 40 percent are women.

The Laboratory for Prelaw Students, including Native Americans, Hispanics, and African Americans, are actively recruited by medical schools. A Minority Premed Club and Minority Recruitment Project, sponsored by the College of Medicine, are available to encourage minority applicants.

The Prehealth Professions Committee offers faculty interviews to each premed student. It writes a collective letter of recommendation for medical and other professional school admissions committees. (See the College of Medicine section for more information.)

PRELAW PROGRAM—A broad liberal education is considered an excellent preparation for a career in law. Recommended courses are those which strengthen communication, analytical, and research skills, along with courses that provide an understanding of social, political, and economic institutions. The college offers legal internships that contribute to the development of law-related skills and insights. However, there is not a specific prelaw curriculum. Law school deans encourage prelaw students to choose a major which reflects their interests and abilities, offers the functional skills necessary for a law career, or builds a foundation for a legal specialty. Prelaw students frequently select majors such as accounting, economics, English, finance, interdisciplinary studies, history, management, philosophy, political science, or psychology.

Law schools accredited by the American Bar Association require a bachelor's degree for admission. Specific criteria assessed by law schools include: a student's LSAT score, undergraduate grade-point average, the difficulty and depth of the student's degree program, community and college extracurricular activities, volunteer or work experience, letters of recommendation, and a student's personal statement (a written essay). The preparation process begins during the freshman year with course selection and culminates in the fall of the senior year with the application process.

Freshmen are encouraged to test their commitment to a legal career and to examine all degree options before choosing a major. During the first year of undergraduate study, students can make an appointment with the prelaw advisor for assistance in planning a program. In addition, the prelaw advisor is able to answer questions about the law school admission process, Law School Admissions Test (LSAT), visits of law school representatives, and the two prelaw student associations: Phi Alpha Delta Fraternity and the Minority Pre-Law Student's Association.

In recent years, about 70 percent of the UA graduates who applied to law school have been accepted. Over half of our applicants have been accepted at the UA College of Law, while others have been admitted to ABA-approved law schools across the country. The average GPA of our graduates accepted to the UA College of Law ranges from 3.3 to 3.5.

SOCIAL SERVICES PROGRAM—Students interested in professional careers in social work should plan on study through the master's degree. Because each graduate school of social work has its own statement of requirements, in addition to consulting an advisor, students should examine catalogs from the graduate schools of social work, and contact those schools. Although the college has no degree program in social work, it does offer specific curricula oriented toward the common educational goals of the profession. In addition, ongoing volunteer work within the various social services provides valuable experience with agencies, organizational structures, social policies and programs, the client, and the community.

Research and Service Units

The following units and programs are affiliated with or support the college's academic mission. Information about some of these may be located under the Research and Special Public Service Units section of this catalog.

- The Arizona Institute for Neurogenic Communication Disorders
- The Arizona State Museum
- The Bureau of Applied Research in Anthropology
- The Center for Computing and Information Technology
- The Center for Middle Eastern Studies
- The Center for the Study of Complex Systems
- The Division of Neurobiology of the Arizona Research Laboratories
- The Grace H. Flandrau Planetarium
- The Institute of Atmospheric Physics
- The Laboratory of Tree-Ring Research
- The Latin American Area Center
- The Lunar and Planetary Laboratory
- Mexican American Studies and Research Center
- The Mineral Museum
- The Social and Behavioral Research Institute
- The Southwest Center
- The Southwest institute for Research on Women (SIROW)
- The Steward Observatory
- The Women in Science and Engineering Program

DEGREES AND DEGREE REQUIREMENTS

Undergraduate Degrees

Ten undergraduate degrees are offered: Bachelor of Arts (B.A.), Bachelor of Science (B.S.), Bachelor of Fine Arts (B.F.A.), Bachelor of Music (B.M.), Bachelor of Arts in Art, Bachelor of Arts in Music, Bachelor of Arts in Media Arts, Bachelor of Arts in Theatre Arts, Bachelor of Science in Geosciences, and Bachelor of Science in Speech and Hearing Sciences. The degrees are listed by faculty and major above.

The interdisciplinary studies major for the Bachelor of Arts degree is described later in this section.

Graduate Degrees

Most departments in the college offer programs leading to master's and doctoral degrees. See the Graduate Catalog for detailed information.

Requirements for Bachelor of Arts (B.A.) and Bachelor of Science (B.S.) Degrees

Requirements for the Bachelor of Arts (B.A.) and Bachelor of Science (B.S.) degrees include:

1. 125 units.
2. The general education requirements.
3. The requirements of at least one major and a minor (see interdisciplinary studies major for its requirements).
4. 30 units of University credit (for definition of University credit see the Academic Guidelines section of this catalog) including 18 of the last 30 units offered toward the degree.
5. 15 units of university credit in the major and 9 units in the minor.
6. 2000 grade-point average in the major and for all university credit course work.
7. 42 upper-division units.
8. Upper-division Writing Proficiency Examination.
9. A junior or senior level "Writing-Emphasis Course" (see Academic Guidelines section).
10. A minimum of 90 units in Arts and Sciences courses (up to 30 units of economics may be included).
11. All other college and University requirements for graduation. (For explanation of University graduation requirements see the Graduation Requirements section of this catalog).

Note: No more than 48 units within the major may be applied toward the degree. That applies to Honors courses in the major, and courses cross-listed with an academic committee or center (African American Studies, American Indian Studies, Judaic Studies, Latin American Studies, Mexican American Studies, Religious Studies, Russian and Soviet Studies, and Women's Studies). Excluded from the 48 units rule are...
freshman composition, the first year (elementary) of a foreign language (see departmental headings for exceptions), and courses cross-listed with a second academic department if the latter is the home department.

The Department of English offers majors in English and creative writing, allowing a student to major in one department and Bachelor of Music (B.M.) degrees.

Requirements for Bachelor of Fine Arts (B.F.A.) and Bachelor of Music (B.M.) Degrees

In addition to the Bachelor of Arts (B.A.), Fine Arts offers the Bachelor of Fine Arts (B.F.A.) and the Bachelor of Music (B.M.) degrees.

Requirements for the B.F.A. include:

1. 125 units.
2. The general education requirements.
3. Courses to complete a major (no minor is required).
4. 30 units of university credit (for definition see the Academic Guidelines section of this catalog) including 18 of the last 30 units offered toward the degree.
5. 15 units of university credit in the major.
6. 2,000 grade-point average in the major and for all university credit course work.
7. 42 upper-division units.
8. Upper-division Writing Proficiency Examination.
9. A junior or senior level "Writing-Emphasis Course" (see Academic Guidelines section).
10. All other college and University requirements for graduation. (For explanation of University graduation requirements, see the Graduation Requirements section of this catalog.)

Requirements for the B.M. include:

1. 125 to 132 units, depending on emphasis area chosen by the student.
2. The general education requirements.
3. Courses to complete the major.
4. 30 units of university credit (for definition see the Academic Guidelines section of this catalog), including 18 of the last 30 units offered toward the degree.
5. Any university credit requirements of the specific major.
6. 2,000 grade-point average in the major and for all university credit course work.
7. 42 upper-division units.
8. All other University, college and School of Music requirements for graduation. (For explanation of University graduation requirements, see the Graduation Requirements section of this catalog.)

The Major

THE MAJOR FOR HUMANITIES, SCIENCE, AND SOCIAL AND BEHAVIORAL SCIENCES—The undergraduate major programs listed as majors and degrees under these faculties in The Faculties section above are open to all students. A major is a method of organizing studies around a single discipline. These in-depth studies provide a sense of the growth and evolution of knowledge, its complexity and limitations, and its method of training in critical analysis and the solving of problems. Although the major may or may not determine one's career, it is the cornerstone of an undergraduate degree program. It should reflect postgraduate options and personal, career, and life considerations. The interdisciplinary studies major requires no minor.

Each department provides an advisor to help its majors select courses in the major and in a minor. An interdisciplinary studies major receives advice on courses from a faculty panel constructed especially for the student.

THE MAJOR FOR FINE ARTS—The faculty of Fine Arts requires students to declare a degree program at the time of application for admission to the University. Each student must declare a major within one department. For details see an advisor in the English Department.

The course and total-unit requirements for majors are specified by individual departments in the Departments and Courses of Instruction section of this catalog. Course work used to satisfy other graduation requirements cannot be used to satisfy requirements of the major. Students must obtain a grade-point average of 2.000 or better for all work in the major.

For graduation with bachelor degrees other than the Bachelor of Fine Arts and the Bachelor of Music degrees, students must complete the general education requirements, a major, and appropriate electives. Bachelor of Arts degrees are offered with majors in art history, dramatic theory, media arts, and music.

For graduation with Bachelor of Fine Arts and Bachelor of Music degrees, students must complete the general education requirements, a major, and appropriate electives. Bachelor of Fine Arts degrees are offered with majors in studio art, art education, dance, theatre production, theatre arts education, musical theatre, and general fine arts studies; Bachelor of Music degrees are offered with majors in performance, music education, theory and composition, and jazz studies. For B.F.A. and B.M. degrees, at least 45 general academic units must be taken outside the major department. The general education requirements are counted toward these 45 outside units. Students pursuing a B.F.A. degree with a major in general fine arts studies must take at least 45 units outside the Faculty of Fine Arts. Students majoring in art education, theatre arts education or music education must complete at least 56 units applicable to the degree with a grade-point average of 2.500 or better, must pass all three portions of the Pre-Professional Skills Test, and must obtain written permission from the Office of Student Services, College of Education, before being admitted to certain professional education courses. (See the College of Education section of this catalog for additional details.)

Fine arts students are encouraged to participate in both on-campus and nondepartmental, off-campus productions and performances. Participation cannot conflict, however, with commitments already made to departmental programs and to student colleagues in those programs. When such conflicts are imminent, students are responsible for consulting in advance with their department head or director.

The Minor

THE MINOR FOR B.A. AND B.S. PROGRAMS—A 20-unit minor is required in Bachelor of Arts and Bachelor of Science degree programs. Exceptions are made for a double major, the interdisciplinary studies major, the Bachelor of Arts with a major in Latin American Studies, and the Bachelor of Science in Geosciences. Most departments list core courses for a minor. Transfer students may discuss with the major advisor use of prior course work for the minor.

Some departments permit a thematic minor to be developed around a theme identified by the student using courses from two or more disciplines. A thematic minor form, available at the Office of Academic Services, must be submitted at the time of application for degree certification.

Requirements for a minor: (1) at least 20 units, and (2) at least 9 units upper-division units of university credit. Excluded from the minor: freshman composition, courses below Math. 124, military aerospace studies, military or naval science, specified courses in exercise and sport sciences, and first year courses in foreign language (except Greek, American Indian languages, and languages taught by the departments of East Asian Studies and Near Eastern Studies). American sign language may not be a minor if used to meet the foreign language requirement.

THE MINOR FOR FINE ARTS—The minor complements the major area of study and is an essential component of the bachelor of arts and bachelor of science degree programs in the Faculty of Fine Arts. The required 20-unit minor usually is completed in a department related to the major. The minor must be approved by the major advisor, who also advises the student in the minor area of study. Minors are structured by some departments; information can be found in the departmental listings in this catalog and by contacting the major advisor.

In general, completion of the minor can be accomplished in one of the following ways:

1. Twenty units in one department;
2. A split minor of work done in two departments, with at least 8 units in one and 12 units in the other;
3. A fine arts minor, composed of a broad survey of courses outside of the major department, which must include 6 to 9 units from three of the following departments: art, dance, media arts, music, theatre arts;
4. A teaching minor for education majors (specific requirements described in the departmental sections of this catalog).

Course work used to satisfy other graduation requirements cannot be applied to the requirements of the minor.

**General Fine Arts Studies**

The general fine arts studies major, offered by the Faculty of Fine Arts for the Bachelor of Fine Arts degree, combines general education requirements with introductory fine arts course work and concentrated study and participation in selected fine arts fields. For information regarding the specific requirements for this major, please refer to the General Education section below.

**Interdisciplinary Studies Major**

The interdisciplinary studies major (IDS), formerly called the general studies major, is offered by the Faculties of Humanities, Science, and Social and Behavioral Sciences for the Bachelor of Arts degree. It permits a student to combine three disciplines into a coherent and intellectually challenging major. In designing the major, the student must consult with an advisor in the Office of Academic Services and with advisors for the three study areas. Each proposal or change in proposals must be approved by the study area advisors and by the OAS.

Designing the major requires that the student (1) construct the program of study with the aid of an OAS advisor and the three departmental advisors; (2) prepare a written proposal; and (3) have the final proposal or change in proposals accepted by the college.

Requirements include:

1. All general education requirements.
2. Units within each of three subject areas: 24.
3. Total units for the B.A.: 125.
4. Upper-division units: 42.
5. Upper division units in each area: 12.
6. Units in Arts and Sciences courses: 90.
7. University credit in each area: 12.

Entry to the interdisciplinary studies major follows the completion of 30 units.

Subject areas I and II must be in single programs or majors in which a Bachelor of Arts or a Bachelor of Science degree is offered, or in the structured program of an academic committee within one of the three faculties.

Subject area III may include courses from the three faculties, from Fine Arts, or from another UA college. Courses in area III must be selected from no more than two related academic disciplines (divided equally), or from an approved combination of courses united by a common theme. In a foreign language, only upper division course work may be used in a split area III program.

Certain courses may not be used in any IDS subject area: freshman composition, the first year of a foreign language (except for Greek, American Indian languages, languages taught within the East Asian Studies and Near Eastern Studies departments, Fren. 302b, Port. 202b, and Span. 202b), mathematics courses below 124, military aerospace studies, military science, naval science, and certain courses in exercise and sport sciences.

A writing emphasis course must be taken from those specified by the department chosen for either subject area I or II.

A subject area discipline may not be used as a major or a second degree program.

**Double Majors and Second Degrees**

**DOUBLE MAJOR**—A student may create a double major by satisfying all of the requirements for the major in two departments within the college. A double major is available within the Department of English in English and creative writing. Both majors must lead to the same degree—B.A., B.S., B.F.A., or B.M. A minor is not required. It is essential to maintain contact with the advisor in each department to ensure that all requirements are being met. Both majors are declared on the Change of Major form and when filing for degree candidacy. The minimum units required for graduation are 125, with at least 15 units in each major taken as University credit course work. The student must earn whatever number of units are required by a selected major.

**SECOND DEGREE**—A second degree may be earned (e.g., B.A. and B.S.) by completing no fewer than 30 units in addition to the units required for the first degree, and meeting all general education and major requirements for the second degree.

Those students interested in the double major or second degree should meet with an advisor in their dean’s office for specific information.

**GENERAL EDUCATION**

To be able to listen and read critically; to think, speak and write clearly; to appreciate the application of the sciences and social sciences and the power of the humanities and the arts; to understand that scholarly disciplines and study areas are not independent but rather intricately interrelated and to have a perspective on the interrelationship — these are among the goals of general education.

The general education requirements are governed by the college’s general education committee, which decides which courses will be included and retained within it.

**B.A. and B.S. General Education Requirements**

The Bachelor of Arts and the Bachelor of Science degrees are offered in all four faculties of the college, and share a common general education program. This program is designed to offer students the opportunity to learn how different disciplines define, acquire, and organize knowledge; to enhance their understanding of the reciprocal influences of Western and non-Western cultures; to examine values; to develop analytic, synthetic, linguistic, and computational skills useful for lifelong learning; to develop a common foundation for wide-ranging dialogue with peers; and to acquire a critical and inquiring attitude, an appreciation of complexity and ambiguity, a tolerance for and empathy with persons of different backgrounds or values, and a deepened sense of one's self.

**Summary of B.A./B.S. General Education Requirements**

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Note: Credits may be obtained through the Advanced Placement or College-Level Examination Program.

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| I. BASIC PROFICIENCIES |

Each student must take and abide by the results of any placement/ proficiency examinations, audits, or portfolio reviews required by the appropriate department prior to enrollment in the following courses. In addition, it is possible to satisfy the composition, mathematics, and foreign language requirements by any examinations authorized by the departments responsible for these courses.
A. Composition (minimum 6 units)

All freshmen must enroll in one of the following three sequences:

1. Engl. 100 (exposition, review of syntax and usage), 101 (exposition, emphasis on essays), and 102 (critical papers on selected subjects);
2. Engl. 101 and 102;
3. Engl. 103H and 104H (Honors).

Placement is based on scores resulting from the UA Freshman Composition Placement Exam, and the English section of the American College Test or the Test of Standard Written English portion of the Scholastic Aptitude Test.

For other aspects of the composition requirement, see the "University Requirements in Composition" under Academic Guidelines section of this catalog.

B. Mathematics (3 units)

Required is College Algebra (Math. 117R/S), or any three-unit mathematics course numbered above 117R/S. There is a mandatory placement examination.

It should be noted that many departments require specific mathematics courses in support of their majors.

C. Foreign Language (0-16 units)

This requirement may be met by demonstrating proficiency in a single foreign language at the fourth semester level, in one of the following ways:
1. Successful completion of a fourth semester course taught in the foreign language;
2. Successful completion of the second semester of an intensive foreign language course;
3. Through an examination administered by the appropriate UA language unit;
4. Sixteen units in sign language to include S.E.R. 370a/394, 370b/394, 431a/494, and 431b/494.

Students whose native language is other than English may satisfy this requirement by successful completion of English 101 and 102, or English 107 and 108.

II. STUDY AREAS

The study area courses encourage the investigation of relations among and between disciplines. In seeking to identify similarities and differences in subject matter, methods, aims, and results of the various approaches to knowledge, the student will explore the extent to which different modes and forms of knowledge can be integrated, and the ways in which they resist integration.

All students should be able to better understand the segregative boundaries which exist in human society, particularly the values that have been maintained arbitrarily on the basis of gender, class, race, or ethnic identity. Courses listed among the study areas are designed to introduce and epitomize their respective disciplines, so as to enable the student to make informed decisions about majors and careers.

These requirements may be fulfilled during any semester of the undergraduate years. However, at least one course in each study area should be completed before the beginning of the fifth semester. Transfer credit may be allowed for courses in which equivalency has been established.

A. Traditions and Cultures (9 units)

Fundamental to this study area is the awareness that our place in the world is determined by two distinct forces. We are historical beings, shaped by the experience and acts of our predecessors; in turn we shape the lives of those who follow us. But no simple connection binds us to the past, as we are also profoundly affected by the cultures coexisting with our own.

The internal organization of this study area is intended to reinforce the assumption of these two forces. You must take a total of 9 units (3 courses); 3 units (1 course) from List 1 (Non-Western), and a 6-unit sequence from List 2 (Western). Studied in conjunction, these two subareas provide a greater understanding of the reciprocal influences of Western and Non-Western cultural traditions.

B. Biological and Physical Sciences (8 units)

This study area will provide the student with the vocabulary and the facts needed to understand major scientific principles. In addition, it will show how data is collected to test hypotheses, how conclusions from this data can be used to make predictions, construct models, or formulate general theories, and what part skepticism and knowledge of limits play in the interpretation and acceptance of new ideas.

This requirement is to be satisfied by two approved courses, four units each, which include laboratory work. Each student is strongly encouraged to take either one two-semester sequence in the biological sciences or one two-semester sequence in the physical sciences.
C. Individuals, Societies, and Institutions (9 units)

Courses in this area afford the opportunity to examine systematically individual and collective behavior, and to explore the basic concepts and theories used in analyses of personal, social, cultural, political, economic, philosophical, religious and scientific issues. As a result, there is a clearer understanding of issues of self-identity, social difference and social status, the role of science in society, and the effects of major institutions on individual experiences. This requirement is to be met by taking three approved courses, offered in at least two different departments. In addition, one of the courses offered in fulfillment of this requirement must focus systematically on gender, class, race, or ethnicity (marked by *).

A.Ec. 475 Economics of Water and Land Resources in the American West
Anth. 101 Introduction to Physical Anthropology and Archaeology
Anth. 102 Introduction to Cultural Anthropology and Linguistic Anthropology
Anth. 301 Pararnormal Anthropology
Anth. 303* Gender and Language
Anth. 307 Ecological Anthropology
Anth. 319* Mexican-American Culture
Anth. 405* Urban Adaptation of Ethnic Groups
Anth. 406* Gender and Social Identity
Anth. 409 Economic Anthropology
Anth. 487 Culture and Materials Technology
Anth. 490* Women in Middle Eastern Society
Armo 336 Weather, Climate and Society
Clas. 330* Women in Antiquity
Comm. 300 Introduction to Communication Theory
Comm. 309 Introduction to Mass Media Effects
Comm. 318 Persuasion
M.C.S. 446 Consumer Economics
Ecol. 421 Philosophy of the Biological Sciences
Econ. 200 Basic Economic Issues
Econ. 371 Economic Development
Geog. 102a-102b Human Geography
Geog. 305 Economic Geography
Geog. 360 Environmental Perception
Geog. 379 Urban Growth and Development
Geog. 411 Middle America
Geog. 412 South America
Geog. 456 Urban Geography
Geog. 461 Population and Resources
Geog. 464 The Arid and Semiariad Lands
Hist. 201 Religion in America
Hist. 236 Indians in U.S. History
Hist. 245 Frontier America
Hist. 253a-253b History of Women in the U.S.
Hist. 271 The History of Christianity
Hist. 351* Race and Class in Latin America
Hist. 361* History of the U.S.-Mexico Border Region
Hist. 399HT History of the Art of America
Hist. 410 History of Hell in Early Europe
Hist. 419 The French Enlightenment
Hist. 428 Antisemitism
Hist. 452* American Ethnic History
Hist. 467* Contemporary Latin America
Hist. 469* History of Women in Latin America
Hist. 489* Women in East Asia
Hum. 260* Intercultural Perspectives
Jour. 151 News in Mass Communications
Jour. 439 Ethics and the News Media
Jour. 470 The Press and Society
Ling. 101 Introduction to Language
Ling. 210 Native Languages of North America
Ling. 320* Language and Social Issues
Ling. 430* Language Variation
M.S.E. 479 Culture and Materials Technology
M.S.E. 486 Technology and Western Society
M.A.S. 180a-180b* Introduction to Mexican American Studies
Min.E. 120 Mineral Resources, Geotechnology, and the Environment
N.E.E. 120 Technology and Society: An Historical Perspective
Nurs. 484 The Health Professions and Social Sciences
Nurs. 487 Poverty and Health
Phil. 111 Introduction to Philosophy
Phil. 113 Introduction to Moral and Social Philosophy
Phil. 145 Science, Technology and Human Values
Phil. 233 Philosophy of Religion
Phil. 249* Existential Problems
Phil. 260 Ancient Philosophy
Phil. 262 Modern Philosophy
Phil. 305 Introduction to the Philosophy of Science
Phil. 310 History of Ethics
Phil. 321 Medical Ethics
Phil. 322 Business Ethics
Phil. 350* Minds, Brains, and Computers
Phil. 370 Issues in Greek Philosophy
Phil. 421 Philosophy of the Biological Sciences
Phil. 434 Social and Political Philosophy
Phil. 436 Games and Decisions
Phil. 438a-438b Philosophy of Law
Phil. 442 Knowledge and Cognition
Phil. 443 Knowledge and Society
Pol. 100 Introduction to Politics
Pol. 102 American National Government
Pol. 120 Introduction to International Relations
Pol. 130 American State and Local Government
Pol. 140 Introduction to Comparative Politics
Pol. 160 Introduction to Political Ideas
Pol. 242a Western European Political Systems: Britain, Ireland, Scandinavia, and Other Countries
Pol. 247 Introduction to Latin American Politics
Pol. 250 Contemporary International Politics
Pol. 280 Politics and the Vietnam War
Pol. 330* Minority Groups and American Politics
Pol. 421 Ancient and Medieval Political Theory
Pol. 422 Early Modern Political Theory
Pol. 423 Recent Political Thought
Pol. 426 American Political Thought
Pol. 334* Politics and American Indians
The purpose of this study area is to provide opportunities to explore the processes by which visual, performing, and literary artists produce their works, and to evaluate the significance of those works in larger cultural contexts.

The Arts

ArE. 130 Appreciating the Visual Arts
ArH. 117 Survey of World Art, Prehistoric-Gothic Century
ArH. 118 Survey of World Art, Renaissance-20th Century
ArH. 319 Introduction to American Art
Art 101 Drawing
Art 102 Color and Design
Art 104 Three Dimensional Design
Dnc. 100 Looking at Dance
Dnc. 112a Beginning Ballet
Dnc. 143 Improvisation
Dnc. 152a Beginning Modern Dance
Dnc. 152b Modern Dance for Beginners with Limited Experience
Dnc. 152c Intermediate Modern Dance
Dnc. 179 Theater Dance
Dnc. 244a-244b-244c-244d Jazz Dance Technique
Dnc. 343a-343b-343c-343d Dance Ensemble
Dnc. 370 Human Movement in the Arts
Engl. 449b Folklore: Forms of Nonverbal Folklore
M.A. 200 Fundamentals of Theory and Aesthetics in Media Arts
Mus. 100 Basic Musicianship
Mus. 101a Exploring Music through Piano for the General Student
Mus. 107 Survey of Music I
Mus. 108 Survey of Music II
Mus. 120a Music Skills and Structure I
Mus. 200a-200s Large Conducted Ensembles
Mus. 201a-201h Coached Ensembles
Mus. 202a-202f Small Conducted Ensembles
Mus. 337 Survey of Mexican Folk Music
Mus. 360 Music Fundamentals through Experience
Mus. 400a-400s Large Conducted Ensembles
Mus. 401a-401h Coached Ensembles
Mus. 402a-402f Small Conducted Ensembles
Phil. 433 Aesthetics
T.Ar. 100 Acting for General College Student
T.Ar. 103 Theatre Appreciation
T.Ar. 336 Introduction to Shakespeare through Performance

Literature

Engl. 260 Major British Writers
Engl. 261 Modern British Literature
Engl. 265 Major American Writers
Engl. 267a-267b World Literature
Engl. 270a Approaches to Literature: Major Authors
Engl. 270b Approaches to Literature: Major Works
Engl. 270c Approaches to Literature: Literary Mode or Genre
Engl. 270d Approaches to Literature: Major Themes
Engl. 310 The Novel
Engl. 320a-320b Literature of the Bible
Engl. 331 Shakespeare's Major Plays
Engl. 372a-372b The Short Story
Engl. 380 Literary Analysis
Engl. 416 The Nature of Literature
Engl. 418 Women in Literature
Engl. 419a Non-fiction Prose: The Essay in English
Engl. 419b Non-fiction Prose: Other Prose Forms
Engl. 424 Studies in Southwest Literature
Engl. 426 English Medieval Literature
Engl. 427 Chaucer
Engl. 431a-431b Shakespeare
Engl. 432 Renaissance Drama
Engl. 444 Milton
Engl. 449a Folklore: Forms of Verbal Folklore
Engl. 458a-458b The English Novel
Engl. 460b Romantic Literature
Engl. 465 Victorian Literature
Engl. 466 Themes in Victorian Literature
Engl. 473a-473b Modern British Literature
Engl. 475 Modern Continental Drama
Engl. 477a Ethnic Literature: North American Indian Literature
Engl. 482 American Romanticism
Engl. 484a The American Novel: Nineteenth Century
Engl. 484b The American Novel: Twentieth Century
Engl. 485 Modern British and American Drama
Engl. 488a-488b American Poetry
Fre. 282 The French Novel and Society
Fre. 283 Existentialism and the Absurd: The French Foundations
Fre. 396H Honors Proseminar (French Women Writers of the 20th Century)
Ita. 282 The Middle Ages: Italian Literature in Translation
Ita. 283 The Renaissance: Italian Literature in Translation
Ger. 275 Creative Minds: The German Classical Heritage
Ger. 276 Hermann Hesse's Life and Works
Ger. 277 Eroticism and Love in the Middle Ages
Ger. 375 Vienna, 1890-1920: Its Cultural Legacy to the Modern World
Ger. 455 Music and German Literature
Phil. 238 Philosophy in Literature
Russ. 250a-250b Russian Humanities in Translation
Russ. 330 Russian Literature from the Beginnings to 1850
Russ. 340 Nineteenth Century Russian Literature in English
Russ. 350 Twentieth Century Russian Literature in English
Span. 435 Cervantes' Don Quixote
Span. 445 Novel of the Mexican Revolution
T.Ar. 336 Introduction to Shakespeare through Performance

Note: The list of courses satisfying general education requirements is modified on a regular basis. Refer to the most recent issue of BookLink for the most up-to-date listing.

B.F.A. and B.M. General Education Requirements

General education requirements vary among the several degree programs of the Faculty of Fine Arts. Bachelor of Arts programs require the general education coursework described earlier. Students enrolled in a Bachelor of Fine Arts or Bachelor of Music degree program must...
satisfy the general education requirements shown below. Students should consult with departmental advisors for additional information. Individual studies, special topics, experimental courses, and courses crosslisted from other home departments will be accepted in general education only if approval is granted by the dean prior to enrollment.

In extenuating circumstances, when students feel they need to include a course other than those listed, they should consult their departmental advisor and have the advisor submit a College Recommendation Form to the dean prior to enrollment in the course.

Students in all B.F.A. and B.M degree programs are required to complete 45 units outside of the major department, including the general education requirements.

**Bachelor of Fine Arts**

(Majors in Studio Art, Dance, Theatre Production, Musical Theatre, and Media Arts)

and Bachelor of Music

(Majors in Performance, Composition, and Jazz Studies)

I. Communication and Conceptualization (12 units)

A. Freshman Composition (6 units)
   3. Engl. 103H and 104H (Honors).

B. Mathematics (3 units)
   Three units of Math. 101 or 117 and above. (Media arts majors also may take M.I.S. 111)

C. Oral Communication (3 units)
   Selected from oral interpretation, beginning acting, Speaking in the Arts, and media arts performance courses. Media arts majors are required to take Comm. 100 and 102. Theatre production and musical theatre majors may substitute Engl. 207 for this requirement.

II. Study Areas (33 total units)

A. Western Civilization (6-9 units)
   Western civilization courses must be selected from outside of the student's major department from the following courses: Ar.H. 117, 118; Dnc. 259; Mus. 107, 108; Hum. 355; N.E.S. 140; Phil. 111, 113; T.Ar. 140a, 140b; W.S. 200; or from one sequence of western civilization courses: Fine Arts 207, 307, 317; Hist. 101, 102, 103; Hum. 250a, 250b, 250c; Engl. 251a, 251b, 251c; or Phil 121, 122, 123.

To satisfy group II-A requirements, media arts students must include no fewer than 3 units from the following: Engl. 260, 261, 265, 267a, 267b, 268 or T.Ar. 140a, 140b.

B. Science (3 units)
   Three units of science (laboratory or nonlaboratory) in the following departments: astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, entomology, Geog. 103a, 103b (lab 104a, 104b); geosciences, molecular and cellular biology, physics, planetary sciences, Sp.H. 250, 280; R.N.R. 135; W.F.Sc. 125, PI.S. 100.

Media arts majors are required to take 4 units of laboratory science.

C. Individuals, Societies, and Institutions (6 units)
   Courses to be selected from anthropology, economics, geography and regional development, (except Geog. 103a-103b and 104a-104b), history (except Hist. 101, 102, 103), M.Ar. 101, philosophy (except Phil. 111 and 113), political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except N.E.S. 140), religious studies, women's studies (except W.S. 200).

D. Non-Western and Minority Studies (3 units)
   Students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization.

This course can be part of the general studies major, general education, or elective course work and must be approved by the program advisor.

E. The Arts (6 units)
   From all fine arts offerings in departments other than the student's major, with only one course of applied (studio/performance/production) arts accepted.

To satisfy group II-E requirements, media arts students must include no fewer than three units from Art 101, 102, or 104.

F. Department-Specified General Education Course Work Outside of the Major Department (9-15 units)
   Some area II-F courses specified by the departments can be used to satisfy requirements in other areas above. However, the student must take the minimum required units in each area.

1. Department of Art Requirements:
   Students select from the following courses. Some of the courses are required for a particular study emphasis within the Department of Art, so each student should consult with an advisor in the designated study emphasis.
   Ar.H. 430, Clas. 229, Dnc. 100, 259, 270; Ecol. 159a or 159b; Jour. 301; M.Ar. 101, 200; Mktg. 361, 364; Mus. 107, 108; Phil. 110, 111, 433; T.Ar. 108, 109, 140a or 140b, 170, 474; W.S. 243a, 243b.

2. Committee on Dance Requirements:
   Mus. 107, 108; Phil. 110; T.Ar. 101.

3. Department of Media Arts Requirements:
   3 units from each of the following categories:
   a. Art 241.
   b. Mus. 100 or 360 or 3 units of 101, 102, 103.
   c. Ar.H. 117, 118; Mus. 107, 108; 331.

4. School of Music Requirements:
   9 to 15 units selected from courses in the College of Arts and Sciences and from any additional courses approved by the General Education Committee for the fulfillment of general education requirements. Voice performance majors can count 12 units of foreign language studies as fulfilling requirements in area II-D.

5. Department of Theatre Arts Requirements:
   6 units of dramatic literature selected from the following courses: Engl. 267a, 331, 431a, 431b, 432, 446 468, 475, 485; Ger. 371; Clas. 346. 6 additional units determined in consultation with the student's study area advisor.

**Bachelor of Fine Arts**

(Majors in Art Education and Theatre Arts Education)

and Bachelor of Music

(Major in Music Education)

I. Communication and Conceptualization (12 units)

A. Freshman Composition (6 units)
   Completion of one of the following sequences:
   3. Engl. 103H and 104H (Honors).

B. Mathematics (3 units)
   Math. 101 or 117R/S or above

C. Oral Communication (3 units)
   Selected from oral interpretation, beginning acting, Speaking in the Arts, and media arts performance courses. Media arts majors may substitute Engl. 207 for this requirement.

II. Study Areas (33 total units)

A. Western Civilization (6-9 units)
   Western civilization courses must be selected from outside of the student's major department from the following courses: Ar.H. 117, 118; Dnc. 259; Mus. 107, 108; Hum. 355; N.E.S. 140; Phil. 111, 113; T.Ar. 140a, 140b; W.S. 200, or from one sequence of western civilization courses: Fine Arts 207, 307, 317; Hist. 101, 102, 103; Hum. 250a, 250b, 250c; Engl. 251a, 251b, 251c; or Phil 121, 122, 123.

To satisfy group II-A requirements, media arts students must include no fewer than 3 units from the following: Engl. 260, 261, 265, 267a, 267b, 268 or T.Ar. 140a, 140b.

B. Science (3 units)
   Three units of science (laboratory or nonlaboratory) in the following departments: astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, entomology, Geog. 103a, 103b (lab 104a, 104b); geosciences, molecular and cellular biology, physics, planetary sciences, Sp.H. 250, 280; R.N.R. 135; W.F.Sc. 125, PI.S. 100.

Media arts majors are required to take 4 units of laboratory science.

C. Individuals, Societies, and Institutions (6 units)
   Courses to be selected from anthropology, economics, geography and regional development, (except Geog. 103a-103b and 104a-104b), history (except Hist. 101, 102, 103), M.Ar. 101, philosophy (except Phil. 111 and 113), political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except N.E.S. 140), religious studies, women's studies (except W.S. 200).

D. Non-Western and Minority Studies (3 units)
   Students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization.
Western civilization courses must be selected from outside of the student's major department from the following courses: Ar.H. 117, 118; Dnc. 258; TAr. 140a, 140b; W.S. 200; or from one sequence of western civilization courses: Fine Arts 207, 307, 317; Hist. 101, 102, 103; Hum. 250a, 250b, 250c; Engl. 251a, 251b, 251c; or Phil. 121, 122, 123.

B. Science (3 units)
Three units of science (laboratory or nonlaboratory) in the following departments: astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, entomology, Geog. 103a, 103b, (lab 104a, 104b); geosciences, molecular and cellular biology, physics, planetary sciences, Sp.H. 260, 280; R.N.R. 135, W.F.Sc. 125, Pl.S. 100.

C. Individuals, Societies and Institutions (6 units)
Required courses: Psyc. 101 and Hist. 106 or 107. One additional course selected from anthropology, economics, geography and regional development (except Geog. 103a-103b and 104a-104b), history (except Hist. 101, 102, 103), M.Ar. 101, political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except N.E.S. 140a-140b), religious studies, women's studies (except W.S. 200).

Note: Examination in U.S./Arizona Constitutions or completion of Pol. 110 also is required, although not included in total units required in study areas.

D. Non-Western and Minority Studies (3 units)
Students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization. This course can be part of the general studies major, general education, or elective course work and must be approved by the program advisor.

E. The Arts (3-6 units)
From all fine arts offerings in departments other than the student's major, with only 3 units of applied (studio/performance/production) arts accepted.
Art education majors can apply 6 units of upper division art history to area II-E.
Music education majors can apply 6 units of Mus. 330 to area II-E.

F. Department-Specified General Education Course Work Outside of the Major Department (15 units)
Fifteen designated units in the College of Education. Please consult an art education, music education, or theatre arts education advisor for designated units.

Bachelor of Fine Arts

(MAJOR IN GENERAL FINE ARTS STUDIES)

I. Communication and Conceptualization (12 units)
A. Freshman Composition (6 units)
Completion of one of the following sequences:
3. Engl. 103H and 104H (Honors).

B. Mathematics (3 units)
Three units of Math. 101 or 117R/S and above.

C. Oral Communication (3 units)
Selected from oral interpretation, beginning acting, Speaking in the Arts, and media arts performance courses.

II. Study Areas (33 units)
A. Literature/Foreign Language/Journalism (12 units)
From two of the following areas:
1. Literature (or survey literature in a foreign language department).
2. Foreign language (8 units minimum in one language).

B. Science (3 units)
Three units of science (laboratory or nonlaboratory) in the following departments: astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, entomology, Geog. 103a, 103b, (lab 104a, 104b); geosciences, molecular and cellular biology, physics, planetary sciences, Sp.H. 260, 280; R.N.R. 135, W.F.Sc. 125, Pl.S. 100.

C. Individuals, Societies and Institutions (6 units)
Courses to be selected from anthropology, economics, geography and regional development (except Geog. 103a-103b and 104a-104b), M.Ar. 101, history (except Hist. 101, 102, 103), philosophy (except Phil. 111 and 113), political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except N.E.S. 140a-140b), religious studies, women's studies (except W.S. 200).

D. Non-Western and Minority Studies (3 units)
All general fine arts studies students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization. This course can be part of the general studies major, general education, or elective course work and must be approved by the program advisor.

E. Engl. 207, 209, 210, 307, 308 or F.A. 397a (3 units).

III. Introductory Fine Arts Courses (24 units)
(including western civilization course work)
Students select four of the following fields and take the designated courses: Art 101 and Art.H. 117 or 118; Dnc. 259 and 3 units of dance activity courses; M.Ar. 101, 200; Mus. 107 or 108, and 3 units of performance courses; TAr. 140a or 140b, 149.

IV. Fine Arts Emphasis Course Work (48 units)
The candidate for this degree also must complete a minimum of 24 additional units of course work in one of the departments selected in section III above, and 12 additional units of course work in each of the two other departments selected in section III. (With approval of the advisor, creative writing may be used as one of the 12-unit departments.) At least 24 units must be upper-division courses. At least 24 units in sections III and IV must be taken in residence.
All group IV courses must be taken in the home department, that is, the department actually teaching the course and for which the complete course description is included in the catalog.
General fine arts studies students take the writing emphasis course designated in their department A (the department in which 24 units are taken).

Policies

Change of College
To enter the College Arts and Sciences from another University of Arizona college, a student must meet with an advisor in the Office of Academic Services, Modern Languages Building, Room 347, or if a Fine Arts major, consult an advisor in the Office of the Faculty of Fine Arts, Music Building, Room 111. The student must present a copy of his or her current university transcript and an official evaluation of transfer courses (if available). The change of college is effective at the beginning of the following semester.

Change of Major
To change a major to another within the college, the student must fill out a declaration of major form from the Office of Academic Services, Modern Languages Building, Room 347. Approval for the change must be obtained from the new department. Fine Arts majors should go to the Office of the Faculty of Fine Arts, Music Building, Room 111. The change of major is effective at the beginning of the next semester. To
declare an interdisciplinary studies major; go to OAS for instructions regarding special procedures. For the general fine arts studies major, go to the Office of the Faculty of Fine Arts.

**Course Load**

The maximum course load is 19 units of credit per semester in a four year study plan. All courses, including those taken for credit, audit, by correspondence, or at another academic institution are counted in determining the maximum academic load. Students who wish to register for more than 19 hours must have a grade average of at least 3.0 and must secure permission from the assistant dean of the college.

**Withdrawal Procedure**

The college adheres to the University's change of schedule procedures. Scheduled classes may be added only through the university's late registration period early in each semester. Consult with an academic advisor about the addition of independent studies classes. The initial four weeks of a semester provide the opportunity to evaluate the content of a class, the syllabus, the course requirements, and the type of instruction, thus withdrawals filed during this period result in deletion of the course from the student's record. Withdrawal from a course must conform to the following calendar and procedures:

Week 1: Instructor's signature required.
Weeks 2 through 4: Course withdrawals filed by the end of the fourth week of classes result in cancellation of registration in the course. No signatures are required.
Weeks 5 through 10: Course withdrawals filed during this period require the instructor's signature and a grade of "W" or "E" will be awarded by the instructor and included on the permanent record.
Week 11 to end of semester: Beginning with the eleventh week, withdrawal from a course is only with special permission of the assistant dean of the college and only under very exceptional circumstances.

**Grade Appeal Procedures**

A grade appeal process is available for the student who believes a final grade was based on non-academic considerations that did not reflect course requirements as defined by the instructor. Grade appeals in the College of Arts and Sciences are handled by the Associate Dean of the College. For a detailed description of the grade appeal procedure, see "Appeal of Grade" under Academic Guidelines section of this catalog.

**Incomplete Grade**

Students who receive an incomplete (I) grade have the responsibility to initiate with the instructor the procedure to complete the work. For specific information regarding the incomplete grade, see "Grading System" in the Academic Guidelines section of this catalog.

**Pass-Fail**

The purpose of the pass-fail option is to encourage students to take courses according to their interests without requiring assignment of letter grades. The pass-fail option may not be used to fulfill the general education requirements, the requirements of the major and minor areas of study, nor to qualify for honors awards for high scholarship.

For additional information see "Pass-Fail Option" under Academic Guidelines and "Honors, Awards, and Prizes" under Provisions for Superior Students elsewhere in this catalog.

**Audit**

Students wishing to attend courses for information without receiving credit or regular grade may register for "audit" by obtaining special permission from the instructor and completing the appropriate form from the Registrar's Office, Room 210. The registration fee for audit courses is the same as for courses taken for credit. The course instructor establishes attendance and work standards. A department may have restrictions on courses open to audit students.

**Correspondence Study**

Many University of Arizona credit courses are available from the Independent Study through Correspondence program in Extended University. Students enrolled in the College of Arts and Sciences obtain the assistant dean's approval before enrolling in correspondence study. Credit earned through correspondence is not considered residence credit, and up to 60 units may be applied to the degree. Grades received are not averaged into the cumulative grade-point average. Students who have in disqualification status should consult an academic advisor before enrolling in correspondence courses. For information on courses available for correspondence study, or to request the correspondence catalog, call 621-3210.

**Individual Studies**

Individual studies provides an opportunity for experiential education outside the normal classroom experience. Experiential education is a challenging learning process which encompasses skills, knowledge, application, and personal growth, and recognizes the student as an individual who learns in unique ways and who has unique goals.

The college encourages its students to integrate experience and learning through preceptorships, internships, legislative internships, practice, and independent studies.

A department may have a limit on the number of units of this type of study which may be credited toward the major or toward the degree. For additional descriptions of individual studies options, see the "University-Wide House-Numbered Courses" section of this catalog.

**Honors Program**

The faculties and departments of the college participate in and strongly support the University Honors Program. To encourage and recognize academic work of depth and originality by undergraduates, virtually every department in the College of Arts and Sciences supplements its regular degree program with honors courses. Honors courses are specially designated by a department and carry an "H" after the course number.

**Transfer Students**

The Office of Admissions and New Student Enrollment (in the Nugent Building) reviews the official transcript to determine course transfer credits. The evaluator may assign a transfer course to a discipline or may assign a course equivalency for a course from an Arizona community college. Entering transfer students in the Fine Arts who wish to determine the application of courses to the general education program should go to the Music Building, Room 111. All other students should go to the Office of Academic Services, Modern Languages Building, Room 347.

The evaluation of transfer course work in the major and minor disciplines is done by the major advisor. Fine Arts transfer students must declare a major upon admission. All other students must declare a major area of study at the 55-unit level. Students who transfer 55 units or more may remain as undeclared for one semester following admission.

A copy of the transcript is required for evaluations. Advisors will not evaluate the application of courses to the degree program without a transcript.

Students are urged to participate in the academic orientations offered by the college during the summer and at the beginning of each semester. Special sessions offer the transfer student an evaluation of the transcript, explanation of the requirements and meaning of the General Education Program, materials that cover the degree options and structured minor areas of study, a list of faculty advisors, and specific information about the special and preprofessional programs.
SPECIAL ACADEMIC PROGRAMS

Cooperative Education, Internship Program, and Summer Co-op

Complete information on these programs is available through the Career Services Office of the Student Resource Center.

THE COOPERATIVE EDUCATION PROGRAM provides students with opportunities to supplement academic studies with periods of paid, career-related work experience prior to graduation. Co-op can be full-time during a semester and/or summer, or part-time (20+ hours per week combined with a minimum of 7 units of study). Students take time away from formal studies to work in positions in business, industry, and government throughout the United States. By carefully planning academic and Co-op schedules it is possible to graduate in 4-1/2 to 5 years.

Requirements are: (1) completion of the freshman year, (2) completion of or current enrollment in one full-time UA semester; (3) a minimum GPA of 2.000. (Note: Many employers require considerably higher GPAs.)

THE INTERNSHIP PROGRAM merits exploration if a student wishes to work part-time in a career-related position while attending the UA. Internship listings are for both paid and nonpaid positions.

THE SUMMER CO-OP PROGRAM is designed to help students find full-time, paid, career-related, work experience during the summer months. Employment opportunities exist in business, industry, and government throughout the United States.

Study Abroad

The University of Arizona study abroad programs are available in France, England, Italy, Spain, Denmark, Germany, Greece, Mexico, Brazil, the Soviet Union, Taiwan and Japan. The University will add other countries to the list from time to time. Check with the Study Abroad Program Office, Nuncteg 205, for current information.

Through the Center for Arabic Studies Abroad, UA students may study Arabic language, literature, and culture in Cairo, Egypt. The University participates in exchange programs sponsored by the government of the Republic of China, Taiwan, and by the University of Tuebingen in West Germany.

Students may visit an Office of Academic Services advisor or a departmental advisor to review how courses abroad will contribute to degree and general education requirements. Written confirmation of course equivalencies is made in advance of travel. The Admissions Office evaluates foreign study apart from University programs and can confirm transfer of course work. The University awards credit only upon receipt of an official transcript from the foreign university.

Evening Study Program

Many department in the College of Arts and Sciences offer courses in the late afternoon and evening. Individuals interested in completing a degree program through such course offerings should consult with a departmental advisor and with an advisor in the Office of Academic Services for pre-entry advising about the college, peer support, and referrals to campus services. Extended University can provide assistance in meeting the changing needs of the adult learner.

College of Business and Public Administration

BPA Building, Room 108
(602) 621-2505

The college offers professional education in both business and public administration. Its purpose is to prepare men and women for professional positions in the private and public sectors. The college also provides continuing educational opportunities for those seeking to improve their positions. Faculty of the college are actively engaged in research on a wide range of economic and administrative topics.

The college has been a member of the American Assembly of Collegiate Schools of Business since 1948, and its undergraduate and graduate curricula in business are accredited by the assembly. The college's graduate program in public administration is recognized by the National Association of Schools of Public Affairs and Administration.

The college faculty offers a rich combination of experience in professional management problems and practices, scholarship, teaching and research. Many members serve as consultants in industry, government, health care, education and transportation. Several faculty members have authored texts which are widely used in management education throughout the United States. In addition, the faculty is well represented on the editorial boards of major professional publications.

The college includes the Karl Eller Graduate School of Management; School of Public Administration and Policy; and the following departments: Accounting; Economics, Finance and Real Estate; Management and Policy; Management Information Systems; and Marketing.

DEGREE PROGRAMS

Undergraduate Degrees

Two undergraduate degrees are offered by the college: the Bachelor of Science in Business Administration (B.S.B.A.), and the Bachelor of Science in Public Administration (B.S.P.A.). The structure and purposes of the two degrees are similar. Both provide a strong foundation in the arts and sciences in the freshman and sophomore years. In each, the common body of knowledge necessary for effective management is thoroughly explored. Through the major, a comprehensive exposure to a particular field is obtained. Finally, there is the opportunity to enroll throughout the undergraduate years in courses outside the field of administration.

Undergraduate Majors

Within the B.S.B.A. degree program, students may select a major in accounting, business economics, finance, general business administration, management information systems, marketing, operations management, personnel management, or real estate. A competitive entry program in entrepreneurship also is available to undergraduates.

Within the B.S.P.A. degree program, students may select a major in criminal justice administration, health and human services administration, or public management.

Students may elect to take a second major from among those offered in their degree program. The general business administration major, however, may not be combined with another major. Students selecting a second major must complete all the stipulated requirements for each.

The majors offered in the college are more fully described below. Minor fields are not available in the college.

Students interested in the Cooperative Program in International Management Careers should see "Special Programs" in the College of Arts and Sciences section of this catalog.

Graduate Degrees

The Graduate College, through the Karl Eller Graduate School of Management in the College of Business and Public Administration, offers a number of graduate degrees for qualified students. These include the Master of Business Administration; Master of Accounting; Master of Arts degree with a major in economics; and Master of Science degree with majors in finance, management and policy, management information systems, and marketing. The School of Public Administration and
Policy, in conjunction with the Graduate College, offers the Master of Public Administration. Also, the Graduate College, through the Gradu-
ate Committee on Planning, offers the Master of Science degree with a
major in planning. In conjunction with the College of Law, combined
programs for the Juris Doctor/Master of Business Administration, Juris
Doctor/Master of Arts with a major in economics, and Juris Doctor/
Doctor of Philosophy with a major in economics are offered.

The Doctor of Philosophy degree is offered with majors in business
administration and economics.

Detailed information on these programs is contained in the Graduate
Catalog.

STUDENT ADVISEMENT

Students new to the college, whether just entering the University or
transferring from on-campus into the BPA College, should come to the
Undergraduate Programs Office, BPA 108, for information and aca-
demic advising. Students with prior college-level work should bring
transcripts.

Freshmen, sophomores and all general business administration ma-
jors are counseled by college advisors in the Undergraduate Programs
Office.

Juniors and seniors in all majors except general business administra-
tion are advised through the department offering the major. Students
should contact the department office to obtain a major advisor.

Information on all college baccalaureate degree programs, policies
and requirements can be obtained at the Undergraduate Programs
Office.

SPECIAL ADMISSION REQUIREMENTS

Incoming freshmen should present credit in mathematics as follows:
one unit of elementary algebra, 1/2 unit of intermediate algebra, and 1/2
unit of advanced algebra.

Transfer students from community colleges must meet all freshman
and sophomore requirements as shown below for the degree they wish
to pursue, either by acceptable transfer credit or course work for univer-
sity credit.

TRANSFER CREDITS

General Statement

Undergraduate programs in business administration in universities nor-
mally concentrate the professional courses in the last two years of a
four-year program. Only a limited amount of work in business courses
is offered below the junior year. The objective of this policy is to permit
the student to acquire a foundation of work in the basic arts and
sciences as a prerequisite for professional courses in business.

All business programs accredited by the American Assembly of Col-
legiate Schools of Business require the students to take a minimum of
40% of the degree program in the arts and sciences, including work in
mathematics, social science, humanities and the natural sciences. Stu-
dents desiring a four-year degree are advised to take a majority of their
work during the first two years in the arts and sciences, including a
strong background in mathematics.

Students planning to take their first two years of work at a junior
college or at another four-year institution should take only those
courses in business that are offered as freshman- or sophomore-level
courses at any of the three state universities. These lower-division
courses are numbered 1 through 299. A maximum of 30 units of busi-
ness and economics courses from community colleges will be ac-
cepted toward a bachelor's degree in business administration.

Professional business courses taught at the junior or senior year in
the three state universities may not be completed at a two-year college
for transfer credit in the business core or major (the introductory course
in the legal environment in business will be accepted as lower-division
credit as an exception to this policy). Such courses may be utilized in
the free elective subject category subject to the 30-unit limitation. Courses
taught as vocational or career classes at the community colleges which
are not taught in the colleges of business at any of the three state
universities will not be accepted for credit toward a bachelor's degree.

Courses taught in the upper division business core at the three state
universities must be completed at the degree-granting institution unless
transferred from an accredited four-year school.

Only 72 units of community college work may be applied toward a
BPA College degree program.

Suggested Courses

The following general pattern of courses is recommended for students
completing their first two years' work in a junior college and planning to
transfer to one of Arizona's universities without loss of credit:

Upper-Division Business Courses

The college accepts transfer credit in upper-division courses only from
schools or colleges whose programs are accredited by the American
Assembly of Collegiate Schools of Business.

Policies regarding transferable units and requirements vary among universities. For fur-
ther information, see "Transfer Students" in the Admission to the Uni-
versity section of this catalog.

ADVANCED STANDING POLICY

The Advanced Standing Policy restricts all enrollments in upper-
division (300- and 400-level) courses taught by the departments in the
BPA College during the fall and spring semesters to those who qualify
either as BPA, non-BPA, or exempt program students or by catalog
exemption.

During the summer sessions, upper-division BPA courses may be
taken without Advanced Standing with the permission of the Under-
graduate Programs Office. Students seeking permission must have at
least junior status and meet course/program prerequisites.

All undergraduate students seeking to register for the restricted upper-division courses offered by the BPA College must make application
and have their eligibility established. Information and application
forms are available in the Undergraduate Programs Office, BPA 108.

In general, permission to register for the restricted courses is granted
subsequent to receipt of complete documentation of a student's eligi-
bility. Thus, evidence of completion of course requirements being taken
elsewhere, or by correspondence, of total units, or of the attainment of
the requisite University grade-point average is required before permis-
sion to register is granted. Conditional ability to register for restricted
courses is granted only to BPA students who are completing any out-
standing requirements in residence and whose grade-point average
meets the current eligibility level.

Ineligible students either erroneously or inadvertently enrolled in any
of the restricted courses will have their enrollment cancelled. All stu-
dents are responsible for their own registrations and for having estab-
lished their eligibility for any of the courses covered by the Advanced
Standing Policy.

All students seeking either a B.S.B.A. or B.S.P.A. degree must qualify
for Advanced Standing as a BPA student and must have done so prior
to completion of professional core and major field of concentration
course requirements.

Students entering the college by intra-campus transfer are subject to
all of the provisions of the Advanced Standing Policy in effect at the
time of their acceptance into the BPA College.
Advanced Standing Requirements

Eligibility requirements for advanced standing are as follows:

BPA STUDENTS

Applicants must have

1. credit for a minimum of 56 units, including all stipulated lower-division requirements* (pre-major requirements excepted);
2. taken a minimum of 12 regularly graded units of applicable course work at the University of Arizona;
3. a grade-point average based on all university credit course work attempted at the University of Arizona of not less than the minimum established by the BPA College; and
4. an approved application on file with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

*See each degree program description for details.

2.750 required for students as of fall 1990; see BPA Undergraduate Programs Office for current requirement.

NON-BPA STUDENTS

Applicants must have

1. credit for a minimum of 56 units;
2. taken a minimum of 12 regularly graded units at the University of Arizona;
3. a grade-point average based on all university credit course work attempted at the University of Arizona of not less than the minimum established by the BPA College; and
4. been enrolled in a non-BPA program for at least one regular semester;
5. an approved application on file with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

2.750 required for students as of fall 1990; see BPA Undergraduate Programs Office for current requirement.

Exempt Programs

Exempt programs must have the approval of the Dean of the BPA College and the dean of the college which offers the degree program. Students who qualify under this provision will be permitted to take only required upper-division BPA courses which have been specifically approved and designated in their major field of study. Permission is granted on a semester-by-semester basis once eligibility has been established for the term.

Applicants must

1. be enrolled in a program approved as exempt and have a grade-point average based on all university credit course work attempted at the University of Arizona of at least 2.000;
2. have credit for a minimum of 56 units, 12 of which must have been at the University of Arizona;
3. have been enrolled in a non-BPA program for one full semester; and
4. have an approved application on file each semester with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

Catalog Exemption

To qualify for catalog exemption, one must be graduating under the conditions of the 1979-81 or earlier University of Arizona General Catalog. Such students must be registered as qualified under the Advanced Standing Policy with the BPA Undergraduate Programs Office.

Transfer Students

In any of the provisions above, applicants who would otherwise qualify except that they do not meet the requirement of having attained a minimum of 12 regularly graded units applicable to the degree program at the University of Arizona will be given provisional permission to enroll in upper-division BPA courses until they have the requisite minimum number of quality hours. Thereafter, they must meet all of the regular provisions of the policy to be eligible to continue taking upper-division BPA courses. Such students must have an approved application on file with the BPA Undergraduate Programs Office.

Writing Proficiency Examination Requirement

All University students are required to take the Upper-Division Writing-Proficiency Examination (WPE) once they have accumulated at least 40 units of credit.

Accordingly, BPA students applying for Advanced Standing must provide either evidence of completion of the WPE or evidence of having registered to take the WPE. In the latter case, any subsequent registration for upper-division BPA courses will be contingent upon having completed the examination as scheduled and prior to the next registration period.

PRESCRIBED CURRICULUM FOR BACHELOR OF SCIENCE IN BUSINESS ADMINISTRATION DEGREE

The purpose of the undergraduate curriculum in business administration is to provide a broad education to prepare the student for imaginative and responsible citizenship and leadership roles in business or society, both domestic and worldwide. The bulk of the professional course work is concentrated in the upper-division portion of the degree program following a basic foundation of general education. This foundation includes course work in communications, mathematics and quantitative methods, the language of commerce, the social and behavioral sciences, the natural sciences, world civilizations, ethics, international multicultural experience, foreign language, literature and the arts.

The B.S.B.A. degree requires a minimum of 125 units including all of the areas and requirements detailed below. A minimum of 54 units must be completed in course work offered by departments outside of the BPA College. Additionally, a minimum of 51 units must be completed in upper-division courses numbered 300 or higher. A grade-point average of at least 2.000 on all work undertaken for the degree program and in the major field is required for graduation.

Students expecting to receive the B.S.B.A. degree must attain advanced standing as a BPA student and have declared a major prior to applying for degree candidacy. Any course work that might be applicable to the upper-division professional core or major requirements taken while enrolled in other colleges or at other universities is subject to acceptance by the BPA College for degree certification purposes.

Minimum Requirements for the B.S.B.A. Degree General Education Requirements

I. Basic Skills and Proficiencies

A. Communications

Engl. 101 or 103H1
Engl. 102 or 104H1
Upper-Division Writing Proficiency Examination2
Comm. 412

B. Mathematics and Quantitative Methods

Math. 1191,3
Math. 1231,3
Stat. 2751,3

C. Language of Commerce/Pre-Professional Course Work

M.I.S. 1111
Acct. 2001
Acct. 2101
Econ. 2001

II. Study Areas

A. Biological and Physical Sciences

Two semesters selected from astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, geography (103a, 103b, 104a, and 104b only), geosciences, hydrology, microbiology and immunology, molecular and cellular biology, physics or planetary sciences. (6-8 units)

B. Social and Behavioral Science and Ethics

Three units selected from anthropology, psychology or sociology plus 3 units from a list of ethics course options available in the BPA Undergraduate Programs Office. (6 units)
C. Western and Non-Western Civilizations
   Six units of western and 3 units of non-western civilization course options selected from the relevant lists in the BPA Undergraduate Programs Office. (9 units)

D. International and Multicultural Experience
   Two courses in international affairs selected from the relevant options list in the BPA Undergraduate Programs Office. (6 units)

E. Foreign Language
   Two semesters of the same foreign language at the college level is required. Students whose native language is not English or who have passed a language proficiency examination at the 16-unit level can be absolved of the requirement. Contact the Undergraduate Programs Office for details about doing so. (8 units)

F. Arts and/or Literature
   Six units in the arts and/or literature selected from the relevant course option lists available in the BPA Undergraduate Programs Office. (6 units)

Professional Requirements

III. Professional Core
   All candidates for the degree must complete this set of professional courses. These are normally taken in the junior year except for the capstone business policy course which should be completed in the student's last year.
   A. Econ. 300 and 330; Fin. 311; M.A.P. 305 and 320; M.I.S. 373; Mktg. 361.
   B. Any one business policy course* option selected from the set: Acct. 471, Fin. 471, M.A.P. 471, M.I.S. 471, or Mktg. 471. (Credit is allowed for only one policy course). (24 units)

IV. Major Fields
   A major field of at least 15 units is to be selected. Some majors have up to 6 units of required supplemental course work. See individual major listings for details.
   V. Free Electives
   (7-15 units)

TOTAL REQUIRED FOR GRADUATION
125 units

Minimum Out-of-College Unit Requirement
54

Minimum Upper-Division Unit Requirement
51

1 Lower-division professional program requirements and prerequisites that must be completed by all BSBA degree candidates.
2 Students earning an "unsatisfactory" result on the exam normally will be required to complete additional writing course work as specified by the college.
3 College algebra or the equivalent is prerequisite for Math. 119 and 123, which are prerequisites for Stat. 275.
4 Writing-Emphasis Course. The writing proficiency exam is a prerequisite.

B.S.B.A. Advanced Standing Lower-Division Requirements

To attain advanced standing as a BPA student, the following lower-division program course requirements must be met: Engl. 101 or 103H, 102 or 104H; Math. 119, 123; M.I.S. 111; Acct. 200, 210; Econ. 200; Stat. 275; and 6 to 8 units of biological and physical sciences. In addition, sufficient general education study area, lower-division pre-major and elective units to meet the minimum 56 required by the policy are necessary.

MAJOR FIELDS AVAILABLE

Students are asked to declare one of the major fields of business administration upon enrollment. Any subsequent change in major is accomplished by completing a change-of-major form available in BPA 108.

The major consists of 15 units. Some majors also require supplemental or pre-major course work. Additional units beyond the requirements are optional to the student. Prior permission of the departmental advisor and the college dean is required to apply an individual study course to any major. To graduate the student must have a grade-point average of 2.000 or better in courses undertaken in the major field. This average is computed on all courses attempted that are applicable to the major, but does not include any pre-major courses or any course taken for the business policy option.

BPA students are not allowed credit for more than one policy course in their degree program. Students must select any one of Acct. 471, Fin. 471, M.A.P. 471, M.I.S. 471, or Mktg. 471 for the policy course. Students must earn at least 6 units of university credits in the major in the BPA College.

The requirements for each major field in business administration are given below.

Accounting

This major prepares students for diversified careers in the independent practice of public accounting, in controllership for business and government, and in general accounting management. Accounting majors must complete Acct. 310 in addition to the requirements listed directly below. Either Acct. 471, M.A.P. 471, M.I.S. 471, or Fin. 471 are recommended for the policy requirement.

1. All accounting majors must complete: Acct. 300a-300b.
2. An additional 9 units (three courses) must be selected from the following: Acct. 320, 401, 422, 431, 472.

*P: 300b, 305.

Some states require a five-year program to be eligible to sit for the Uniform C.P.A. Examination; for this and other career reasons, a five-year program leading to the Master of Accounting degree (see Graduate Catalog) may be necessary to achieve a student's objectives. Information concerning the legal requirements for taking the Uniform C.P.A. Examination may be obtained by writing the state board of accountancy in the capital city of the appropriate state. In Arizona the address is 3110 N. 19th Ave., 140, Phoenix, AZ 85015.

Business Economics

This major is designed for those who want to concentrate in economic analysis and to prepare themselves for such professional work in business firms, governmental agencies, private research, or consulting firms; or to enter college teaching following graduate study. Business economics majors must complete Econ. 200, 330, and 361 (in lieu of 300) for the Professional core as well as Econ. 332 and M.I.S. 375 prior to beginning major courses. The business policy requirement may be fulfilled by Acct. 471, Fin. 471, M.A.P. 471, M.I.S. 471, or Mktg. 471. Under certain circumstances, students may take Econ. 300 in place of Econ. 361 with the approval of the department and the dean.

The major consists of fifteen units of economics, including Econ. 460 and 461, to be selected from the 300- and 400-level courses (not including 300, 330, 332 and 361) offered by the Department of Economics.

Entrepreneurship

The entrepreneurship major is a competitive, restricted entry, senior major program sponsored by the Karl Eller Center for the Study of the Private Market Economy. Students must apply to and be accepted into the program. Participants are selected in the spring term prior to entry, which occurs only in the fall term. Program students complete an integrated set of courses over the fall and spring terms as a group.

The program prepares students for careers as leaders in venture capital and investment banking activities, as managers of innovative corporate endeavors, and as independent entrepreneurs. Students in the program take a specially designated section of M.A.P. 471 for the business policy requirement. The major consists of the following courses:

1. Mktg./Econ. 480 and Fin./M.A.P. 481 in the fall term, and
2. M.A.P/Mktg. 483 and M.A.P/Fin. 484 in the spring along with the business policy requirement.

Finance

This major offers undergraduate preparation for careers or graduate work in corporate financial management, investment analysis, security brokerage, and investment or commercial banking. Finance majors must take Acct. 320 and M.I.S. 375 prior to beginning major courses.
and either Fin. 471 or M.A.P. 471 is recommended from the entire policy set to fulfill the business policy requirement.

1. All students in this major will complete Fin. 412, 421, and 431.
2. Six additional units (two courses) will also be chosen from the following: Acct. 300a, 300b, 310; Econ. 332, 422, 442; Fin. 313, 361, 362, 414; M.I.S. 426.

**General Business Administration**

This major provides the student the opportunity to develop a broad knowledge of the principal areas of business. Students can tailor the major along individualized lines to prepare for career paths of interest, e.g., in small or family business, international areas, or graduate study. The major aims to develop generalists rather than specialists. The major may not be combined with any of the other business major options. General business administration majors may take any of the policy set options.

The major consists of 15 units. Students will select one 3-unit 300- or 400-level course from each of five of the following six areas: (1) accounting; (2) economics; (3) finance and real estate; (4) management and policy; (5) management information systems; and (6) marketing (400-level courses only).

**Management Information Systems**

This major is designed for students with interest in establishing careers in the analysis, design, implementation, use and management of computerized information systems in an organizational environment.

All students planning to major in management information systems must complete M.I.S. 121 and 301 before beginning the major. M.I.S. majors may take any of the policy options; M.I.S. 471 is recommended.

1. All students in this major will complete M.I.S. 307, 331, 341 and 441.
2. An additional three units (one course) must be selected from the following: M.I.S. 411, 421, 422, 451, 453, and 461.

Materials describing career paths, recommended major courses, and suggested options for upper-division non-business electives are available in the M.I.S. office.

**Marketing**

The major offers undergraduate preparation for careers both in business and in nonprofit organizations. Attention is given to understanding the changing wants of customers and the public; the development of products and services, pricing, distribution, promotion, planning, execution and control of marketing programs; and maintenance of satisfactory relationships with customers and the public. Marketing majors must complete M.I.S. 375 prior to beginning major courses. Students may complete any of the policy options; Mktg. 471 is recommended.

1. All students in the major will complete Mktg. 440 and 450. (Mktg. 361, a prerequisite to all 400-level marketing courses, should be taken in the first semester of the junior year.)
2. Nine additional units (three courses) are to be selected from 400-level marketing courses.

**Operations Management**

This major offers preparation for management careers in manufacturing and service operations. Emphasis is placed on operation and control of inventory systems, materials management, plant and project scheduling, and service design. Both quantitative and computer based techniques are used for specific applications in these areas.

The major also useful for those who wish to understand more about the functioning of the production system of any organization. All students planning to major in operations management must complete M.I.S. 121 or 122 before beginning the major. M.A.P. 471 is the recommended policy option, but students may elect any of the policy options.

1. All students in the major will complete M.I.S. 473a-473b.
2. Three additional courses (nine units) must be taken:
   a. At least one course must be selected from M.I.S. 474, 475, 476, or 479.

b. Two more courses may be taken from either those courses listed under a or M.I.S. 301, 331, 421, 422, S.I.E. 405, or 492.

**Personnel Management**

This major is concerned with the recruiting, development, compensation, and utilization of human resources, and with the creation of constructive human relationships within modern organizations. Prospective majors are strongly urged to choose elective courses in psychology and sociology. Psyc. 101 should be elected for the freshman or sophomore years. M.A.P. 471 is the recommended policy option, but students may elect any of the policy options.

1. All students in this major will complete M.A.P. 330 and 430.
2. Nine additional units (three courses) must be selected from the following: Coun. 401, Econ. 382, 383, 386, Psyc. 450, M.A.P. 411, 413, 432, 433, 444, 480, M.I.S. 479.

**Real Estate**

This major, by providing a broad basic understanding of the legal, economic, social, and civic aspects of real property, prepares the student for a career in both the real estate profession and related industries. Real estate majors must take Acct. 320 and Fin. 261 before beginning major courses, and either Fin. 471 or M.A.P. 471 is recommended from the entire policy set to fulfill the business policy requirement.

1. All students in this major will complete Fin. 361, 362, 461.
2. Six additional units (two courses) must be selected from the following: A.Ec. 414; Econ. 484; Fin. 251, 463, 465; Geog. 359, 379, 453, 476; M.A.P. 426, 485.

**PRESCRIBED CURRICULUM FOR BACHELOR OF SCIENCE IN PUBLIC ADMINISTRATION DEGREE**

The undergraduate curriculum in public administration seeks to provide the student with a broad general education as well as preparing one for imaginative and responsible citizenship and leadership roles in the public sector of society. The broad general education foundation includes course work in communications, mathematics and quantitative methods, the language of commerce, the social and behavioral sciences, the natural sciences, western and non-western civilizations, ethics, international multicultural experience, foreign language, literature and the arts. The professional portion of the program includes course work in management, policy and public sector administration.

The B.S.P.A. degree requires a minimum of 125 units including all of the areas and requirements detailed below. A minimum of 54 units must be completed in course work offered by departments outside the BPA College. Additionally, a minimum of 51 units must be completed in upper-division courses numbered 300 or higher. A grade-point average of at least 2.0000 on all work undertaken for the degree program and in the major field is required for graduation.

Students expecting to receive the B.S.P.A. degree must attain Advanced Standing as a BPA student and have declared a major prior to applying for degree candidacy. Any course work that might be applicable to the upper-division professional core or major requirements which is taken while enrolled in other colleges or at other universities is subject to acceptance by the BPA College for degree certification purposes.

**Minimum Requirements for the B.S.P.A. Degree**

**General Education Requirements**

<table>
<thead>
<tr>
<th>I. Basic Skills and Proficiencies</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>A. Communications</td>
<td></td>
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<tr>
<td>Engl. 101 or 103H1</td>
<td>3</td>
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<tr>
<td>Engl. 102 or 104H1</td>
<td>3</td>
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<tr>
<td>Upper-division Writing Proficiency Examination^2</td>
<td>Comm. 412</td>
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<tr>
<td>B. Mathematics and Quantitative Methods</td>
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<tr>
<td>Math 119^1,3</td>
<td>3</td>
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<tr>
<td>Math 123^1,3</td>
<td>3</td>
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<tr>
<td>M.A.P. 204^1,4</td>
<td>3</td>
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<tr>
<td>Stat. 275^1,3</td>
<td>3</td>
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</tbody>
</table>
C. Language of Commerce/Pre-Professional Course Work
M.A.P. 101
M.I.S. 111
Acct. 200
Acct. 272
Econ. 200
III. Study Areas
A. Biological and Physical Sciences
Two semesters selected from astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, geography (103a, 103b, 104a, and 104b only), geosciences, hydrology, microbiology and immunology, molecular and cellular biology, physics or planetary sciences. (6-8 units)
B. Social and Behavioral Science and Ethics
Three units selected from anthropology, psychology or sociology plus 3 units from a list of ethics course options available in the BPA Undergraduate Programs Office. (6 units)
C. Western and Non-Western Civilizations
Six units of western (6) and three units of non-western (3) civilization course options selected from the relevant lists in the BPA Undergraduate Programs Office. (9 units)
D. International and Multicultural Experience
Two courses in international affairs selected from the relevant options list in the BPA Undergraduate Programs Office. (6-8 units)
E. Foreign Language
Two semesters of the same foreign language at the college level is required. Students whose native language is not English or who have passed a language proficiency examination at the 16-unit level can be absolved of the requirement. Contact the Undergraduate Programs Office for details about doing so. (8 units)
F. Arts and/or Literature
Six units in the arts and/or literature selected from the relevant course option list available in the BPA Undergraduate Programs Office. (6 units)

Professional Requirements
III. Professional Core
All candidates for the degree must complete this set of professional courses. They are normally taken in the junior year with the exception of M.A.P. 472 which should be taken in the student's last year:
Econ. 300 and either 435 (preferred) or 330; M.A.P. 305, 405, and 410a; Pol. 480; M.A.P. 472. (21 units)

IV. Major Fields
A major field of 12 units is to be chosen from the set of restricted options in the major area. (12 units)

V. Free Electives
(13-15 units)

TOTAL REQUIRED FOR GRADUATION
125 units
Minimum Out-of-College Unit Requirement
54
Minimum Upper-Division Unit Requirement
51

1 Lower-division professional program requirements and prerequisites that must be completed by all B.S.P.A. degree candidates.
2 Students earning an “unsatisfactory” result on the exam normally will be required to complete additional writing course work as specified by the college.
3 College algebra or the equivalent is prerequisite for Math. 119 and 123, which are prerequisites for Stat. 275.
4 To be completed prior to Stat. 275.
5 Writing Emphasis course. The writing proficiency exam is a prerequisite.

B.S.P.A. Advanced Standing Lower-Division Requirements
To attain advanced standing as a BPA student, the following lower-division program course requirements must be met: Engi. 101 or 103H, 102 or 104H; Math. 119, 123; M.I.S. 111; M.A.P. 100, 204; Stat. 275; Acct. 200, 272; Econ. 200; and 6 to 8 units of biological and physical sciences. In addition, sufficient general education study area and elective units to meet the minimum 56 required by the policy are necessary.

MAJOR FIELDS AVAILABLE
Students are asked to declare one of the major fields in public administration upon enrollment. Any subsequent change of major is accomplished by completing a change-of-major form available in BPA 109.
The Office of Executive Programs

The Office of Executive Programs utilizes college faculty, as well as experts from across the country, in the presentation of conferences, programs and seminars for executives. The Executive Development Conference, a nine-day program, attracts top executives from throughout the U.S. and several foreign countries. The Arizona Executive Program is designed to promote the professional development of upwardly mobile managers and executives through a series of weekly and three-day residential sessions. The Public Management Program, an eight-day residential program, brings executive education to senior managers in state and local government.

Distinguished Lectures

Throughout the academic year, leaders in American business and public management are brought to the college to speak to students and faculty. The MBA Student Association sponsors an Executive Lecture Series. Other lectures are presented periodically when exceptional executive talent is available.

Career Guidance

In addition to the services offered by the University of Arizona Career Services Office, the College of Business and Public Administration provides career assistance to its students. At career forums throughout the year, students learn more about the kinds of career opportunities available in a variety of business and public fields. Executives also serve as guest speakers in classes and at special programs sponsored by BPA student organizations.

RESEARCH AND SPECIAL PUBLIC SERVICE UNITS

In addition to the two baccalaureate degrees and other supplemental programs listed above, the College of Business and Public Administration also has the following research centers described later in the catalog in the section on Research and Special Public Service Units. See:

- The Center for the Management of Information (CMI)
- The Division of Economic and Business Research (DEBR)
- The Economic Science Laboratory (ESL)
- The Karl Eller Center for the Study of Private Market Economy

STUDENT INVOLVEMENT

The college encourages student participation in the numerous professional clubs, organizations and honorary societies associated with the various fields of business and public administration.

The BPA Student Council is a college-wide service organization which serves as a liaison between students, faculty, administration and other student organizations. The council sponsors and participates in a variety of college activities and programs.

The honoraries and professional organizations affiliated with the college include Alpha Kappa Psi, a professional business fraternity; Alpha Mu Alpha, a national marketing honorary; American Marketing Association, a professional marketing organization student chapter; Beta Alpha Psi, a national accounting honorary; Beta Gamma Sigma, a national scholastic honor society; Delta Sigma Pi, an international business fraternity; Management Information Systems Association, a professional information systems organization; Phi Chi Theta, a college professional fraternity; Pi Alpha Alpha, the National Honor Society for Public Affairs and Administration; Public Administration Student's Association; University of Arizona Personnel Administration Association, a student chapter of the American Society for Personnel Administration; Accounting Club; Economics Club; Finance Management Association; Association of Collegiate Entrepreneurs; AIESEC-International Association of Students in Economics and Business; American Production and Inventory Control Society; Minority Business Student Association; and Master of Business Administration Student Association.

Outstanding student accomplishments are recognized each year through the presentation of a number of awards and honors.

College of Education

Education Building, Room 201
(602) 621-1461

The College of Education is committed to the preparation of qualified individuals in fields of instruction in elementary, secondary, special, and postsecondary education. Further, the college prepares individuals in the supervision and administration of elementary and secondary schools, special education and rehabilitation schools and facilities, community colleges, and universities. The college is composed of the divisions of Educational Foundations and Administration; Language, Reading and Culture; Special Education and Rehabilitation; and Teaching and Teacher Education. The college also administers the Center for the Study of Higher Education and the Arizona Center for Evaluation and Measurement.

DEGREES, MAJORS, AND MINORS

Degrees

The College of Education offers academic programs leading to the Bachelor of Arts in Education, Bachelor of Science in Education, Master of arts, Educational Specialist, Doctor of Education, and Doctor of Philosophy. At the time of catalog production, the Master of Education and Master of Teaching degrees were under review.

Graduate Majors

The Doctor of Philosophy degree is available with majors in educational psychology; higher education; language, reading and culture; special education and rehabilitation; and teaching and teacher education. The Doctor of Education degree is available with majors in educational administration; language, reading and culture; special education and rehabilitation; and teaching and teacher education. The Educational Specialist degree is offered with majors in educational administration; educational psychology; language, reading and culture; special education and rehabilitation; and teaching and teacher education. The Master of Arts degree is available with majors in bilingual/multicultural education; educational psychology; higher education; language, reading and culture; special education and rehabilitation; and teaching and teacher education.

At the time of catalog production, the foundations of education major for the Master of Arts and Doctor of Philosophy degrees was under review. The educational media major for the Master of Arts and Educational Specialist degrees was also under review. Prospective students should consult the Office of Student Services in the college for further information regarding these majors.

For further information on requirements for graduate degree programs in education, please see the Graduate Catalog.

Undergraduate Majors

At the undergraduate level, students select either a major administered within the College of Education or a subject area teaching major administered through another academic department. Majors within the College of Education are available in elementary education and rehabilitation. At the time of catalog production, the major in early childhood education was under review.

For information on course requirements for elementary education major, students should consult an advisor in the Division of Teaching and Teacher Education. For information on course requirements for the rehabilitation major, students should consult an advisor in the Division of Special Education and Rehabilitation.

A teaching major is defined as the secondary school academic subject area in which the student plans to teach. Teaching majors are administered through the relevant academic departments in cooperation with the College of Education, which is responsible for providing the necessary professional education course work. Subject area course requirements for prospective teachers will be found under the appropriate academic department in the Departments and Courses of Instruction section of this catalog. For information on the professional education requirements, consult an advisor in the Division of Teaching and Teacher Education.
The Bachelor of Science in Education degree is awarded for a major in rehabilitation (including a specialty in interpreting for the deaf) and for teaching majors in mathematics or any of the physical sciences. The Bachelor of Arts in Education degree is awarded for majors in elementary education, or any teaching major area other than mathematics or any of the physical sciences. See "Majors and Minors for Secondary School Teaching" for a list of available teaching majors.

Undergraduate Minors

Most teaching majors will require a teaching minor in a second field of specialization. Course requirements for these teaching minors will be listed under the relevant academic department in the Departments and Courses of Instruction section of this catalog. Four particular teaching majors are sufficiently comprehensive as to require no additional minor subject (see "Majors Requiring No Minor").

Students majoring in elementary education are required to either complete an extended general education preparation exam or a modified extended general education program plus an academic concentration. These options should be selected and planned with the assistance of an advisor in the Division of Teaching and Teacher Education. Majors in rehabilitation require a minor field which should be selected and planned with the assistance of an advisor in the Division of Special Education and Rehabilitation.

Two nonteaching minors are available in the areas of rehabilitation and special education. These minors can be combined with education or teaching majors or can be selected by persons who wish to explore these fields as an adjunct to majors outside the College of Education.

Selection of Majors and Minors

Majors and minors should be selected in consultation with a College of Education advisor as early in the undergraduate career as possible, and no later than the junior year. Major subjects may be changed at the beginning of any semester. However, if a change of major or minor field is made late in the program, an additional semester or more may be necessary to complete the required course work.

Teaching majors and minors should be selected from the following lists of subjects commonly taught in high schools in most states. With the exception of the four majors that require no minors, all subject areas available as teaching majors may also be chosen as teaching minors; additional subject areas are available as minors only.

Majors and Minors for Secondary School Teaching

MAJORS REQUIRING A MINOR

The following teaching majors are also available as teaching minors:

Chemistry  History
Communication  Journalism
Earth Science  Latin
English  Mathematics
French  Physics
General Biology  Political Science
Geography  Russian
German  Spanish

MINORS ONLY

Anthropology  Italian
Athletic Coaching  Media Arts
Bilingual/Bicultural Education  Oriental Studies
Chemistry/Physics  Portuguese
Computer Science  Psychology
Economics  Sociology

MAJORS REQUIRING NO MINOR

EXTENDED ENGLISH—For information, see the Department of English section in this catalog.

PHYSICAL EDUCATION (K-12 EMPHASIS)—For information, see the Department of Exercise and Sport Sciences section in this catalog.

LANGUAGE ARTS-SOCIAL STUDIES—A 50-unit combination of language arts and social studies intended for junior high-middle school teaching. For information, see an advisor in the Division of Teaching and Teacher Education.

SOCIAL STUDIES—A 50-unit combination of social studies intended for secondary school teaching. For information, see an advisor in the Division of Teaching and Teacher Education.

TEACHING MAJORS FOR DEGREES OUTSIDE THE COLLEGE OF EDUCATION

Three academic units outside the College of Education offer programs for training teachers in their particular disciplines. These majors will earn degrees specific to those units, rather than College of Education degrees. A major in art education, for example, offered by the College of Arts and Sciences, Faculty of Fine Arts, will earn a Bachelor of Fine Arts degree; similarly, a major in agricultural education, offered by the College of Agriculture, will earn a Bachelor of Science in Agriculture degree.

The following teaching majors and degrees are available outside the College of Education.

Agricultural Education (B.S.Ag.) College of Agriculture
Art Education (B.F.A) College of Arts and Sciences
Health Education (B.S.H.S.) School of Health-Related Professions
Home Economics Education (B.S.F.C.R.) College of Agriculture
Music Education (B.M.) College of Arts and Sciences
Physical Education (B.S.H.S.) School of Health-Related Professions
Theatre Arts Education (B.F.A.) College of Arts and Sciences

BUSINESS EDUCATION—The University offers no formal major in business education. However, students with an interest in teaching business and office subjects can do so through a program developed in cooperation between the College of Education and the College of Business and Public Administration. Because of the nature of the course requirements, students considering this program are encouraged to consult an advisor in both the College of Business and Public Administration and the College of Education early in their careers.

ADMISSIONS

Formal admission to the College of Education is required of all undergraduate students who wish to pursue a major for a College of Education degree as well as for students who wish to enroll in restricted professional education courses for the purposes of earning a teaching certificate. Undergraduate students normally apply for admission to majors in the College of Education at the beginning of their junior year, having completed their first two years of study in the College of Arts and Sciences as pre-education majors. However, students are encouraged to consult the pre-education advisor in the College of Education as soon as they begin considering education as a career goal in order to plan their lower-division course work most effectively. Upon formal admission to the College of Education, students will be assisted by an advisor in the division appropriate to their chosen major.

Admission Requirements for Rehabilitation Major

To be admitted to the rehabilitation degree program, applicants must meet the following minimum requirements:

1. Completion of 56 units of credit applicable to the baccalaureate degree in rehabilitation.
2. Cumulative grade-point average of 2.5000 or better. (This also applies to transfer students’ work taken at other institutions.)

Admission Requirements for Majors Involving Initial Teacher Preparation

As a professional school within a land-grant university, the College of Education best serves the needs of the State of Arizona by preparing teachers who possess strong records of academic achievement, who exemplify high ideals of character, who are representative of the cultural heritage and linguistic diversity of the State, and who demonstrate a
clear and continuing commitment to the education of fellow human beings.

Admission to programs for initial teacher preparation is by application only. To ensure the selection of students who meet the expectations stated above, the college screens applications according to the following four criteria:

1. Academic achievement, as indicated by grade-point average and scores on required and optional standardized tests.
2. Language proficiency, in English and in other languages common to Arizona and the American Southwest, as indicated by applicant's written materials, letters of recommendation, test scores, and grades in relevant courses.
3. Cross-cultural experience indicative of an understanding of and an ability to work successfully with members of different racial and ethnic groups represented in Arizona and the Southwest, as indicated by family background, bilingualism, relevant work experience, or significant and sustained association with a racial or ethnic group different from one's own.
4. Commitment to the profession and a capacity to meet its professional standards, as indicated by pertinent work experience, pertinent volunteer experience, letters of recommendation, applicant's self statement, and other relevant information that the applicant may choose to submit.

To be eligible for admission, each applicant must have (1) attained a cumulative grade-point average of at least 2.5000 on the most current 56 units of credit, (2) attained passing scores on the Pre-Professional Skills Test (PPST), (3) completed not less than 56 units of credit applicable to a baccalaureate degree, and (4) taken the Upper-Division Writing-Proficiency Examination. Once eligibility for admission is determined, applications are then reviewed according to criteria 1 through 4 above. At the discretion of the college, interviews may be required in order to provide additional information regarding these criteria. Only those applicants who, in the judgment of the Committee on Teacher Admissions, Credentials and Standards, meet the standards established by these criteria are offered admission.

The college may, from time to time, establish program initiatives of special importance to the educational needs of the State of Arizona or in certain academic areas of prominence at the University of Arizona. In such instances, applicants whose abilities and accomplishments qualify them for participation in these initiatives, and who meet the eligibility requirements stipulated above, may be given preference in admission.

In unusual cases, the Committee on Teacher Admissions, Credentials and Standards may offer provisional admission to an applicant who meets the eligibility requirements but whose record on one or more of the four criteria is in doubt. The provisional status is reviewed after the applicant completes not more than ten units in the professional education sequence, and a final determination of admission is made in the course of this review.

Meeting or exceeding minimum admission standards as outlined in this admission policy does not in any way imply or guarantee admission to the initial teacher preparation program. If limitations on resources require restrictions to be placed on the number of students admitted in a given semester or year, the Committee on Teacher Admissions, Credentials and Standards will admit students according to the level of distinction achieved on one or more of the criteria above or the strength and balance of the applicant's record across the several criteria.

Post-Baccalaureate Program in Initial Teacher Preparation

Persons who have previously earned a bachelor's degree and are interested in obtaining a state teaching certificate must apply for admission to the initial teacher preparation program in the same way as undergraduate students do. This would also apply to graduate students who have already been admitted to a graduate degree program in the University. The same admission policy and procedures used with undergraduates are used in reviewing the applications of post-baccalaureate and graduate students. To be considered eligible for admission, an applicant must have earned an undergraduate degree at a regionally accredited institution, with an overall grade-point average of 2.5000 or better.

Post-baccalaureate and graduate students who are admitted to the initial teacher preparation program will be required to pass the basic skills portion of the Arizona Teacher Proficiency Examination (ATPE) before they can begin their student teaching, and they will need to pass the professional knowledge portion of the examination prior to their certification.

Further information for post-baccalaureate and graduate students is available in the Office of Student Services.

RESTRICTED ENROLLMENT IN PROFESSIONAL EDUCATION COURSES

Most professional education courses in the initial teacher preparation program (also referred to as "methods" courses) are closed to students who have not been formally admitted to the program. The restriction involves a variety of courses in several divisions of the College of Education as well as certain education-related courses in other colleges. A list of restricted courses is available in the Office of Student Services in the College of Education.

Undergraduate students majoring outside the College of Education (see "Teaching Majors for Degrees Outside the College of Education" above) are required to meet the following minimum standards before enrolling in any "closed" professional education courses:

1. Completion of 56 units of credit applicable to a baccalaureate degree,
2. A cumulative grade-point average of 2.5000 or better, and
3. Passing scores on all three portions of the Pre-Professional Skills Test (PPST).

Such students must obtain cards of admittance ("red cards") from the Office of Student Services prior to registering for these courses, indicating that the requirements have been met. Information regarding the PPST, including advisement and remediation, may be obtained from the Office of Student Services.

IMPORTANT: Students who enroll in professional education courses without meeting all necessary requirements will be administratively dropped from the classes. If, through student or administrative oversight, an ineligible student completes a restricted course, Arizona law and Board of Regents policy expressly prohibits the use of the course toward meeting teaching certification requirements. It is therefore essential that prospective enrollees confirm their eligibility in the Office of Student Services prior to registering for a restricted course.

UNDERGRADUATE PROGRAMS

The following undergraduate programs are currently being offered within the divisions of Special Education and Rehabilitation and of Teaching and Teacher Education.

Major in Early Childhood Education

At the time of catalog production, the major in early childhood education was under review. Prospective students should consult the Office of Student Services in the college for further information regarding this major.

Major in Elementary Education

Students who wish to prepare for teaching careers in grades kindergarten through sixth grade should select a major in elementary education. Students should check with the Division of Teaching and Teacher Education for current degree requirements.

Dual Program in Bilingual and Elementary Education

This course of study is intended for students who plan to teach in classrooms operating bilingual curricula in English and Spanish.

Majors in Secondary Education

College of Education students planning to teach at the secondary school level must complete the requirements for a teaching major or a teaching major and minor from among the subjects and fields listed...
under the "Majors and Minors for Secondary School Teaching" section above. Students are encouraged to speak to an advisor in the Office of Student Services during their lower-division years concerning selection of appropriate teaching majors and minors. Students should check with the Division of Teaching and Teacher Education for current degree requirements.

**Major in Rehabilitation**

The major in rehabilitation will prepare students for professional employment in social service agencies, including rehabilitation and educational programs. The major includes a specialty in interpreter training for the deaf. Students are encouraged to check with the Division of Special Education and Rehabilitation for degree requirements.

**Minor in Rehabilitation**

A nonteaching minor in rehabilitation exposing a student to various disabled populations is available at the undergraduate level. Students are encouraged to check with the Division of Special Education and Rehabilitation for requirements for the minor.

**Minor in Special Education**

A nonteaching minor in special education emphasizing various exceptionals is available at the undergraduate level. Students are encouraged to check with the Division of Special Education and Rehabilitation for requirements for the minor.

**CERTIFICATION FOR COMMUNITY COLLEGE TEACHING**

The College of Education cooperates with departments in other colleges of the University in the preparation of students who are candidates for community college teaching certificates. The Arizona Board of Directors for Community Colleges has established the following standards for academic certification.

The minimum requirements for an Arizona Community College Regular Certificate, valid for six years, are:

1. A master's or higher earned degree with at least 24 semester hours of upper-division and/or graduate credit in the field to be taught, or
2. A bachelor's degree in a specific area with at least three years of directly related occupational experience and skill in the field to be taught, or
3. An associate's degree or at least 64 semester hours and, in addition, at least five years of directly related occupational experience in the field to be taught.

In addition, applicants must have completed an approved course on the subject of the community college offered at one of the Arizona universities or by a community college district.

Provisional, special, and honorary Arizona community college certificates are available with varying requirements and periods of validity. The Center for the Study of Higher Education in the College of Education will assist individuals seeking application information on these certificates. The above standards are subject to modification by the Arizona State Board of Directors of Community Colleges.

**RESEARCH CENTERS AND PUBLIC SERVICE**

Research centers and public services operating within the College of Education greatly enhance the academic programs and research capabilities of the college. Basic and applied research is conducted in all contexts and at all levels of professional education. Professional services are available to clientele ranging from individuals to such institutions as school districts; public and private postsecondary institutions; local, state, and federal agencies; health service-related agencies; correctional institutions; Indian tribal governments; and business and industry.

**Arizona Center for Educational Evaluation and Measurement**

A description of the nature and function of this center can be found in the "Research and Special Public Service Units" section of this catalog.

**Center for the Study of Higher Education**

A description of the nature and function of this center can be found in the "Research and Special Public Service Units" section of this catalog.

**University Rehabilitation Services**

The rehabilitation program provides an excellent setting for interdisciplinary research and demonstration projects. Such projects are directed by faculty members for various university departments. Research is encouraged in all aspects of rehabilitation. A variety of services is available through the Division of Special Education and Rehabilitation including comprehensive vocational and psychological evaluation which provides handicapped individuals with realistic vocational goals.

The rehabilitation staff is trained in the practical application of rehabilitation techniques and provides consultative services to rehabilitation agencies.

**College of Engineering and Mines**

Geology Building, Room 134
(602) 621-6032

Engineering education is preparation for a professional career. While most graduates embark on careers in engineering practice, men and women with engineering majors find the baccalaureate program excellent preparation for other fields as diverse as law, medicine, business and government. An engineering education develops analytical and quantitative thinking, a critical but optimistic approach to problem solving, and the habit of self-directed future learning. Graduates make successful transition to a wide variety of different careers. The graduate has a thorough understanding of how materials, energy, and information can be adapted to humanity's needs and desires. This is developed through the study of physical science, mathematics, engineering science, engineering design, humanities, social science, and philosophy.

**COLLEGE ENTRANCE REQUIREMENTS**

Entering freshmen will meet those requirements outlined in the Admission to the University section of this catalog. Notice that in the section titled "Admission to Particular Colleges and Schools", College of Engineering and Mines entrance requirements differ from the general university requirements. Also, students transferring from other colleges or universities are required to present a cumulative grade-point average of 2.500 or better for all previous college work.

**PROFESSIONAL FIELDS OF STUDY**

The college offers four-year curricula leading to Bachelor of Science degrees in engineering and in areas of engineering science:

**Engineering**

- Aerospace Engineering
- Agricultural and Biosystems Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Energy Engineering*
- Geological Engineering
- Industrial Engineering
- Materials Science and Engineering
- Mechanical Engineering
- Mining Engineering
- Nuclear Engineering
- Optical Engineering
- Systems Engineering

*At the time of catalog production, the energy engineering program was under review. Please contact the Department of Nuclear and Energy Engineering for further information.
The Engineering Sciences

Engineering Mathematics
Engineering Physics
Hydrology

FRESHMAN YEAR

Students should identify an intended major from the above lists when they are admitted into the college. This will assure personal access to an academic advisor and initiate career decision making. After completion of Engr. 101 and 102 they should re-evaluate their career choices. There will be no loss in credit if majors are changed at the end of the freshman year.

The common freshman curriculum for all degrees offered by the college is as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engr. 101 (see options)</td>
<td>3</td>
<td>102</td>
<td>3</td>
</tr>
<tr>
<td>Math. 124/125a</td>
<td>5/3</td>
<td>Math. 125b</td>
<td>3</td>
</tr>
<tr>
<td>Chem. 103a</td>
<td>3</td>
<td>M.S.E./Chem. (see options)</td>
<td>4</td>
</tr>
<tr>
<td>Chem. 104a</td>
<td>1</td>
<td>Engl. 102</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 101</td>
<td>3</td>
<td>Phys. 110</td>
<td>4</td>
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<tr>
<td>Hum./Soc. Sci. Elective</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>18/16</td>
<td>Total</td>
<td>17/16</td>
</tr>
</tbody>
</table>

MATHEMATICS PLACEMENT

A mathematics readiness test will be taken by all entering freshmen. College algebra and trigonometry should be reviewed before taking the test. Some students may find that enrolling in a pre-calculus course at a local college during the summer prior to entering the University will allow them to enter directly into Math. 124 or 125a and the freshman curriculum. Those who are placed in Math. 124 should postpone the first semester Humanities/Social Science (HSS) course to a summer session or a later semester. Students placed in a pre-calculus course should take that course during the first semester and substitute a second HSS course for Engr. 101. Subsequent semesters can be organized with the assistance of an advisor. Studies show that while graduation may be delayed by a semester for students who begin the freshman year in pre-calculus mathematics, success still depends on individual effort and ability.

OPTIONS AVAILABLE DURING THE FRESHMAN YEAR

Sections of Engr. 101 based on FORTRAN and others based on PASCAL are offered. Students may choose either, but the following are recommended:

FORTRAN: Aerospace Engineering, Chemical Engineering, Civil Engineering, Engineering Physics, Geological Engineering, Mechanical Engineering, Mining Engineering.


The 4-unit chemistry requirement listed in the second semester of the freshman year may be satisfied by M.S.E. 110 or by Chem. 103b and Chem. 104b. Students may choose either of these options, but the following are recommended:


CHEM. 103b-104b: Chemical Engineering, Civil Engineering, Engineering Mathematics, Engineering Physics, Hydrology, Mining Engineering, Geological Engineering.

EITHER OPTION: Agricultural and Biosystems Engineering, Industrial Engineering, Nuclear Engineering, Systems Engineering.

Students who change majors at the end of the freshman year may need to learn the other computer language or take the other chemistry course. This will be determined by the department into which the student transfers, but additional credit thus earned will apply to the graduation requirements of the newly selected degree.

COLLEGE OF ENGINEERING AND MINES FRESHMAN HONORS PROGRAM

This program recognizes the abilities and achievements of high school graduates and offers a variety of special challenges and resources to encourage the full development of academic and interpersonal skills. Eligibility is based on academic excellence, creativity, curiosity, maturity and motivation. The program is open to high school seniors who have applied for admission to the College of Engineering and Mines and who meet one of the following criteria:

1. A Flinn Scholar or National Merit Scholar.
2. Among the top 5% of his or her graduating class.
3. An ACT composite score of at least 30 (or SAT of 1300).

Applications and inquiries should be directed to: Dr. Dunbar Birnie, College of Engineering and Mines, University of Arizona, Tucson, Arizona 85721. Freshman honors students are strongly encouraged to register for Engr. 196H.

ACCREDITATION AND THE CURRICULAR CONTENT REQUIRED FOR ENGINEERING DEGREES

The Accreditation Board for Engineering and Technology (ABET) is the official agency for accrediting undergraduate engineering degrees. As part of the required curricular content, every engineering student must complete a minimum of 16 units of engineering design, 32 units of engineering science, and 16 units of humanities and social sciences courses. These requirements are integrated into the curricula that are specified on the following pages for each engineering degree.

Engineering Design (ED)

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process in which resources are converted optimally to meet stated objectives. ED courses include at least some of the following features: development of creativity, use of open-ended problems, development and use of design methodology, formulation of problem statements and specifications, consideration of alternative solutions, feasibility considerations, and detailed system descriptions. They may also include constraints such as economic factors, safety, reliability, aesthetics, ethics, and social impact.

Engineering Science (ES)

The engineering sciences have their roots in mathematics and basic sciences, but carry knowledge toward creative application. These studies provide a bridge between the sciences and engineering practice. At least one ES course must be taken outside of the department of the major.

Humanities and Social Science (HSS)

The humanities are the branches of knowledge concerned with the culture and values of the human race, and the social sciences are studies of individual relationships in and to society. HSS studies assist in meeting the objective of a broad education and in meeting the objectives of the engineering profession. In the interests of making engineers
fully aware of their social responsibilities and better able to consider related factors in the decision-making processes, HSS course work is required as an integral part of the engineering program.

The HSS requirements must also be met by students majoring in engineering mathematics, engineering physics, and hydrology.

The ED and ES units of each engineering course are designated in the course description presented in the catalog section titled Departments and Courses of Instruction. The HSS requirement and a list of approved HSS courses are available in the Geology Building, Room 134.

COLLEGE OF ENGINEERING AND MINES SCHOLARSHIPS

A limited number of scholarships are recommended each year by departments within the College of Engineering and Mines. Students interested in applying for these scholarships should contact their departmental offices for information. It is usually best to do this prior to March 1. All scholarships require the submission of an application to the Office of Student Financial Aid (203 Administration Building) and many require the demonstration of need as defined by that office. Scholarships are not available in the dean's office.

OPTIONS

Biomedical Engineering Option

Biomedical engineering can be defined as a multidiscipline in which physical scientists and engineers interact with life scientists and physicians to solve problems ranging from basic investigations to applications in clinics and the health care delivery system. The departments of Aerospace and Mechanical Engineering, Chemical Engineering, Electrical and Computer Engineering, Nuclear and Energy Engineering, and Systems and Industrial Engineering have biomedical options available as undergraduate technical electives, graduate minor programs and research. A university committee coordinates the option. See "Biomedical Engineering" under the Departments and Courses of Instruction section for further details.

Computer Software Engineering Option

This option deals with the analysis and design of systems in which computer programs play an important role. The computer software engineer performs the systems analysis which determines the computer programs to be developed, participates in the structured design of the programs, manages the programming effort and oversees the testing, debugging, installation and documentation of the programs. This option is available through the undergraduate degree program in systems engineering by structuring the choice of technical electives.

Energy Engineering Option

This option encourages interdisciplinary studies in the College of Engineering and Mines involving production, conversion, distribution, and utilization of energy from conventional and renewable sources. New perspectives on energy supply and demand are emphasized by an exposure to energy management principles, conversion technology and environmental issues. Courses include energy management and utilization, modern air conditioning systems, solar and wind energy, photovoltaics, electrical and thermal power systems, and environmental analysis. Energy-related elective programs can be taken while earning a Bachelor of Science in Mechanical Engineering or Nuclear Engineering.

Manufacturing Systems Engineering Option

The modern manufacturing systems engineer designs, installs, implements, and manages computer integrated manufacturing systems. This option prepares students in the areas of organizing, scheduling, and managing the total manufacturing system from product design through fabrication, distribution and consumer services. This option is available through the undergraduate degree program in industrial engineering by structuring the choice of technical electives.

Premedical Option

An engineering degree can provide a valuable background for physicians who will utilize the modern technological advances being implemented in the practice of medicine or who will participate in medical research. All departments in the college offer a premedical option. Electives which satisfy admission requirements for medical school are selected by the student and departmental advisor.

ADVANCED STANDING

Students must have been granted advanced standing to enroll in 300- or 400-level courses in the College of Engineering and Mines. To qualify for permanent advanced standing, students must meet the following criteria:

1. Completion of a minimum of 56 credit hours, including all required courses listed in the freshman and sophomore years of the curriculum of the student's major department. At least 15 units of required courses must have been completed at the University of Arizona. In addition, all admission deficiencies must have been removed.
2. A University of Arizona cumulative grade-point average of not less than the minimum set by the major department, but in no case below 2.0000.
3. Completion of the Upper-Division Writing-Proficiency Examination.

Students otherwise qualified and lacking no more than three required lower-division courses, or the writing-proficiency examination, may be granted temporary advanced standing. If these requirements are not completed during the next semester they are offered, advanced standing may be revoked until they are completed.

Transfer students who do not meet the 15-unit requirement set forth above, but meet all other requirements, will be granted temporary advanced standing until they have completed a minimum of 15 units of required courses at the University of Arizona. At that time advanced standing will become permanent if the student's grade-point average at the University of Arizona meets the departmental requirement; if it does not, advanced standing will be revoked.

Application forms are available at the Office of the Dean of the College of Engineering and Mines (Room 134, Geology Building) and at all departmental offices in the college.

Students wishing to enroll in 300- or 400-level engineering courses, who are registered in colleges other than the College of Engineering and Mines, will normally be expected to have fulfilled the above criteria relative to their own majors. Such students will be allowed to register for one advanced-standing course each semester without special permission. Those wishing to register for more than one advanced-standing course must apply at the dean's office for special permission.

STUDENT PROFESSIONAL AND HONORARY SOCIETIES

The following professional organizations have active student chapters sponsored by the college and coordinated by the Engineers' Council. Students are encouraged to participate in these organizations during all four years of enrollment. Contact departmental or college offices for information.

Scholastic Honorary Societies

Alpha Epsilon (agricultural & biosystems engineering)
Alpha Nu Sigma (nuclear engineering)
Eta Kappa Nu (electrical engineering)
Tau Beta Pi (all engineering)

Professional Organizations

American Nuclear Society
American Society of Agricultural Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
American Institute of Aeronautics and Astronautics
American Institute of Chemical Engineers
American Water Resources Association
Institute of Electrical and Electronic Engineers
Institute of Industrial Engineers
Society of Automotive Engineers
Society of Mining Engineers (AIME)
Society of Reliability Engineers
Student Energy Society
The Minerals, Metals and Materials Society (AIME)

Other Engineering Student Organizations
American Indian Science and Engineering Society
National Society for Black Engineers
Society of Hispanic Professional Engineers
Society of Women Engineers
Theta Tau

GRADUATE STUDY
The Master of Science (M.S.) degree is offered with majors in aerospace engineering, agricultural and biosystems engineering, chemical engineering, civil engineering, electrical engineering, engineering mechanics, geological engineering, hydrology, industrial engineering, materials science and engineering, mechanical engineering, mineral economics, mining engineering, nuclear engineering, reliability engineering, systems engineering and water resources administration. The Doctor of Philosophy (Ph.D.) degree is offered with majors in aerospace engineering, agricultural and biosystems engineering, chemical engineering, civil engineering, electrical engineering/engineering mechanics, geological engineering, hydrology, materials science and engineering, mechanical engineering, mineral economics, mining engineering, nuclear engineering, systems and industrial engineering and water resources administration. Complete details of both graduate programs are set forth in the Graduate Catalog.

PLACEMENT SERVICES
The following programs are available and recommended to all students in the College of Engineering and Mines. Information is available through the Career Services Office.

Cooperative Education Program
The Cooperative Education Program provides students with an opportunity to supplement their academic studies with periods of career-related work experience prior to graduation. Co-op is a full-time, paid work experience away from formal studies. Co-op students who carefully plan their academic schedules will be able to participate and still graduate in 4-1/2 to 5 years. A Summer Cooperative Education Program is also available.

Internship Program
Students who want to work part-time in a career position while attending the University should explore local opportunities available through the Internship Program.

Placement Program
Students who have qualified for advanced standing in the college have reached such a level of career progression that they should visit the Career Services Office and initiate preparation for placement interviews during the senior year. Training in resume writing, interviewing, and other placement skills are available.

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING
(ABET Accredited)
Aerospace engineering is concerned primarily with solving the problems of flight, and places special emphasis on the design and operation of all types of aircraft, rockets, satellites, and spacecraft. In recent years, aerospace engineers have also become involved in the design of deep-submergence vehicles, modern surface ships, air cushion vehicles, and ground transportation systems.

Equipment supporting aerospace engineering studies includes digital computers with interactive graphics; internal combustion engines; microcomputers and microprocessors; nonlinear control systems; production and tooling shop; low and high-speed wind tunnels; refrigeration and heat transfer loops; and instrumentation of a wide variety.

Required Curriculum:

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester Units</th>
<th>Course</th>
<th>Second Semester Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 223</td>
<td>4</td>
<td>Math. 254</td>
<td>3</td>
</tr>
<tr>
<td>Phys. 116</td>
<td>4</td>
<td>A.M.E. 230</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 214</td>
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<td>A.M.E. 250</td>
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<tr>
<td>Hum./Soc. Sci. Elective</td>
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<td>C.E. 217</td>
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<tr>
<td>E.C. 207</td>
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<td>Hum./Soc. Sci. Elective</td>
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### Junior Year

<table>
<thead>
<tr>
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<th>Course</th>
<th>Second Semester Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.M.E. 301</td>
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<td>A.M.E. 301</td>
<td>3</td>
</tr>
<tr>
<td>A.M.E. 331a</td>
<td>3</td>
<td>A.M.E. 302</td>
<td>3</td>
</tr>
<tr>
<td>E.C. 208</td>
<td>3</td>
<td>A.M.E. 320</td>
<td>3</td>
</tr>
<tr>
<td>M.S.E. 331R</td>
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<td>A.M.E. 321</td>
<td>3</td>
</tr>
<tr>
<td>M.S.E. 331L</td>
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<td>A.M.E. 323</td>
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</tr>
<tr>
<td>Hum./Soc. Sci. Elective</td>
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<td>A.M.E. 324</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>18</td>
</tr>
</tbody>
</table>

### Senior Year

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester Units</th>
<th>Course</th>
<th>Second Semester Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.M.E. 420 or 421</td>
<td>3</td>
<td>A.M.E. 401</td>
<td>2</td>
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<tr>
<td>A.M.E. 424</td>
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<td>A.M.E. 422</td>
<td>3</td>
</tr>
<tr>
<td>A.M.E. 425</td>
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<td>A.M.E. 461</td>
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</tr>
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<td>A.M.E. 455</td>
<td>3</td>
<td>A.M.E. 495s</td>
<td>1</td>
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<td>Tech. Elective*</td>
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<tr>
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<td>15</td>
<td>Total</td>
<td>15</td>
</tr>
</tbody>
</table>

*The 9 units of technical electives are selected, in consultation with an advisor, from upper-division offerings in engineering or other scientific technical fields. Each student is required to complete 16 units of engineering design.

BACHELOR OF SCIENCE IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING
(ABET Accredited)

Agricultural and biosystems engineers integrate mathematics and the biological, physical and engineering sciences with engineering design principles. These principles are applied to the design, analysis, construction, and management of equipment, systems, and facilities for the efficient production, processing, and utilization of food, fiber, and biological/biochemical products. The curriculum is based on a core of courses required of all students with electives to place emphasis in areas such as agricultural engineering, biological engineering, bioenvironmental engineering, food engineering, irrigation engineering and water resources management, and agri-biosystems power and machinery design. Modern developments in control systems, expert systems, robotics, sensors, microprocessors, materials science, and computer-based analyses are emphasized throughout the program as appropriate.

Required Curriculum:

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester Units</th>
<th>Course</th>
<th>Second Semester Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 223</td>
<td>4</td>
<td>Math. 254</td>
<td>3</td>
</tr>
<tr>
<td>Phys. 116</td>
<td>4</td>
<td>A.M.E. 230</td>
<td>3</td>
</tr>
<tr>
<td>A.B.E. 121</td>
<td>1</td>
<td>C.E. 217</td>
<td>3</td>
</tr>
<tr>
<td>Ch.E. 201</td>
<td>4</td>
<td>Hum./Soc. Sci. Elective</td>
<td>3</td>
</tr>
<tr>
<td>C.E. 214</td>
<td>3</td>
<td>Electives*</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
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<td>Total</td>
<td>17</td>
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</tbody>
</table>
BACHELOR OF SCIENCE IN CIVIL ENGINEERING
(ABET Accredited)

Civil engineering is concerned with a wide variety of elements of natural and man-made environments. The civil engineer conceives, designs, constructs, manages and maintains physical facilities and infrastructure such as residential and industrial buildings, bridges, transportation systems, tunnels, dams, power plants, space structures, water resources and treatment systems, municipal and industrial waste disposal including hazardous waste treatment systems, and air and water pollution control systems. Students may elect to take a series of courses concentrated in structural engineering, geotechnical engineering, transportation engineering, hydraulic engineering, environmental engineering, or general civil engineering. Well-equipped physical and computer laboratories are available for instruction and research.

Required Curriculum:

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Units</th>
<th>Course</th>
<th>Second Semester</th>
<th>Units</th>
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<tbody>
<tr>
<td>Math. 223</td>
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<td>Math. 254</td>
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</tr>
<tr>
<td>Phys. 116</td>
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<td>Phys. 213</td>
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</tr>
<tr>
<td>Chem. 225a</td>
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<td>Chem. 323</td>
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<tr>
<td>Chem. 226a</td>
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<td>Chem. 241</td>
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<td>Ch. E. 201</td>
<td>4</td>
<td>Ch. E. 202</td>
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</tr>
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<td>Total</td>
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<td>Ch. E. 306</td>
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<tr>
<td>Chem. 480a</td>
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<td>Chem. 480b or Adv. Sci.</td>
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<td>Ch. E. 420</td>
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<td>H.S.S./T.E./T.R.**</td>
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<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>16</td>
<td></td>
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</tbody>
</table>

*Total electives are 45 units. Electives must include the following: humanities/social sciences, 18 units; agricultural/biological sciences, 8 units; and the balance of units selected from technical electives, humanities/social sciences, and agricultural/biological sciences depending upon the emphasis area selected. The design component of the program must total 18 units in required courses and technical electives. Courses in each area must be selected from departmental course lists in each area in consultation with the student's advisor.

BACHELOR OF SCIENCE IN COMPUTER ENGINEERING
(ABET Accredited)

The computer engineering program prepares students to work in the dynamic and rapidly expanding field of digital technology. Computer engineers design computers and computer systems, apply computers as components of larger systems, and apply digital techniques to solving a broad range of engineering problems. The curriculum includes a strong electrical engineering component, consisting of most of the required courses in the electrical engineering curriculum. To this base it adds extensive course work in both the hardware and software aspects of computers and digital systems. The program is strengthened by the availability of extensive laboratory and computing facilities.

The presence in the department of the Computer Engineering Research Laboratory, the Computer-Aided Design Laboratory, the Digital Image Analysis Laboratory, and the Computer-Aided Engineering Cen-
ter, as well as research in artificial intelligence and expert systems, computer communications, computer networking, simulation, and other specialties, maintains a modern viewpoint in the undergraduate curriculum.

Required Curriculum:

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
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### Junior Year

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<th>Course</th>
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### Senior Year

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*E.C.E. 495b (limited enrollment) may be substituted for 494a and 495a.
**E.C.E. 301 or E.C.E. 381.
***Technical electives will be selected from 400-level courses in E.C.E. or C.Sc., in a program developed in consultation with a faculty advisor. These must include 4 units of engineering design.

### BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING (ABET Accredited)

The goal of the electrical engineering undergraduate curriculum is to educate immediately productive electrical engineers who are also qualified to pursue further educational activities. The program emphasizes basic scientific knowledge, modern design techniques, and laboratory techniques needed for design verification.

The presence in the department of the Computer Engineering Research Laboratory, the Computer-Aided Design Laboratory, the Electromagnetics Laboratory, the Microelectronics Laboratory, the Center for Microcontamination Control, and the SEMATECH Center of Excellence, as well as research in lasers, microelectronics, pattern recognition and image processing, simulation, artificial intelligence, optical communications, robotics, and other specialties, maintains a modern viewpoint in the undergraduate program.

Required Curriculum:

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<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
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<td>Phys. 116</td>
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### BACHELOR OF SCIENCE IN ENERGY ENGINEERING

At the time of catalog production, the major in energy engineering was under review. Consult the Department of Nuclear and Energy Engineering for current information.

### BACHELOR OF SCIENCE IN ENGINEERING MATHEMATICS

The engineering mathematics curriculum is designed to give the student a deep understanding of mathematics to complement specific interests in engineering. Graduates of this curriculum working in industry may use their proficiency in analysis, statistics, computer science or numerical analysis to develop techniques needed to obtain meaningful solutions to engineering problems for which there is no standard solution. The program can be tailored to give each individual the desired concentration in particular areas of mathematics and engineering, the goal being breadth with selective depth. The engineering mathematics curriculum gives an excellent background for graduate work in applied mathematics and computer science as well as various areas in engineering.

Required Curriculum:

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
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### Senior Year

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*Those students interested in using technical electives to emphasize computer science should include C.Sc. 227 and 237 their first three semesters.
**Humanities and social science electives: 17 units to be chosen from a list approved by the college. Technical electives: 17 units to be chosen in consultation with an advisor.
BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Modern engineering regularly begins at the edge of scientific knowledge. The engineering physics program is designed to provide the strong scientific base and the grounding in engineering perspective essential to use this knowledge. Graduates are prepared for employment in a variety of engineering fields. They are also prepared for graduate study in physics and in some areas of engineering. Which preparation predominates depends on choices of technical elective courses. These are normally upper-division units chosen in conference with an advisor, which constitute a coherent supplemental program.

Students committing to the program in the freshman year are advised to follow the curriculum shown below. The engineering college freshman curriculum is also acceptable; students choosing this option should plan to replace Phys. 111a-111b; 112a-112b with Phys. 110, 116, 121, and 330.

Required Curriculum:

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Sophomore Year

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Junior Year

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Senior Year

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BACHELOR OF SCIENCE IN GEOLOGICAL ENGINEERING
(ABET Accredited)

Geological engineering involves the application of geological science to the design of engineering structures. The geological engineer is an environmentalist trained to recognize and understand the significance of geological conditions and their influence on engineering designs. Graduates spend much of their time on location throughout the world working on the earth's surface and underground. Projects requiring geological engineering expertise cover a broad spectrum, ranging from domestic toxic waste reclamation to foreign dam investigations to mineral resources exploration.

Required Curriculum:

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<th>Course</th>
<th>Units</th>
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Sophomore Year

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Junior Year

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Summer Session

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BACHELOR OF SCIENCE IN HYDROLOGY

Hydrology, the science of water, deals with the origin, distribution, and the physical, chemical and biological properties of the waters of the Earth. It has application to flood, drought, and weather-related hazards, water supply, recreation, the design of bridges and dams, pollution control, and other water management concerns. The hydrology curriculum is designed to give the student a basic knowledge of hydrology and allied subjects, including hydrologic modeling with computer applications. Flexibility is offered through the selection of humanities/social sciences, technical, and general electives so that a program of study can be developed which best fits the student's needs. Specialization options: Technical electives can be used to obtain specialization in the areas of hydrometeorology, hydrogeology, environmental chemistry, environmental hydrology, and water resources engineering. Students should consult with the department regarding development of these options.

Graduates with the degree of Bachelor of Science in Hydrology obtain professional positions in the fields of hydrology and water resources. Because hydrology is a natural science, instruction is augmented at all levels with field trips in Arizona, a state which contains a great diversity of topographic and geologic features and climatic zones, making it a superb outdoor laboratory. The four-week summer field course provides direct experience with hydrologic measurements, testing, and data gathering at a number of locations in Arizona. The field course ends with students applying these techniques, on location, to solve a local water resource problem.

Required Curriculum:

<table>
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<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
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</table>
### BACHELOR OF SCIENCE IN INDUSTRIAL ENGINEERING (ABET Accredited)

Industrial engineering focuses on the design and implementation of integrated systems of people, materials, machines, energy and information. After first specifying system objectives, industrial engineers combine technical knowledge and skill from the physical, engineering and social sciences to design, evaluate and monitor system performance.

The industrial engineer is charged with the responsibility of managing the total manufacturing system, from product design through transportation and government. In each of these environments, industrial engineers are involved with a variety of systems such as production, research, development, and production. Graduates are also prepared for graduate study in the many facets of materials science and engineering.

The M.S.E. curriculum prepares students for employment in materials research, development, and production. Graduates are also prepared for graduate study in the many facets of materials science and engineering.

### Required Curriculum:

<table>
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<tr>
<th>Course</th>
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### Summer Session (Presession)

| H.W.R. 414a-414b     | 6             |                |       |

### Senior Year

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</table>

### Hum. /Soc. Sci. Electives must be chosen from a list approved by the College of Engineering and Mines. Selection of these electives is made in consultation with the student's faculty advisor.

**Engl. 308 must be taken as a technical elective. Additionally, at least one technical elective must be taken from the list: S.I.E. 406, 408, 453, 464, 485, 486. Others may be selected from a list of 300- and 400-level courses available in the departmental office and approved by the student's advisor. In the manufacturing systems option, the technical electives are chosen from manufacturing-oriented courses such as S.I.E. 485 and 486.

### BACHELOR OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING (ABET Accredited)

Materials science and engineering is the study of the structure, processing and properties of materials. The field covers the behavior of metals, ceramics, glasses, polymers, semiconductors, and composites. The curriculum in M.S.E. includes an unusually large number of elective courses, which can be taken both inside and outside M.S.E. This is a reflection of the interdisciplinary nature of the field.

All students in M.S.E. are required to take the ten core courses, which cover the fundamental principles of M.S.E. Based upon a student's interests, an appropriate sequence of elective courses is decided upon with a faculty advisor in the sophomore year. Involvement in active research programs is an important part of undergraduate education in M.S.E. While participation is not mandatory, it is highly encouraged, and students are urged to seek out faculty and arrange for projects as early in their undergraduate careers as possible.

The M.S.E. curriculum prepares students for employment in materials research, development, and production. Graduates are also prepared for graduate study in the many facets of materials science and engineering.

### Required Curriculum:

<table>
<thead>
<tr>
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<th>Second Semester</th>
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### Junior Year

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</table>
### BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

(ABET Accredited)

Mechanical engineering is a broad discipline which covers the fields of solid and fluid mechanics, thermodynamics, and engineering design. Basic studies are devoted to machine dynamics, fluid flow, energy and power systems, mechanical properties of materials, and instrumentation. Students can specialize in a wide variety of topics, which include power systems, thermal sciences, automatic controls, reliability and quality assurance, and mechanical design.

Equipment supporting mechanical engineering studies includes digital computers with interactive graphics; internal combustion engines; microcomputers and microprocessors; nonlinear control systems; production and tooling shop; low- and high-speed wind tunnels; refrigeration and heat transfer loops; and instrumentation of a wide variety.

**Required Curriculum:**

**Sophomore Year**

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<th>Course</th>
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<td>3</td>
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**Junior Year**

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**Senior Year**

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*Elective courses are chosen by the student in consultation with a faculty advisor. 28 units of electives must be taken in the humanities and social sciences. The remaining 15 units are technical electives, which are to be selected from engineering and science courses. At least 12 units must be at the 400-level, with 9 of these in A.M.E. (exclusive of independent study, which can at most total 3 units). Moreover, 3 of these units must be taken from a selected list of courses having a design emphasis.

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### BACHELOR OF SCIENCE IN MINING ENGINEERING

(ABET Accredited)

Mining engineering is that branch of engineering responsible for planning, developing and operating mining and other underground facilities. Mining engineers acquire an intimate understanding of the unique environment presented underground; they learn how rock behaves when excavated, how to plan and supervise mines and how to excavate, transport and process minerals and coal.

Graduates with a Bachelor of Science degree in mining engineering find employment in the fields of design and operation of underground and surface mines, management of mines, heavy construction projects and tunneling and underground chamber projects, heavy equipment development and finance.

**Required Curriculum:**

**Sophomore Year**

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<th>Course</th>
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<th>Course</th>
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**Junior Year**

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<td>Geos. 321</td>
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**Senior Year**

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*The 25 units of electives are chosen by the student in consultation with a faculty advisor. 16 units (to include Econ. 210) are selected from humanities and social sciences and must satisfy the college requirements for these courses. The remaining 9 units of technical electives are selected from engineering and science courses. These must include 3 units of design.

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### BACHELOR OF SCIENCE IN NUCLEAR ENGINEERING

(ABET Accredited)

Nuclear engineering is directed to the study of the release, control, and application of all forms of energy resulting from nuclear reactions and to the utilization of the unique properties of radioactive materials in research, medicine, and materials processing. This branch of engineering is rooted in the physical sciences and mathematics; its applications range from power generation to radioisotope uses in science, medicine, and industry.

The four-year curriculum begins with a group of science and mathematics studies designed to provide the basic for work in the engineering sciences. Writing and computer skills are also included in the basic curriculum. Subsequent courses provide the specific engineering science and engineering design instruction needed to prepare for work as a nuclear engineer. The further development of computer skills in problem formulation, system modeling, and numerical evaluation are an essential part of this program. Further studies in the humanities and social sciences are included in the latter years of the program. For
some students, the opportunity to take for the first time or expand already existing skills in a foreign language is a welcomed option.

The objective is to develop the skills and insight to allow a positive and creative response to new opportunities that may arise from future technological initiatives. Of importance is the understanding that continued intellectual development is a basic ingredient for continued success in any engineering field, and especially in the changing nuclear engineering discipline.

Facilities available for laboratory instruction and research include: the TRIGA nuclear reactor, operating in either the steady or pulsed mode; the 1.25 Mev Radiation Dynamics Electron Accelerator, operating as a source of electrons or bremsstrahlung; a 300 curie Gamma Ray Irradiator for materials and biological specimen irradiation. A variety of laboratories for radioactive material counting, radiochemical processing, materials studies on the effects of radiation, and related studies are also available.

Required Curriculum:

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
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<th>Course</th>
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<td>C.E. 214</td>
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<td>N.E.E. 290</td>
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**Junior Year**

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**Senior Year**

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*Technical elective courses are chosen by the student in consultation with a faculty advisor and must include at least 2 units of design.

**BACHELOR OF SCIENCE IN OPTICAL ENGINEERING**

The undergraduate optical engineering program is designed to educate optical engineers who will be productive immediately upon graduation in areas involving optical design, optical fabrication and testing, lasers, optical detectors, optical instrumentation, optical fiber communications. This program, which is an interdisciplinary program offered by the Department of Electrical and Computer Engineering and the Optical Science Center, has a strong electrical engineering component. The curriculum includes many of the courses required for the B.S. degree in electrical engineering, and qualified graduates should have little difficulty pursuing further educational opportunities at the graduate level if desired.

Continuation in this program beyond the freshman year is competitive and selective because the number of individuals accepted is limited by departmental resources. Satisfactory completion of the freshman core does not assure that a student will be allowed to continue.

Students wishing to continue in the optical engineering program beyond the freshman year should apply through the Department of Electrical and Computer Engineering.

**Required Curriculum:**

**Sophomore Year**

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<tr>
<th>Course</th>
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<th>Course</th>
<th>Units</th>
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<td>Phys. 116</td>
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<td>Phys. 121</td>
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**Junior Year**

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**Senior Year**

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*Six units of technical electives must consist of two courses from the list: E.C.E. 340, 425, 430, 434, 454, 456, 459, 492, 487, Opti. 411, Stat. 361; or one course from this list and its 300-level prerequisite. The second six units may satisfy this rule or be chosen from the union of this list and other 400-level courses in engineering, mathematics, or physics. Each student is required to complete 16 units of engineering design.

**BACHELOR OF SCIENCE IN SYSTEMS ENGINEERING**

(ABET Accredited)

Systems engineers design and build systems to meet the needs of people. As computer speed and analytic sophistication have increased, society’s needs have become more varied and complex. Graduates of the systems engineering program are prepared to face these needs.

The goal of a systems engineer is to make the best use of resources. Stated formally, systems engineering is concerned with the processes and methodology of modeling, analyzing, and designing technologically advanced systems that function safely, effectively, and economically. It requires appreciation and understanding of machines, people, software, hardware, materials, and energy. Systems engineers work on a wide range of activities and applications, including communication systems, computer networking, manufacturing systems, robotics, healthcare systems, societal problems, and all phases of both industrial and military research and design. To prepare students for careers of such exceptional diversity, the systems engineering curriculum includes operations research, probability and statistics, numerical computing methods, artificial intelligence courses, robotics and human factors. This is clearly a broader and more abstract program than most traditional engineering disciplines.

Since computing and related methodology are invariably an integral part of modern systems engineering, the department offers a software option within the systems engineering curriculum. The option is exercised by taking the courses indicated in brackets below.
Required Curriculum:

Sophomore Year

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Junior Year

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Senior Year

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*Five course substitutions as indicated within the brackets are required for the software systems engineering option.

**Technical electives and math electives must be chosen from lists of 300- or 400-level courses available in the department office and must be approved by the student's faculty advisor. The S.I.E. elective and technical electives must be chosen to include a total of at least 2 units of Engineering Design and 1 unit of Engineering Science. S.I.E. 422 and 474 individually satisfy these requirements.

***Hum. and soc. sci. electives must be chosen from a list approved by the College of Engineering and Mines. Selection of these electives is made in consultation with the student's faculty advisor.

College of Law

Law Building, Room 120
(602) 621-1373

The University of Arizona College of Law is a member of the Association of American Law Schools and an approved law school of the American Bar Association. A rigorous course of professional education prepares students for service to the community in the private and public practice of law. To qualify for membership in the legal profession, a student must possess a broad educational experience and significant intellectual capacity, and must successfully negotiate a difficult course of study during which he or she is expected to master the principles of the law and of the legal system and to acquire professional techniques of lawyers.

Application forms and additional information pertaining to the program, as well as a College of Law Catalog, may be obtained from the College of Law.

ADMISSION PROCESS

Applicants are initially evaluated according to personal statements, references, the candidate's undergraduate grade-point average and score on the LSAT. Many admittees are selected from the pool of applicants based primarily upon the quality of their academic performance and LSAT score.

The balance of the entering class will be chosen by the vote of the Admissions Committee from a group of qualified candidates whose backgrounds and academic records indicate a good chance to succeed in law studies and to make a significant contribution to the legal education process, the legal profession and the community. Diversity is essential to a vital educational process and a dynamic legal profession. Although weight is given to academic records and test scores, the committee looks to other factors that not only affect the diversity objective in a positive manner but also may render grades and test scores less important as indicators of intellectual strength. Among those factors are college attended, course of study, grade trends, significant or extracurricular activities, unique educational or occupational experience, involvement in community affairs, participation in prelaw school programs (e.g., CLEO), race and ethnicity, economic or cultural background, and any other factors that may justifiably be relied upon in appraising the qualifications of applicants for success in law school and contribution to the legal profession. In making the selections, consideration is given to the individual characteristics of each applicant.

APPLICATION PROCEDURE

First-year students are admitted only in the fall semester. Applicants are encouraged to submit their applications as early as possible in the fall semester. All application materials, including the LSDAS report, must be delivered to the Admissions Office or postmarked no later than March 1.

1. To complete an application, a candidate for admission must submit:
   A. A Law School Application Matching Form (see item 3).
   B. A complete law school application (including personal statement).
   C. A Domicile Affidavit.
   D. Two references.
   E. A nonrefundable $25 application fee. (Only checks or money orders, payable to the University of Arizona, are acceptable.)

2. All candidates must take the Law School Admission Test (LSAT), which is given at centers in the United States several times a year. Information about the test can be obtained by writing Law School Administration Services (LSAS), Box 2000, Newtown, PA 18940, or by contacting the nearest law school or prelaw advisor. In order to meet the March 1 deadline for complete applications, candidates must take the test no later than the December administration preceding the year in which the candidate wishes to enroll.

An applicant may take the LSAT more than once; however, the scores are usually averaged for use in the initial evaluation formula.

3. All applicants must register for a Law School Data Assembly Service Report. LSDAS reports are produced only for candidates who submit directly to all law colleges a Law School Application Matching Form with their application for admission. The matching forms are included with the LSAT/LSDAS registration materials found in Law School Admission Bulletins. To preserve a candidate's right to privacy, LSAS does not release LSDAS reports to any school that does not supply them with an Application Matching Form.

It is important to recognize that considerable lead time is required for the LSDAS process. To ensure timely completion of applications, candidates should register with LSDAS and submit transcripts from each undergraduate institution they have attended to LSDAS prior to January 1. Students must provide to LSDAS transcripts of any course work completed after the initial submission to LSDAS. It is wise to keep receipts for transcripts and LSDAS services as evidence of compliance with deadlines.

Graduate transcripts should also be sent to LSDAS. Graduate grades will not be analyzed on the report but the transcripts will be attached to the back of the report.

Transfer Students

Students who have done very well at other law schools may be permitted to transfer to the University of Arizona in either the fall or the spring semester of their second year of law school. A transfer applicant must send the following items to the Admissions Office, University of Arizona College of Law, Tucson, Arizona 85721, prior to December 1 for application to the spring semester, and prior to July 15 for application to the fall semester.

1. Completed application for transfer admission.
2. Domicile Affidavit.
3. An LSDAS report showing entire undergraduate career and the LSAT score.
4. A letter from the dean of the law school currently being attended stating that the candidate is presently in good standing and eligible to continue studies at that institution.

5. Transcripts of at least one full year (three quarters or two semesters) of law work including class rank. First-year students may not transfer in midyear.

If these minimum requirements are met, applicants will be judged as to whether a transfer would be in the best interest of the student and of the college. Third-year students will not be considered for transfer but may apply as visiting students. No student who has been disqualified or placed on probation at another law school, or who has failed to maintain at least a “C” average for all law work attempted, will be allowed to transfer to or visit the College of Law. Transfer students will not receive credit for work done at a law school which is not a member of the Association of American Law Schools or approved by the American Bar Association.

Nondegree Students

SPECIAL STUDENTS—A limited number of students without the qualifications required of candidates for the law degree may, at the discretion of the faculty, be allowed to audit a course or courses as special students. Applicants must have experience and educational background which indicate a strong probability that they will be successful in law study. They must also demonstrate some special need for legal training.

STUDENTS FROM OTHER COLLEGES AT THE UNIVERSITY—With the written approval of their advisors and Dean of the Graduate College, graduate students may register for courses in the College of Law. Students desiring to do so will be required to obtain the prior approval of the instructor and of the assistant dean of the College of Law. Special students and students from other colleges studying at the College of Law are not degree candidates, nor are they eligible for the Arizona bar examination. Law courses may not be used by part-time students as credit toward a law degree in the event that such students are subsequently admitted as degree candidates.

College of Medicine

Basic Sciences Building, Room 2209
(602) 626-6214

The College of Medicine offers a professional program leading to the M.D. degree and graduate programs leading to the Ph.D. degree in certain of the medical sciences. A combined M.D./Ph.D. program in which the two degrees are awarded concurrently is also available. Candidates for the Ph.D. degree are enrolled in the Graduate College of the University. For information beyond that summarized below, one should request a catalog from the Admissions Office, College of Medicine, University of Arizona, Tucson, Arizona 85724.

PREMEDICAL REQUIREMENTS

Applicants must successfully complete the minimum requirement of 90 semester hours, including 30 hours at the upper-division level, in an accredited college or university. Successful completion of the following specific course work is required: two semesters or three quarters each of inorganic chemistry, organic chemistry, physics, general biology or zoology and English. Students should demonstrate the ability to handle scientific material effectively, irrespective of their majors.

MEDICAL COLLEGE ADMISSION TEST

All applicants must take the current Medical College Admission Test and arrange to have scores forwarded to this college. The test should be taken in the year preceding that in which the student hopes to enter medical school, or at the latest, within two years of application. In all cases, applicants must submit scores from the 1991 MCAT or later. For applications write: MCAT—The American College Testing Program, P.O. Box 414, Iowa City, Iowa 52243.

APPLICATION TO THE FIRST-YEAR CLASS

The College of Medicine is a participating member in the American Medical College Application Service (AMCAS). Each student need submit only one application if applying just to AMCAS schools. Requests for application material may be obtained from the Admissions Office of the College of Medicine. The application period is June 1 to November 1 of the year preceding that in which the applicant hopes to enter medical school. Those to be considered are requested to appear for personal interviews. Further details of the application procedure may be found in the College of Medicine Catalog.

SELECTION FACTORS

The College of Medicine follows the recommended acceptance procedures of the Association of American Medical Colleges. Acceptance is based upon an assessment of the applicant's intellectual and personal traits. In evaluating candidates, the Admissions Committee considers ability and scholarship as indicated by the candidate's entire academic record, the results of the MCAT, letters of recommendation, and personal interviews. Consideration is given only to residents of Arizona and to highly qualified residents of Alaska, Montana, and Wyoming who are certified and funded by the Western Interstate Commission for Higher Education (WICHE). Applicants from states other than these cannot be considered.

ADMISSION OF TRANSFER STUDENTS

Applications are accepted for transfer into the clinical years of the College of Medicine curriculum only from Arizona residents. Please see the College of Medicine Catalog for further information.

ACADEMIC POLICY AND CURRICULUM

All medical students are graded on an Honors-Pass-Fail basis. Students who are enrolled in other colleges of the University and who are taking College of Medicine courses will be graded by the same system as the rest of the University.

The curriculum of the College of Medicine is based upon a four-year program. For information concerning the pace of academic work, please consult the College of Medicine Catalog.

College of Nursing

Nursing Building, Room 316
(602) 626-6154

The College of Nursing offers a professional program leading to the Bachelor of Science in Nursing degree and graduate programs leading to the Master of Science and Doctor of Philosophy degrees with a major in nursing. For information regarding graduate study, please see the Graduate Catalog.

The College of Nursing also offers accelerated B.S.N./M.S. pathways for superior students who are (1) registered nurses who graduated from associate degree or diploma nursing programs; (2) registered nurses who hold degrees in a non-nursing field; and (3) college graduates who have a baccalaureate or higher degree in a non-nursing field.

The program which leads to the B.S. in Nursing prepares the graduate to begin practice as a professional nurse, and to undertake graduate study in nursing. The curriculum is composed of prenursing courses, which are taken in the College of Arts and Sciences, followed by the professional nursing major. After having completed the prenursing phase of the program, students are admitted selectively to the College of Nursing to begin the nursing major in fall or spring. A minimum of 30 units of the nursing major must be university-credit course work.

Nursing students are preparing for a profession which is exacting and in which they must take responsibility for the lives and well-being of others. Applicants must be in good physical and mental health; other-
wise, they may be denied admission or, once admitted, recommended for withdrawal.

The college is accredited by the National League for Nursing and approved by the Arizona State Board of Nursing. Upon recommendation of the faculty, the graduates will be admitted to the licensing examination administered by the state board.

REQUIREMENTS

Any entering freshman who meets university admission requirements as described in the Admission to the University section of this catalog may be admitted to the College of Arts and Sciences for the prenursing portion of the program.

Transfer students must meet the same university admission requirements. They may complete all freshman and sophomore general education requirements as listed in the nursing program at another college or university, or may present a combination of transfer and University of Arizona courses for consideration for admission to the nursing major.

There is a selection process before any student can be accepted into the College of Nursing for the professional nursing courses. To be considered for admission to the baccalaureate program, a student must have: removed any high school deficiencies; completed designated prerequisites; earned a 2.750 grade-point average in designated prerequisites; and earned a cumulative grade-point average of 2.750.

Completion of prerequisite courses with a 2.750 average does not assure a student of admission to the professional nursing courses. The number of applicants admitted to the professional courses is limited by the resources of the college. A grade-point average considerably above 2.750 is normally required.

All transfer students must have a minimum 2.750 average on all freshman and sophomore courses for both University of Arizona and transfer credits for consideration for admission to the college. Students who have done well at other nursing schools may be permitted to transfer to the University of Arizona. A letter from the dean or director of the nursing school stating that the applicant is in good standing and eligible to continue nursing studies at that institution is required. Admission criteria for the College of Nursing are periodically reviewed. Consult with the College of Nursing for current information.

Students are required to take the University of Arizona Writing-Proficiency Examination before starting their classes in the College of Nursing. Students who have an unsatisfactory rating on the examination will be required to complete developmental work acceptable to the College of Nursing.

All students entering the College of Nursing are required to have basic computer knowledge, obtained in high school, computer store, university courses, or self-taught.

Since enrollment in the college is limited, completion of freshman courses by entering freshmen or transfer students with the required grade-point average does not assure the student of admission to the major. Once admitted to the major, the student must be full time, attending five consecutive semesters. During these semesters the student must be enrolled for all required courses.

Students seeking acceptance to the College of Nursing for fall semester need to file the special application form, to be obtained directly from the college, by February 1 of the year in which they desire to enter and can expect to hear of their status by April 1. Students planning to enter the college in a spring semester must file this application by August 1 of the previous year and can expect to hear by October 1 regarding acceptance. The College of Nursing does not maintain a waiting list. Students wishing to reapply must contact the College of Nursing regarding reaplication.

In addition to these requirements, registered nurses from diploma or associate degree schools of nursing must hold a current valid Arizona license to practice nursing. For these applicants, acceptance of transfer credits and the establishment of credit by examination will be considered on an individual basis. (See also "Special Examination for Credit" section of this catalog.)

Since clinical laboratories are in a variety of community settings, all students in the clinical nursing course are required to provide their own car for transportation to the areas where they are assigned for patient-care experience.

A candidate for the degree of B.S. in Nursing must fulfill the requirements both in number and kind of units as outlined in the catalog under which the student has chosen to graduate. The graduation average must be 2.0000 or better, with an average of 2.0000 or better for all work undertaken in the major field at the University of Arizona. (See also Graduation Requirements section of this catalog.)

Graduation from the College of Nursing is not the sole criterion for obtaining a license to practice nursing in Arizona. Licensing requirements are the exclusive responsibility of the State Board of Nursing. Graduates must satisfy licensure requirements independently of degree requirements.

Grading Policy for Nursing Courses

The grade of "D" is unacceptable for courses in the nursing major inasmuch as it does not reflect acceptable performance. Students who do not complete a required course(s) with a grade of "C" or better, are not eligible to progress in the professional nursing major. The student may be permitted to repeat the course for credit.

HONORS

The college participates in the Honors Program.

REQUIRED CURRICULUM FOR THE BACHELOR OF SCIENCE IN NURSING DEGREE

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Total Minimum Units Required for Graduation—129-132

*Check with the College of Nursing for acceptable electives.

**General education requirements listed in the junior/senior years, must be upper-division courses selected from Bockink.
The professional degree offered by the College of Pharmacy is the Doctor of Pharmacy (Pharm.D.). The program for this degree is based upon six years of college work (two years of prepharmacy and four years in the College of Pharmacy), as outlined below.

The college also offers graduate studies leading to the Master of Science degree in pharmaceutical sciences, pharmacology, toxicology, and pharmacy and the Doctor of Philosophy degree in pharmaceutical sciences, pharmacology and toxicology, and pharmacy. For information on the specific programs in the departments of Pharmaceutical Sciences, Pharmacology and Toxicology, and Pharmacy Practice, consult the respective departmental headings elsewhere in this catalog.

ADMISSION REQUIREMENTS FOR THE DOCTOR OF PHARMACY PROGRAM

Admission to the Doctor of Pharmacy program requires completion of courses as specified in the prepharmacy curriculum below. Students in the prepharmacy program at the University of Arizona are enrolled in the College of Arts and Sciences. Equivalent courses completed at other colleges or universities may be accepted in fulfillment of the prepharmacy course requirements.

Candidates are admitted into the professional pharmacy program only in the fall semester. Evaluation for admission to the college requires the following application items: (1) a completed University of Arizona application form, (2) official transcripts of all completed university or college courses, (3) a listing of remaining prepharmacy courses that must be completed before entering the College of Pharmacy, (4) a completed student profile questionnaire, (5) three completed recommendation forms, (6) the results of the Pharmacy College Admissions Test (PCAT), and (7) an interview. It is recommended that the PCAT be taken in November, but no later than February. All application materials, including application form and transcripts, should be sent directly to the College of Pharmacy. Students who seek admission to the College of Pharmacy are urged to initiate the application process in October of the year preceding admission and have all application materials submitted as soon as possible, but no later than by the end of February. Applicants will be informed of their admission status by late March or early April.

Application forms for admission to the University are available from the Office of Admissions and New Student Enrollment, The University of Arizona, Tucson, AZ 85721. Profile questionnaire and recommendation forms are available from the Office of the Dean, College of Pharmacy. Application forms for the PCAT may be obtained from Psychological Corporation, 555 Academic Ct., San Antonio, TX 78204 or from the College of Pharmacy.

COLLEGE SCHOLASTIC REQUIREMENTS

Students in the four-year professional Pharm.D. program are required to register for and complete a minimum of 14 units each semester. The cumulative university grade-point average and the cumulative profession-
### General Elective Courses

#### Second Professional Year

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***The Summer Session and Fourth Professional Year are individually designed by the clerkship coordinator and the student. The student may be required to complete rotations outside of the Tucson area.

### CURRICULUM ELECTIVES

In addition to the lower-division electives required of all students during their prepharmacy curriculum, students in the College of Pharmacy are required to complete upper-division electives during their professional curriculum. Six units of upper-division general electives and fifteen units of practicum (clerkship) electives are required.

### GENERAL ELECTIVES

General electives for the Doctor of Pharmacy program may be chosen from upper-division (300-400 level) courses in the following departments:

- Accounting
- Anthropology
- Biochemistry
- Chemistry
- Communication
- Computer Science
- Ecology & Evolutionary Biology
- Economics
- Finance & Real Estate
- Health-Related Professions
- Management & Policy
- Management Information Systems
- Marketing
- Microbiology & Immunology
- Molecular & Cellular Biology
- Nutrition & Food Science
- Pharmaceutical Sciences
- Pharmacology & Toxicology
- Pharmacy Practice
- Psychology
- Sociology
- Statistics

Examples of electives pertinent to pharmacy that may be taken:

- Ph.Sc. 399 (1-4), Independent Study
- Ph.Sc. 427 (2), Antineoplastic Drugs
- Ph.Sc. 430a, 430b (3,3), Medical Radiopharmaceuticals

### SERVICE AND RESEARCH UNITS

The Arizona Poison and Drug Information Center, the Ruth E. Golding Clinical Pharmacokinetics Laboratory, the Jeffrey M. Golding Clinical Research Unit, the Center for Toxicology and the Center for Pharmaceutical Economics are operated by the College of Pharmacy. For a description of their activities, consult the General University Information section of this catalog.

### School of Health-Related Professions

Gittings Building, Room 108  
(602) 621-6990

The School of Health-Related Professions provides educational opportunities for students interested in pursuing a wide range of health-related careers in the university, community, and commercial sectors. Academic programs within the school offer strong, science-based preparation for researchers, technicians, and teachers who will advance knowledge to promote health, prevent disease, improve the quality of life, and enhance human physical performance. The school also provides course work for undergraduates who wish to enter the professions of medicine and physical therapy or to prepare for graduate study in the health science fields.

The academic units of the school include the Department of Exercise and Sport Sciences, the Division of Community and Environmental Health, and the Division of Medical Technology. The school is an integral part of the Arizona Health Sciences Center and maintains research and curricular ties with other colleges and departments in the physical, biological, and social sciences as a recognition of the interdisciplinary nature of the health field.

### DEGREES AND MAJORS

#### Degrees

The School of Health-Related Professions offers academic programs leading to the Bachelor of Science in Health Sciences (B.S.H.S.), Master of Arts, Master of Science, and Master of Education.

#### Undergraduate Majors

Within the B.S.H.S. degree program, students may select a major in exercise sciences, health education, medical technology, occupational safety and health, or physical education. For detailed descriptions of these majors, see below.

#### Graduate Majors

At the master's level, majors are offered in exercise and sport sciences and health education. The major of health education was being re-designed at the time the catalog was being edited. For further informa-
tion on requirements for graduate degree programs, see the Graduate Catalog.

ADMISSION REQUIREMENTS

Formal admission to the School of Health-Related Professions is required of all undergraduate students and is contingent on acceptance into a specific major. Applicants for all B.S.H.S. majors must have completed a minimum of 56 semester hours of college credit applicable to a baccalaureate degree and must have maintained a cumulative grade-point average of 2.2500 or higher on all collegiate work attempted. Additional admission requirements for specific majors are described below.

Students normally apply for admission to majors in the school at the beginning of their junior year, after completion of two years of study in the College of Arts and Sciences. Any student enrolled in the University who is considering application for admission to one of the majors in health-related professions should consult faculty advisors in the School of Health-Related Professions.

GENERAL EDUCATION REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN HEALTH SCIENCES

I. Basic Skills and Proficiencies

A. English Composition (6 units): Engl. 101 (or 103H), Engl. 102 (or 104H), Hlth. 178, Math. 117R (or 117S), Psyc. 101, and one additional 3-unit course approved from Booklink.

B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level. This can be accomplished through courses (8 units) or by examination (0 units).

C. Mathematics (3 units): Math. 117R (or 117S), Psyc. 101, and one additional 3-unit course approved from Booklink.

Total 9-17

II. Study Areas

A. Traditions and Cultures (9 units): Ex.S.S. 288 plus one 3-unit Western Civilization course and one 3-unit Non-Western Civilization course, both approved from Booklink.

B. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b, 181, 182, Eng. 101 (or 103H), 102 (or 104H), Ex.S.S. (10 units to include 288 and 320), Math. 117R (or 117S), 118, 124 or 125a-125b, Phys. 102a-102b, 180a-180b, Psyc. 101.

Major Requirements

The major requires completion of a core of 36 units: Ex.S.S. 420, 421, 460, 462, 491, 496b, 3 units from Ex.S.S. 103-232, and 12 units from Ex.S.S. 261, 267, 377, 380, 381, 394d, 394e, and 410. The remaining 31 units must be selected, with the approval of an advisor, from courses in one of several exercise science specializations, such as biomechanics, exercise physiology, motor control, or sport psychology.

MAJOR IN HEALTH EDUCATION

The Division of Community and Environmental Health offers instructional programs designed to prepare students for careers focusing on critical societal health problems. Students may obtain a major in health education with an option in community health or school health education. The community health option provides students with the education needed to deal with contemporary health problems of public and voluntary health organizations. The school health education option prepares health education teachers for primary and secondary schools.

General Education Requirements for the Major in Health Education

I. Basic Skills and Proficiencies (9-17 units)

A. English Composition (6 units): Engl. 101 (or 103H), Engl. 102 (or 104H).

B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level. This can be accomplished through courses (8 units) or by examination (0 units).

C. Mathematics (3 units): Math. 117R (or 117S).

II. Study Areas (36 units)

A. Traditions and Cultures (9 units): Ex.S.S. 288 plus one 3-unit Western Civilization course and one 3-unit Non-Western Civilization course, both approved from Booklink.

B. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b, 181, 182, Eng. 101 (or 103H), 102 (or 104H), Ex.S.S. (10 units to include 288 and 320), Math. 117R (or 117S), 118, 124 or 125a-125b, Phys. 102a-102b, 180a-180b, Psyc. 101.

Major Requirements

The major requires completion of a core of 36 units: Ex.S.S. 420, 421, 460, 462, 491, 496b, 3 units from Ex.S.S. 103-232, and 12 units from Ex.S.S. 261, 267, 377, 380, 381, 394d, 394e, and 410. The remaining 31 units must be selected, with the approval of an advisor, from courses in one of several exercise science specializations, such as biomechanics, exercise physiology, motor control, or sport psychology.

MAJOR IN EXERCISE SCIENCES

The Department of Exercise and Sport Sciences provides preparation for students intending to pursue graduate study in the exercise sciences as well as for those students who may seek admission to professional schools such as medicine or physical therapy. In addition, students selecting the exercise sciences major may find employment in health and sport clubs, or in community fitness and recreation programs.

General Education Requirements for the Major in Exercise Sciences

I. Basic Skills and Proficiencies (9-17 units)

A. English Composition (6 units): Engl. 101 (or 103H), Engl. 102 (or 104H).

B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level. This can be accomplished through courses (8 units) or by examination (0 units).

C. Mathematics (3 units): Math. 117R (or 117S).

II. Study Areas (36 units)

A. Traditions and Cultures (9 units): Ex.S.S. 288 plus one 3-unit Western Civilization course and one 3-unit Non-Western Civilization course, both approved from Booklink.

B. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b, 181, 182, Eng. 101 (or 103H), 102 (or 104H), Ex.S.S. (10 units to include 288 and 320), Math. 117R (or 117S), 118, 124 or 125a-125b, Phys. 102a-102b, 180a-180b, Psyc. 101.

Major Requirements

The major requires completion of a core of 36 units: Ex.S.S. 420, 421, 460, 462, 491, 496b, 3 units from Ex.S.S. 103-232, and 12 units from Ex.S.S. 261, 267, 377, 380, 381, 394d, 394e, and 410. The remaining 31 units must be selected, with the approval of an advisor, from courses in one of several exercise science specializations, such as biomechanics, exercise physiology, motor control, or sport psychology.

THE COMMUNITY HEALTH OPTION—36 units, including C.E. 479, Chem. 241a, 243a, C.Sc. 115, Hlth. 433, 440, 493a, Math. 263, O.S.H. 410, Phys. 102a-102b, 180a-180b, and 3 units of approved electives.

THE SCHOOL EDUCATION OPTION—Hlth. 381, 430, 432, 434 and College of Education course work required for State Teaching Certification.

All general education requirements for the major must have been completed as well as the following courses: Chem. 103b, 104b, Ecol. 181, 182, 320, Ex.S.S. 261, Hlth. 306, 330, 400, Micr. 357, N.F.S. 310, O.S.H. 486.

II. Admissions to the Major

A. Traditions and Cultures (9 units): 6 units in a Western Civilization sequence and 3 units in a Non-Western Civilization course, both approved from Booklink.
B. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b.
C. Individuals, Societies and Institutions (9 units): Psyc. 101, Soc. 101, and additional 2- or 3-unit course approved from Booklink which focuses on gender, class, race, or ethnicity.
D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.

Admission to the Major

All general education requirements for the major must have been completed as well as the following courses: Chem. 103b, 104b, Ecol. 181, 182, 320, Hlth. 433, Math. 263, Micr. 110, O.S.H. 402, 410, 412, 460, 466, 487, 495a (or 498 for 3 units), and 9 units of approved electives.

MAJOR IN OCCUPATIONAL SAFETY AND HEALTH

The Division of Community and Environmental Health provides professional preparation for students planning a career in the field of occupational hygiene. The major in occupational safety and health is concerned with training students in the recognition, evaluation, and control of environmental factors and stresses arising from the work place.

General Education Requirements for the Major in Occupational Safety and Health

I. Basic Skills and Proficiencies (9-17 units)
A. English Composition (6 units): Engl. 101 (or 103H), Engl. 102 (or 104H).
B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level.
C. Mathematics (3 units): Math. 117R (or 117S) or Math. 125a.

II. Study Areas (36 units)
A. Traditions and Cultures (9 units): 6 units in a Western Civilization sequence and 3 units in a Non-Western Civilization course, both approved from Booklink.
B. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b.
C. Individuals, Societies and Institutions (9 units): Psyc. 101, Soc. 101, and additional 2- or 3-unit course approved from Booklink which focuses on gender, class, race, or ethnicity.
D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.

Admission to the Major

All general education requirements for the major must have been completed as well as the following courses: Chem. 103b, 104b, Ecol. 181, 182, 320, Hlth. 433, Math. 263, Micr. 110, O.S.H. 402, 410, 412, 460, 466, 487, 495a (or 498 for 3 units), and 9 units of approved electives.

MAJOR IN PHYSICAL EDUCATION

The Department of Exercise and Sport Sciences offers general and professional education for students planning careers in teaching physical education and coaching athletics. The physical education major curriculum prepares students to teach physical education and sports in the public schools and in other agencies which hire physical educators.

General Education Requirements for the Major in Physical Education

I. Basic Skills and Proficiencies (9-17 units)
A. English Composition (6 units): Engl. 101 (or 103H), Engl. 102 (or 104H).
B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level.
C. Mathematics (3 units): Math. 117R (or 117S).

II. Study Areas (36 units)
A. Traditions and Cultures (9 units): 6 units in a Western Civilization sequence and 3 units in a Non-Western Civilization course, both approved from Booklink.
B. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b.
C. Individuals, Societies and Institutions (9 units): Psyc. 101, and additional 2- or 3-unit course approved from Booklink which focuses on gender, class, race, or ethnicity.
D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.
Admission to the Major

Students who wish to pursue a physical education major leading to teaching certification are required to take course work in the College of Education and must meet the specific eligibility requirements listed below. Items 3-6 in this list, requirements established by the College of Education, apply to all undergraduate students whose major programs require College of Education professional education courses which have restricted enrollment. It should be noted that admission to these courses may be restricted should the number of qualified applicants exceed the capacity of the College of Education. Admission to the physical education major is contingent upon completion of the eligibility requirements listed below:

1. a minimum of 56 units applicable to the physical education major, including Chem. 103a-103b, 104a-104b, Ecol. 159a-159b, 160a-160b, Engl. 101 (or 103H), Engl. 102 (or 104H), Ex.S.S. 285, 288, 320, 373, 374, and 6 units of professional activities (Ex.S.S. 201-232), Math. 117R (or 117S), Psych. 101,
2. an approved application for admission to the physical education major on file with the Undergraduate Advising Office, Department of Exercise and Sport Sciences;
3. a cumulative grade-point average of 2.5000 or higher on all course work completed at the time of application or by the end of the current semester, whether at the University or elsewhere;
4. a minimum of 12 units taken at the University of Arizona;
5. evidence, at the time of application, of having passed the Pre-Professional Skills Test (PPST), and
6. evidence, at the time of application, of successful completion of the Upper-Division Writing-Proficiency Examination and successful completion of a Developmental Writing Workshop if the Upper-Division Writing-Proficiency Examination was evaluated as unsatisfactory.

Major Requirements

The physical education teaching major (secondary-school emphasis) requires completion of a minimum of 55 units in the Department of Exercise and Sport Sciences. An additional 9 units of exercise and sport sciences courses are required to obtain teaching certification for grades K through 12. In both the secondary emphasis and the K-12 emphasis, a minimum of 21 units of College of Education course work is required for State Teaching Certification: Ed.P. 510, Educ. 350, R.P.C. 435, and T.T.E. 493b.

THE PHYSICAL EDUCATION TEACHING MAJOR (SECONDARY-SCHOOL EMPHASIS)—19 units of Ex.S.S. courses required for admission to the major; 36 additional units, including Ex.S.S. 279, 354 (2 units), 355, 360, 371, 377, 380, 381, 385, 394b, 410, and 6 units of professional activities selected from Ex.S.S. 201-232. The departmental professional skills requirements may be satisfied through proficiency examination or completion of a minimum of eight courses and 14 units from Professional Activity courses.

THE PHYSICAL EDUCATION TEACHING MAJOR (K-12 EMPHASIS)—55 units of exercise and sport sciences courses as required for the secondary school emphasis (described above), plus 9 additional units to include Ex.S.S. 294a, 350, 452 and T.T.E. 493a.

The Graduate College

Administration Building, Room 322
(602) 621-3471

THE NATURE OF GRADUATE WORK

The status of graduate students is different from that of undergraduates. Satisfying degree requirements should not be the primary aim of graduate students. Graduate education provides an opportunity to increase knowledge, to broaden understanding and to develop research capabilities. Consequently, a student's academic achievements should reflect a personal commitment to the discipline and to scholarly standards.

ADMISSION

Admission to the Graduate College is open to qualified applicants who hold the bachelor's degree from the University of Arizona or from a college or university which grants degrees recognized by the University of Arizona. Degrees that are recognized should be based on programs of study that meet or exceed the general education requirements for comparable degree majors at the University of Arizona. A degree cannot ordinarily be recognized if it is based on any of the following types of credits:

1. Credits awarded by postsecondary institutions in the United States that lack candidate status or accreditation by a regional accreditation association.
2. Credits awarded by postsecondary institutions for life experience unless validated by the institution awarding the credits through the use of standardized (such as CLEP) or comprehensive examinations.
3. Credits awarded by postsecondary institutions for courses taken at noncollegiate institutions (e.g., governmental agencies, corporations, industrial firms, etc.).
4. Credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs.

In general, degrees that are recognized should be based on a unit of credit comparable to that defined by the Arizona Board of Regents (May 1979) for institutions under its jurisdiction. A minimum of 45 hours of work by each student is required for each unit of credit. An hour of work is the equivalent of 50 minutes of class time (often called a "contact hour") or 60 minutes of independent study work. For lecture-discussion courses, this requirement equates to at least 15 contact hours and a minimum of 30 hours of work outside of the classroom for each unit of credit. Even though the values of 15 and 30 may vary for different modes of instruction, the minimum total of 45 hours of work for each unit of credit is a constant. Admission is granted only after approval of an applicant's previous academic record by the Dean of the Graduate College and the head of the academic unit in which the greater portion of major academic work will be completed.

Grade-Point Average

Applicants who apply for admission to the Graduate College are evaluated on the individual merits of their academic achievements and individual scholarly potential to complete graduate level course work and curriculum requirements. Ordinarily, a minimum cumulative grade-point average of 3.0000 on the last 60 units of course work is required for admission to the Graduate College. Applicants should consult the academic unit to which they are applying regarding that unit's grade-point average expectations. Prospective students who do not meet this standard may enroll as non-degree students and complete 12 consecutive units of 500-level (or higher) course work with a grade-point average of at least 3.25 in order to establish eligibility for seeking admission to the graduate degree program of their choice.

Graduate Record Examination

Normally applicants must submit scores on the Graduate Record Examination in order to complete the admission process. Scores on the aptitude test of the Graduate Record Examination are used to supplement other evidence of preparation for graduate work. Such scores are only one component of the credentials used to make admission decisions, and they are evaluated in the context of the complete record in the application folder of each applicant. No formal minimum scores on standardized examinations are required for admission to the Graduate College. A number of departments, however, have specific requirements with regard to the Graduate Record Examinations, the Graduate Management Admissions Test, or other examinations. Some may require applicants to take the advanced GRE in the appropriate discipline. Academic departments and departmental headnotes in the Graduate Catalog should be consulted for further information. It is important that the examination be taken as early as possible in the academic year. Applications for the examinations, which are administered locally as
well as in other centers, should be sent, together with the examination fee, to Graduate Record Examinations, Educational Testing Service, Box 6000, Princeton, NJ 08541-6000.

Regular Graduate Status

Students who meet the admission requirements outlined above may be admitted to regular graduate status to undertake work leading to an advanced degree.

Provisional Admission

Provisional admission indicates some reservation on the part of the Graduate College with regard to the applicant's qualifications to undertake graduate work leading to an advanced degree. This restriction does not, however, impair the student's opportunity to earn graduate credit in properly selected courses. If admitted provisionally, a student who then completes nine credit hours of graduate work with superior grades will be in good standing, subject to any additional requirements established by the major department or academic unit. Students admitted provisionally because they lack GRE scores only may request conversion to regular graduate status immediately upon the receipt of the scores in the Graduate College and may have the requirement to complete nine credit hours of graduate work waived. Students on provisional status who wish to be admitted to regular graduate status should obtain the "Provisional to Regular Graduate Status Request Form" from the Graduate College and follow the directions on the form. Only students in Regular Graduate Status can be awarded a degree.

Admission for a Part of Each Academic Year

Some individuals may be admitted to a degree program with the understanding that they will enroll for only one semester or summer session during each academic year. These students must be identified in writing by the department and their Graduate College files so noted. These students must maintain the usual academic standards and are required to attend a minimum of one semester or summer session per year. Upon meeting the minimum standards, the students would not be required to apply for readmission. The department can revoke this status at any time if, in their judgment, the student is not making reasonable progress.

Admission with Deficiencies

An additional number of undergraduate courses may be required when previous work has not approximated the general requirements for the corresponding bachelor's degree at the University of Arizona or the special requirements for the field in which the candidate proposes to specialize. With departmental approval, a limited number of course deficiencies may be satisfied after admission to a graduate program; however, this work will not receive graduate credit.

Graduate Nondegree Status

Individuals holding a bachelor's degree, or its equivalent, from a college or university which grants degrees recognized by the University of Arizona may attend graduate-level courses without being admitted to a graduate degree program. Such students may enroll in graduate-level course work as their qualifications and performance permit; however, no more than 6 units earned while in this status may later be requested to be applied toward an advanced degree awarded at the University.

Admission of International Students

Nonimmigrants should request graduate application forms from the Graduate Student Admissions Office and departmental requirements and materials from the major academic unit. All international student applications, with the required credentials, must reach the Graduate Student Admissions Office before February 1 for summer and fall terms and August 1 for the spring term. International applicants may apply for a deferment of their application processing fee until enrollment if they are from Hungary, Liberia, Poland, Tunisia, the U.S.S.R. or Zimbabwe. All other international applicants must submit a $25.00 processing fee with their application. Some graduates of foreign institutions may be admitted initially as International Special Students for a period of enrollment limited to two academic terms with the understanding that they may be required to undertake some work without graduate credit in order to make up deficiencies in preparation. In any event, no commitment can be made regarding the time required to complete a course of study.

The University requires all applicants whose native language is other than English to take the Test of English as a Foreign Language (TOEFL) unless they have completed at least two academic years of full-time study or received a bachelor's or higher degree at a post-secondary institution in which English is the required language and medium of instruction. Results of the TOEFL are valid for two years to the semester of admission, and scores will be sent to the University of Arizona, when requested by the applicant, from TOEFL, Box 899-TR, Princeton, NJ 08540, U.S.A. The scores for this examination must be received before the student's application is complete. New students who are required to take the TOEFL and whose scores are below 550 are required to take a locally administered English test and to enroll for any further English courses which may be required by the Graduate College or by the student's department. Students whose native language is not English and who wish to be considered for a teaching assistantship must also submit scores on the Test of Spoken English (TSE) that is also administered by the Educational Testing Service, Princeton, NJ 08540, or the SPEAK test available at the University of Arizona.

For those prospective students who lack college-level English proficiency, the Center for English as a Second Language (CESL) offers full-time English language training on campus. The full semester or summer term sessions carry no college credit, but satisfactory completion of CESL training meets the University's English proficiency requirement for admission. Further information can be requested from the Center for English as a Second Language, Room 104 CESL Building, University of Arizona, Tucson, AZ 85721.

Students on nonimmigrant visas must certify that they possess adequate financial resources to support themselves while in residence at the University of Arizona. If sponsorship is through an organization or government agency, the sponsor must inform the Graduate Student Admissions Office, in advance, what the terms of support will be. Financial guarantees must be dated and addressed to the University of Arizona. If the University is to bill for tuition and fees, billing must be through an embassy or an agent in the United States. In addition, students on nonimmigrant visas are required by the University to have student accident and sickness insurance coverage for each term of enrollment. The cost of this insurance is included in the amount of financial guarantee required. Students may be exempted from the University of Arizona's insurance plan only when their government or sponsoring agency has submitted accident and insurance plans acceptable to the University of Arizona. Additional information and costs of this coverage will be sent to those foreign students who are accepted for admission.

Application for Admission

Application for admission to the Graduate College must be made on forms furnished by the Graduate College. Completed application forms must arrive before supporting transcripts come or processing will be seriously delayed. An applicant from another institution should request that one set of completed official transcripts of all undergraduate and graduate work done and degrees received be sent directly by the institution at which the work was done to the Dean of Graduate College and it will not be returned. The application and the transcripts should be on file four to six months prior to registration. Applicants whose records are not in English are required to provide a certified translation of those records. Applicants should also contact the department of their intended major to obtain departmental application materials and requirements.

Students who have been admitted to the Graduate College but who were not enrolled during the previous regular semester must reapply for admission. (See "Admission for Part of an Academic Year" for exception to this policy.) All material becomes the property of the Graduate College and will not be returned.

ADVANCED DEGREES OFFERED

Full descriptions of programs and requirements for each of the following degrees may be found in the Graduate Catalog. A number of depart-
ments offer work leading to more than one degree, and a great many specializations are available within the degrees listed.

Master of Accounting (M.Ac.)
Master of Agricultural Education (M.Ag.Ed.)
Master of Architecture (M.Arch.)
Master of Arts (M.A.)
Master of Business Administration (M.B.A.)
Master of Education (M.Ed.)
Master of Fine Arts (M.F.A.)
Master of Home Economics Education (M.H.E.Ed.)
Master of Landscape Architecture (M.L.Arch.)
Master of Library Science (M.L.S.)
Master of Music (M.M.)
Master of Public Administration (M.P.A.)
Master of Science (M.S.)
Master of Teaching (M.T.)
Educational Specialist (Ed.S.)
Nursing Specialist (N.S.)
Doctor of Education (Ed.D.)
Doctor of Musical Arts (A.Mus.D.)
Doctor of Philosophy (Ph.D.)

OFFICE OF INTERDISCIPLINARY GRADUATE PROGRAMS

One of the major problems facing higher education is the initiation and development of effective interdisciplinary programs of education and research. The traditional disciplinary structure of the University is being altered in diverse ways, some involving informal cooperation of interested faculty, others resulting in creation of centers, institutes and other organized units. The University of Arizona has responded to these needs and challenges by creating a number of interdisciplinary units and programs. These include centers and programs whose instructional and research activities are in the humanities (for example, American Indian Studies, Comparative Literature, and Latin American Studies), in the sciences (for example: Applied Mathematics, Cancer Biology, Neuroscience, Physiological Sciences), and others combine aspects of these academic streams (for example: Arid Lands Resource Sciences, Environment and Behavior, Planning). Each program constitutes a faculty committee whose curricular and administrative activities are carried out by an executive council. Through this faculty governance structure, the programs have gained autonomy, diversity and excellence which come from a sense of belonging, on the part of faculty and students, to a broadly based common academic goal.

The Office of Interdisciplinary Graduate Programs is responsible for furthering the development of ongoing and new activities in these programs. Additional information concerning individual programs may be obtained through this office (621-8368; 621-8367; 1010 N. Martin Street). The Director of Interdisciplinary Programs works with the Dean and Vice Dean of the Graduate College and with the Vice President for Research in fostering educational as well as research projects relevant to interdisciplinary activities. For more information on the following interdisciplinary graduate programs, consult the Departments and Courses of Instruction section of the catalog.

American Indian Studies
Applied Mathematics
Arid Lands Resource Sciences
Biophysics
Cancer Biology
Cognitive Science
Comparative Literature
Masters
and Literary Theory
Environment and Behavior
Epidemiology
Genetics
Gerontology
History and Philosophy of Science
Latin American Studies
Medieval Studies
Neuroscience
Nutritional Sciences
Optical Sciences
Pharmacology and Toxicology
Physiological Sciences
Planning
Remote Sensing
Second Language Acquisition
and Teaching

Extended University

1955 East Sixth Street, First Floor
(602) 621-UofA

The Extended University promotes lifelong learning by extending the resources of The University of Arizona through convenient educational programs. Extended University programs include:

Credit Courses

Extended University manages all off-campus courses for University of Arizona undergraduate and graduate credit. Extended University also offers evening and weekend credit courses on campus. University of Arizona credit courses are offered through a variety of formats worldwide. (See entries for VideoCampus, Sierra Vista, and Correspondence below.)

Degree Programs

Working with the academic deans, Extended University facilitates degree programs offered through off-campus programs, VideoCampus, Sierra Vista, and the Pima Community College/University of Arizona Flexible Degree Program. (See separate entries below.)

Advising

An Extended University advisor works with returning adult students during daytime and evening hours, providing services such as:
1. evaluating students' current educational needs;
2. determining their goals, both educational and personal;
3. analyzing their strengths and weaknesses;
4. addressing financial concerns;
5. finding creative solutions for their time constraints; and
6. making arrangements for transcript evaluation, admission and registration, and support services.

Individual and Professional Development Courses

Extended University offers many courses for personal enrichment and professional training; continuing-education units (CEUs) may be awarded for such experiences. Individual-development courses are offered for personal enrichment; professional-development courses are designed to enhance job performance and expand career opportunities.

Continuing Education Units (CEUs)

Through the conference services division, Extended University may award continuing education units for participation in individual and professional development courses. One CEU represents ten contact hours of participation in an organized continuing-education experience under responsible sponsorship, capable direction, and qualified instruction. CEUs provide students with a standard of measurement to quantify their educational experience. CEUs also provide recognition of one's efforts to broaden his or her knowledge, skills, and experiences by establishing a permanent record of educational history.

Business and Contract Education

Extended University enters into agreements with outside companies, agencies, and groups to provide assessments, classes, training programs, video courses, certificate programs, and other services designed for and delivered to the organization's site.

Certificate Programs

Extended University program development specialists arrange certificate programs entailing various levels of requirements. Such programs have included Supervisory Skills and Managerial Strategies.
Conference Services

Comprehensive conference planning and assistance is available through services such as program development, budgeting, promotion and marketing, lodging and meeting-space reservations, registration details, meals and refreshment breaks, transportation and tours, record-keeping and evaluation. Continuing education units (CEUs) are available as recognition for participation in many conference activities.

Senior Programs/SAGE

Extended University sponsors Seniors' Achievement and Growth through Education (SAGE), a membership learning-in-retirement society, offering university-level intellectual stimulation in a social context to senior citizens.

Elderhostel

The University of Arizona sponsors one of the largest Elderhostel programs in the United States. Elderhostel is a network of more than 1,500 colleges, universities, and other educational institutions that offer low-cost, one-week residential academic programs for people age 60 and over. The University of Arizona operates Elderhostel programs in Nogales and Tucson as well as at the White Stallion Ranch northwest of Tucson.

American Indian Programs

Extended University participates in The University of Arizona's commitment to serve the state's Indian populations. A program development specialist for Indian programs arranges academic and enrichment activities for Native Americans throughout Arizona.

Phoenix Programs

Extended University maintains an office in Phoenix to arrange credit and individual and professional development courses and programs.

Children's Programs/SEEK

Summer enrichment classes for children began in 1990. Similar programs are offered during holiday and vacation periods.

TraveLearn

Extended University offers educational group travel tours to exotic locations. Each trip includes scholarly escorts, on-site lectures and discussions, seminars, and field experiences.

The Breakfast Academy

The academy is an early-morning study series for the community, featuring University of Arizona faculty members.

CORRESPONDENCE

University, high-school, junior-high, and bilingual courses are available by mail for credit or enrichment. The Independent Study through Correspondence program is designed to meet the educational needs and objectives of students unable to attend regular scheduled classes on campus. These may be students who have begun college work at The University of Arizona or elsewhere; professional or business people who need to enhance educational background relative to work responsibilities; high-school students who need high-school courses to satisfy requirements for diplomas or remove deficiencies for college admission; adults who need help preparing for the G.E.D. test; people living in remote areas who want to take advantage of the resources of higher education; junior-high-school students; and others. Courses may begin at any time, and there are no admission or age requirements. Students receive individual instruction and a written record of accomplishments.

University Correspondence Courses

University correspondence courses are designed to parallel the same courses offered on campus. As many as sixty units taken through university correspondence may be applied to an undergraduate degree.

An independent-study program may be completed by students anywhere in the world. Lessons and examinations are mailed between student and instructor. Tucson-area students take examinations in the correspondence office at Extended University. Students residing outside the Tucson area take examinations in the local community under the supervision of an approved proctor.

Although admission to The University of Arizona is not required for correspondence enrollment, all credit earned by correspondence students is held in reserve for them until they enroll in a degree program. University of Arizona students obtain the written approval of the dean of the college in which they are enrolled before they may register for a credit correspondence course. Prospective correspondence students from other colleges or universities are responsible for obtaining any authorization required from their institutions.

Credit received in correspondence courses is not considered "residence credit" at The University of Arizona. Up to one year is allowed for completion of a correspondence course.

Other Courses Available through Correspondence

High-school, junior-high, bilingual, and enrichment courses are also available through correspondence. For more information or to request a correspondence bulletin, call (602) 621-1896.

THE PCC/UA FLEXIBLE DEGREE PROGRAM

Pima Community College and The University of Arizona have joined forces to help working students earn an undergraduate degree. PCC and UA are offering a series of evening and weekend courses which lead to a PCC Associate of Arts degree and a UA Bachelor of Arts degree with a major in interdisciplinary studies (IDS)

The flexibility of the IDS major allows students to create a major that fits their occupational goals. They begin by taking college courses which fulfill the requirements for the PCC Associate of Arts degree and also meet the general education requirements for The University of Arizona. Students then take upper-division courses at The University of Arizona in their chosen areas of study to complete the degree.

Students are eligible for the PCC/UA Flexible Degree Program if:

1. they are enrolled or plan to enroll at Pima Community College, or
2. they have completed or nearly completed general education requirements at PCC or any accredited institution which awards credit corresponding to the same standards as The University of Arizona, and they meet UA admission requirements.

The Bachelor of Arts Degree Interdisciplinary Studies Major (IDS)

The IDS major permits a student to combine three disciplines into a coherent and intellectually challenging major. Requirements include all general education program requirements and 24 units in each of the three subject areas, for a total of 125 units for the degree. (See detailed requirements in the College of Arts and Sciences section of the catalog.)

Areas of study available in the evenings and on weekends through the PCC/UA Flexible Degree Program are:

- Business
- Communication
- Psychology
- English
- Regional Development
- Spanish
- Political Science
- Regional Development
- Spanish
- Political Science

Students focus their studies in three of the seven areas. (More subject areas are available during daytime hours.)

In each of the three chosen study areas, students complete 24 semester hours. Of those 24, 12 must be upper division. Seventy-two semester hours are required for the major. Of these, 42 must be upper division.

Selected courses in each of the seven listed areas will be offered in the evening on the UA campus or at the Extended University's off-campus location. All classes will be held during the week after 5 p.m. or on the weekends.

Students preparing to enroll in The University of Arizona portion of the PCC/UA Flexible Degree Program should apply for undergraduate admission to The University of Arizona.
For information about admission, PCC general education requirements, IDS study areas, or other aspects of the PCC/UA Flexible Degree Program, see an advisor at any Pima Community College campus or call the Extended University advisor at (602) 621-UofA.

OFFICE OF THE SUMMER SESSION

Summer Session

Summer Session is an integral part of the academic structure of The University of Arizona and consists of a three-week pre session and two five-week terms. Summer Session provides opportunities for academic, cultural, and recreational enrichment. Credit courses offered are of the same character as those given during the regular academic year, with the same academic standards applied. More than 800 credit courses are offered during the summer. The Office of the Summer Session coordinates the summer program, with academic deans determining departmental academic programs.

Up to 15 units of credit per summer may be earned through summer study at The University of Arizona. Summer Session classes are open to all regularly admitted students. Summer-only undergraduate admission is also available.

Summer cultural activities include the Summer Arts Festival and the Distinguished Lecturer Series. Recreational facilities for swimming, handball, tennis, and other sports are available.

Detailed information about summer courses and other programs is published in the Summer Session Schedule of Classes available each February.

Winter Session

Winter Session is a three-week term that falls during the break between the fall and spring semesters. Selecting from a limited number of courses, students may earn up to three units of credit. Registration for Winter Session is in early December. For more information, call the Summer Session Office at (602) 621-3944.

VIDEOCAMPUS

VideoCampus delivers University of Arizona courses to students in a live interactive mode via broadcast, campus feed, or satellite, and by videotape. Using video technology and other delivery methods, The University of Arizona can serve students anywhere in the world.

The Extended University develops educational programs using distance-learning technologies. Programs now available through VideoCampus include the following:

1. fully accredited undergraduate and graduate courses carrying regular University of Arizona credit;
2. graduate degree programs;
3. courses for individual and professional development;
4. customized courses developed for clients' specific needs;
5. video conferences on topics such as managerial and technical training, professional development, and office management.

Videotaped courses can be mailed to any location. VideoCampus also uses a live microwave signal to transmit class presentations between the Tucson campus and any site in the Tucson area. Courses are also available through The University of Arizona affiliation with National Technological University and the Association for Media-Based Continuing Education for Engineers.

Credit Courses

Through VideoCampus, groups of students in remote locations may take University of Arizona undergraduate and graduate courses for regular university resident credit. Students taking VideoCampus credit courses must be admitted to the University and pay registration fees.

Degree Programs

The following degree programs are available through VideoCampus, subject to individual site approval by the Graduate Council:

1. The Master of Science degree with a major in electrical engineering, emphases in communication devices, digital hardware, electronic circuits, electronic packaging, and general purpose.
2. The Master of Science degree with a major in optical sciences is available from The University of Arizona in cooperation with the National Technological University satellite network. (This arrangement is unique among programs from NTU, which is a private university awarding accredited master's degrees in engineering disciplines. VideoCampus is one of fifteen satellite uplink sites for NTU. Satellite delivery of NTU courses is via KU band transmission from GSTAR 1.) For more information about National Technological University, write or call NTU, 700 Centre Avenue, Fort Collins, CO 80526 (303) 484-6050.

Other degree programs may be made available on a contractual basis. For more information, interested training officers or other company representatives may call the Distance Learning Office at (602) 621-UofA.

Noncredit Courses

Prerecorded noncredit courses, available at any time, cover a variety of subjects, from Reliability and Maintainability Engineering and Fourier Optics to Controlling Conflict with Communication and Energy Conservation for the Home. For a complete list of VideoCampus courses for individual and professional development, request the VideoCampus catalog from Extended University at (602) 621-UofA.

VideoCampus can custom-design noncredit courses to fit training and education needs.

Video Conferences

In the Tucson area, VideoCampus Educational Telecommunications receives and transmits satellite-distributed video conferences to a variety of locations on topics such as managerial and technical training, professional development, and office management. Registration fees vary; the satellite receive-and-retransmit fee is $50 per program hour.

Video-conference producers include the American Management Association, George Washington University, Executive Communications, National Technological University, the National University of Television Networks (NUTN), and the Public Broadcasting Service (Business Channel and Adult Learning Service). Video conferences range from two to six hours in length. They are transmitted to receivers in the Tucson area via the ITFS (Instructional Television Fixed Service) System or may be viewed on the university campus. Most video conferences offer viewers the opportunity for call-in questions.

For more information about video conferences, or to be placed on the video-conference mailing list, please call VideoCampus at (602) 621-1503.

Course Delivery

VideoCampus site coordinators should order credit courses at least one month before the semester begins. Each credit course comprises about forty 50-minute sessions or about thirty 75-minute sessions over a fifteen-week semester. Each class is recorded on campus and is unedited to preserve spontaneity. The videotaped class, along with any handouts, is mailed to the subscriber after each on-campus class meeting.

VIDEOTAPED COURSES—These are available on three-quarter-inch U-Matic cassettes or one-half-inch VHS cassettes. (Lectures longer than sixty minutes are available on one-half-inch VHS cassettes only.) A videotape playback unit and video monitor are required for viewing. Within the continental United States, tapes and notes are sent by Federal Express standard with shipping costs included in course fees. (Overseas or alternate shipping costs must be paid by user.)

INTERNATIONAL ORDERS—These are subject to U.S. Department of Commerce Export Administration Regulations. VideoCampus tapes are produced in the North American Standard, NTSC.

MICROWAVE—VideoCampus Interactive System uses microwave transmission to provide one-way video and two-way audio between the campus classroom and off-campus sites in southern Arizona. The for-
The flexibility of this degree allows the student to develop an individual studies major. After completing the general education program, students choose a disciplinary studies major. Two Plus Two toward the Master of Library Science and the Master of Arts with a Certification in Elementary Education. Course work is also available in a postbaccalaureate education sequence which prepares students for Postbaccalaureate Professional Certification in Elementary Education. Course work is also available in a postbaccalaureate education sequence which prepares students for Postbaccalaureate Self-Propelled Education (Post SEPE). Students who already have bachelor's degrees may qualify to take the professional education courses necessary to complete a Bachelor of Arts in Education with a major in elementary education. The degree may be completed in the two Plus Two program. After completing the general education program, students complete the junior and senior sequence of education courses. Entrance into the College of Education for these professional courses is by competitive application. To be eligible for admission, students must have:

1. completed applications to The University of Arizona and the College of Education;
2. attained a cumulative grade-point average of at least 2.5;
3. attained passing scores on the Pre-Professional Skills Test (PPST) administered by Cochise College;
4. completed at least 56 credit hours of course work;
5. taken the Upper-Division Writing-Proficiency Examination (UDWPE). (Transfer students may complete the UDWPE during their first semester with The University of Arizona.)

The degree program is approved by and planned with an academic advisor. Advising appointments may be made by calling the Sierra Vista Campus offices at (602) 458-3541 or (602) 458-UASV.

*Students enrolled in the Two Plus Two interdisciplinary studies or elementary education major must fulfill the general education requirements for The University of Arizona's College of Arts and Sciences at Cochise College. Those requirements include:

I. Basic Skills and Proficiencies
   A. Freshman Composition (minimum of 8 credit hours)
   B. Mathematics (3 credit hours, College Algebra or above)
   C. Foreign Language (up to 16 credit hours)
   D. Arts and Literature (6 credit hours)**

II. Study Areas
   A. Traditions and Cultures (9 credit hours)
   B. Biological and Physical Sciences (8 credit hours)**
   C. Individuals, Societies, and Institutions (9 credit hours)
   D. Arts and Literature (6 credit hours)**

**Requirements may vary slightly; please consult an advisor for complete degree information.

Graduate Study

Postbaccalaureate Certification in Elementary Education

Students who already have bachelor's degrees may qualify to take the professional education courses necessary to apply for a teaching certificate— all in Sierra Vista. To be considered for admission to the College of Education's postbaccalaureate program, the applicant must have earned an undergraduate degree with a grade-point average of at least 2.5 at a regionally accredited institution. The amount of time the program takes depends upon the content of the undergraduate degree. For more information, call (602) 458-3541.

Master of Science Degree

Electrical Engineering Major/Information Systems Emphasis

Classes are taught on the U of A campus while Sierra Vista students watch "live" through VideoCampus; or, students may view videotapes at a later time. The degree program is a two-and-a-half year sequence of courses. No thesis is required, but there is a final written comprehensive examination. If you are interested in pursuing a graduate program...
Office of International Programs

R. L. Nugent Building, Room 205a
(602) 621-1900

The Office of International Programs serves as a campus-wide support and coordinating unit for all international activities of The University of Arizona. The office assists campus units in developing grant proposals to secure funding for international research and teaching activities and participates in the process of the internationalization of the university curricula. International visitors and visiting scholars are coordinated through this office, which also serves as a campus clearinghouse for information on international programs, studies and projects, serving students and faculty.

Study Abroad programs coordinated from this office include summer and semester programs in Brazil, France, the United Kingdom, Germany, Japan, and Taiwan. Numerous international academic programs include formal faculty exchanges between the University and institutions in France, Austria, The United Kingdom, and Mexico, and informal but consistent links with institutions in more than 20 other countries.

Guadalajara Summer School

Douglass Building, Room 315
(602) 621-7551

A six-week program, offering accredited undergraduate and graduate courses, provides students nationwide the opportunity to study the Spanish language and to live with Mexican families. Travel affords further immersion in the language and culture of Mexico. The curriculum includes course work in such areas as Spanish, bilingual education, anthropology, political science, music and dance. Up to eight units of credit may be earned. Optional three-week courses may be available. For more information, contact the Guadalajara Summer School at the above address.

School of Military Science, Naval Science and Military Aerospace Studies

South Hall, Rooms 101, 109, 104, respectively
(602) 621-1609, 621-1281, 621-3521, respectively

The Reserve Officer Training Corps (ROTC) has been an integral part of the University of Arizona since 1917. The School of Military Science, Naval Science and Military Aerospace Studies consists of three separate departments, the Department of Military Science (Army), Department of Naval Science (Navy and Marine Corps), and the Department of Military Aerospace Studies (Air Force), under the administrative control of the military coordinator, a civilian member of the University staff designated by the President of the University.

General objectives of the course of instruction are to furnish leaders suitable for commissioning as officers in the U.S. Army, U.S. Navy, U.S. Marine Corps, and U.S. Air Force. Outstanding Army ROTC students who are designated Distinguished Military Students are eligible to apply for appointment as officers in the Regular Army. All graduating students in the Air Force ROTC program go on active duty. Intermediate objectives of the ROTC programs are to develop self-discipline; integrity; a sense of responsibility; an appreciation of the role of a participating citizen in the national defense; and the capacities for thoughtful and decisive leadership.

DEPARTMENT OF MILITARY SCIENCE

Army ROTC (Reserve Officers' Training Corps) is a program which offers college students the opportunity to graduate as officers and serve in the U.S. Army, the Army National Guard, or the U.S. Army Reserve. Army ROTC has been an integral part of the University of Arizona since 1917.
Army ROTC enhances a student's education by providing unique leadership and management training, along with practical experience. It helps a student develop many of the qualities basic to success in the Army, or in a civilian career. ROTC gives each college student a valuable opportunity to build for the future by earning a college degree and an officer's commission at the same time.

**Programs**

The Department of Military Science offers a regular four-year program and a special two-year program.

The four-year program is divided into two parts called the Basic Course and the Advanced Course. The Basic Course is usually taken during the first two years of college and covers such subjects as management principles, national defense, military history and leadership development. In addition, a variety of outside social and professional enrichment activities are available. All necessary ROTC textbooks, uniforms, and other essential materials for the Basic Course are furnished to the students. The student participating in the Basic Course is under no military obligation. After completing the Basic Course, students who have the desire and have demonstrated the potential to become an officer and who have met the physical and scholastic standards are eligible to enroll in the Advanced Course.

The Advanced Course is usually taken during the final two years of college. It includes instruction in organization and management, tactics, ethics and professionalism and further leadership development. All necessary textbooks and uniforms in the Advanced Course are also furnished to students. During the summer between their junior and senior years of college, Advanced Course cadets attend a paid six-week training session at Fort Lewis, Washington, called ROTC Advanced Camp. Advanced Camp gives cadets the chance to practice what they've learned in the classroom, and introduces them to Army life at an active Army post. Advanced Course cadets receive a monthly subsistence allowance of $100.00 during their ROTC training.

The two-year program is designed for junior and community college graduates, students at four-year colleges who did not take ROTC during their first two years of school, students entering a two-year postgraduate course of study, and high school students planning to attend military junior colleges. To enter the two-year program, students must first attend a fully-paid six-week Basic Camp, normally held during the summer between their sophomore and junior years of college. Students going to a military junior college will attend camp the summer following high school graduation. At Basic Camp, students learn to challenge themselves physically and mentally, and to build their confidence and self-esteem. After successful completion of Basic Camp, students who meet all the necessary enrollment requirements may enroll in the Advanced Course of ROTC study. Students with prior military service may qualify for the Advanced Program without having to attend Basic Camp.

**Professional Military Education Requirement**

Prior to commissioning, all cadets must take five professional military education (PME) courses. Cadets must select one course from each of the following fields of study: written communications, human behavior, military history, computers, and mathematics. The suggested courses serve as a guide to assist cadets. If a cadet wants to take another course in one of the required fields or transfer credits from another institution, he or she may do so. Consult an advisor to ensure all PME requirements are completed.

**Written Communications**
1. Any upper-division writing-emphasis course
2. Engl. 207, 209, 210
3. Ling. 101
4. Phil. 112

**Human Behavior**
1. Psyc. 101
2. Soc. 101
3. Anth. 101, 102
4. Phil. 113, 310, 322

**Military History**
1. Hist. 215, 315, 332, 436, 449, 450

**Mathematics**
1. College Algebra, Math. 117R (or 117S)
2. Elements of Calculus, Math. 123
3. Introduction to Statistics, Math. 160
4. Phil. 112

**Military Service Credit**

Credit toward graduation received for active military service (see "Credit for Military Service" in the Admission to the University section of this catalog) can be used in lieu of lower-division (Basic Course) ROTC units in the four-year program.

**Lower-Division Credit**

Three units of credit are given for each semester completed of the Basic Course (total, four semesters).

**Upper-Division Credit**

Three units of credit are given for each semester completed of the Advanced Course (total, four semesters). Advanced Course ROTC cadets are required to sign a contract with the government to continue in ROTC until the completion of ROTC training.

**Financial Assistance**

Subsistence pay of $100.00 per month, tax-free, for a maximum of 20 months during the Advanced Course is paid to upper-division ROTC cadets. Additionally, students receive pay for summer camp and travel pay to and from ROTC Advanced Camp.

Army ROTC scholarships are offered for four and three years and are awarded on a competitive basis to the most outstanding students who apply. Four-year scholarships are awarded to students who will be entering college as a freshman. Three-year scholarships are awarded to students already enrolled in college and to Army enlisted personnel on active duty. Students who attend the Basic Camp of the two-year program may compete for two-year scholarships while at camp.

Each scholarship pays for college tuition and required educational fees, and provides a specified amount for textbooks, supplies and equipment. Each scholarship also includes a subsistence allowance of up to $1,000 for every year the scholarship is in effect.

**DEPARTMENT OF NAVAL SCIENCE**

The mission of the Naval Reserve Officers Training Corps Unit is to develop midshipmen morally, mentally and physically and to imbue them with the highest ideals of duty, honor and loyalty in order to commission college graduates as naval officers who possess a basic professional background, are motivated toward careers in the naval service, and have a potential for future development in mind and character so as to assume the highest responsibilities of command, citizenship and government.

**Programs**

The Naval ROTC (NROTC) program is available to eligible high school seniors, college freshmen, sophomores and juniors. Students progress through the program as either scholarship midshipmen or non-scholarship cadets. Both programs lead to service as a commissioned officer in the U.S. Navy or Marine Corps.

Students interested in either Naval ROTC program may apply at any point during the year (contact the NROTC office at 621-1281). Also, college program members of the NROTC battalion are reviewed and selected for scholarships continually throughout the year. To become a member of the NROTC program, students must demonstrate superior academic performance and display outstanding leadership potential.

**Financial Aid**

The Naval ROTC program offers financial aid to both scholarship and college program midshipmen. Students in the NROTC scholarship program receive full tuition, course fees, books, uniforms and $100 per
month. Additionally, scholarship students are eligible to receive the financial aid package for two, three, four, or five years. NROTC college program midshipmen receive Naval Science textbooks, uniforms, and, if qualified, $100 per month during their junior and senior years.

Applications for the NROTC four- and five-year scholarship program must be made to the Navy by December 1 for entry in the program the following fall semester. The major factors examined during the application process are ACT/SAT scores, high school and college academic performance, leadership potential, and extracurricular activities. Applications for the NROTC two- or three-year scholarship programs and the nonscholarship, college program must be submitted through The University of Arizona NROTC Unit. These applications are accepted year round and are judged on the same criteria as the four- and five-year scholarship applicants.

Further information concerning the program may be obtained from high school and college counselors, local Navy recruiting centers, and the NROTC unit at The University of Arizona.

Courses of Instruction

Students are encouraged to pursue majors in the engineering and physical science (mathematics, chemistry, and physics) fields of study to meet the technological requirements of today's modern Navy. However, a student may elect to pursue any academic major provided the midshipman also completes the required Naval Science curriculum and the Navy-specified college courses outlined below.

While enrolled in the NROTC program the student will complete the following Naval Science and university courses in addition to their academic major requirements.

**First Year**
- Naval Science 101
- Naval Science 202

**Second Year**
- Naval Science 102
- Naval Science 401

**Third Year**
- Naval Science 301
- Naval Science 302

**Fourth Year**
- Naval Science 402

Scholarship students must take the following university courses: Engl. 101, 102; Math. 124/125a-125b; Phys. 110/111a, 116/111b; one semester of foreign language; Engr. 101/M.S. 111/C.Sc. 115/S.I.E. 170/172; and one semester in American Military History or National Security Policy. College program students have English, mathematics, computer and physical science requirements, also.

Course descriptions may be found under Naval Science in the Departments and Courses of Instruction section of this catalog. Marine Corps option students will take Naval Science 310, Evolution of Warfare; Naval Science 410, Amphibious Warfare, and two elective courses (approved by the Professor of Naval Science) during their third and fourth years vice the above schedule.

All ROTC students attend Naval Science Leadership Laboratory once a week. In addition, NROTC scholarship students and senior college program students attend 4-6 weeks of summer training at various Naval Stations and ships throughout the world.

### DEPARTMENT OF MILITARY AEROSPACE STUDIES

The Department of Military Aerospace Studies (Air Force ROTC), provides unique opportunities to students interested in entering the military profession as Air Force officers. Today's Air Force is a highly technologically advanced branch of the military forces. Whether a student's interest lies in flying the most advanced aircraft in the world or in the development of state-of-the-art technology, the Air Force can offer exciting and challenging opportunities to those who qualify. Graduates go on active duty in career fields where they can immediately apply their university education. Additionally, they assume advanced leadership and management responsibilities not normally found in civilian entry level positions. Although a bachelor's degree is the minimum requirement, students working toward higher degrees can also join the program and receive a commission in the U.S. Air Force.

### Two- and Four-Year Programs

Air Force ROTC offers both two- and four-year programs. Both allow a student to compete for a commission in the United States Air Force, and they also provide the same mixture of military academic and leadership studies. The four-year program is generally recommended, however, due to the increased training provided.

The four-year program consists of the General Military Course—four semesters of lower-division aerospace studies classes; and the Professional Officer Course—four semesters of upper-division aerospace studies classes. The first four semesters carry no military obligation, giving students the opportunity to look at the military profession and the Air Force before making a commitment. Since the first four semesters have no prerequisites, they are open to any student interested in exploring Air Force opportunities. Also, a student may attend the first two semesters concurrently with the second two semesters, therefore effectively creating a three-year program.

The two-year program consists of the Professional Officer Course only. Students must have at least a junior standing to enter the two-year program, but should apply during the fall or early spring of their sophomore year of study. Seniors and graduate students wishing to enter the two-year program must be willing to spend two years in ROTC as full-time students.

### Financial Aid

Every student accepted into the Professional Officer Course receives a $100.00 per month, tax-free subsistence allowance during the academic year. Scholarships are also available. Air Force ROTC offers four, three-and-a-half, three, two-and-a-half, and two-year scholarships. Students must apply for four-year scholarships as seniors in high school. Subsequent to high school, students must be enrolled in an Air Force ROTC class to apply. A student enrolled in any lower-division Air Force ROTC class may qualify for a scholarship. Scholarships pay tuition and fees, the cost of books, plus a $100.00 per month, tax-free subsistence allowance. Scholarships are awarded based on the student's achievement, not financial need, and do not extend the active duty commitment.

### Credit

Lower-division Air Force ROTC classes carry two units of credit each semester. Upper-division classes carry three units each semester.

For more information, please contact the Department of Military Aerospace Studies.
Course Listing Information

CURRICULAR CHANGE

Course listings in the following departmental sections are subject to change. Curriculum changes approved during the first year of the catalog's biennium are listed in the Supplement to the University of Arizona Catalog, published approximately one year after publication of the biennial catalog. A copy of this publication is available upon request from the University Curriculum Office, Administration Building, Room 412c.

CLASS SCHEDULES

Because the catalog designation of semesters of offering is subject to change, students should consult the Schedule of Classes for curricular planning of a particular term. Schedules for fall and spring classes are available from the Information Desk of the Administration Building, Room 210, in April and October, respectively. The Summer Session Schedule of Classes is available in February at the Administration Building, Room 210. For a complete statement of the student's responsibility in maintaining acquaintance with current university requirements, see the copyright page of this catalog.

PREREQUISITES

A student registering for a course must meet the prerequisites or otherwise satisfy the instructor of his or her preparation to take the course. Prerequisites can be waived only at the discretion of the instructor or department involved.

CANCELLATION OF COURSES

The University reserves the right to cancel courses not elected by an adequate number of students.

COURSE NUMBERING SYSTEM

Classification of Courses

The number by which a course is designated indicates the level of the course. Courses are numbered as follows:

100-299: Lower-division courses primarily for freshmen and sophomores.
100-199: Primarily introductory and beginning courses.
300-499: Upper-division courses primarily for juniors and seniors.
300-399: Advanced-intermediate-level courses.
400-499: Advanced-level courses.*
500-599: Graduate courses. Open to exceptionally well-qualified seniors with the prior written approval of the course instructor and the Graduate College.*
600-699: Graduate courses. Not open to undergraduate students.
700-799: Graduate courses limited to doctoral students.
800-899: Courses limited to students working toward degrees offered by the College of Medicine or the College of Pharmacy. Not available for credit toward other degrees.

*Certain 400- and 500-level courses with the same number and title may be convened jointly. Students may receive credit for such courses only once, whether jointly convened or separately, unless designated [Rpt.] or unless special approval is granted by the student's major advisor.

Semester Courses (Single Numbers)

A course designated by a single number (as Econ. 248) is one semester in length.

Year Courses (Double Numbers)

A course designated by a double number (as Pol. 233a-233b) is continued through two successive semesters, the work of the first semester being prerequisite to that of the second unless otherwise indicated in the statement of prerequisites.

COURSE DESCRIPTION EXPLANATION

The standard course description includes a variety of symbols indicative of essential information. The following is a standard course description with the individual symbols explained in the order in which they appear in that description.
Sample Course Listing:

406. Social Structure in Modern Societies (3) [Rpt.] I 1991-92 GRD
Critical review of modern theory and research on social structure and
social organization in modern societies. 2R, 3L. P, 6 units of sociology
or CR. (Identical with Hist. 406) Smith

Explanation:

406. Course number.

Social Structure in Modern Societies—Course title.

(Rpt.)—Number of units.

Course title.

Critical review...societies—Course description.

2R,3L—Class structure. R, L, S, and D indicate “recitation,” “labora-
tory,” “studio” and “discussion.” 2R, 3L indicates that the class meets
for two hours of recitation and three hours of laboratory per week
(based upon 15 weeks). For courses consisting of recitation (lecture)
periods only, the number of class hours per week is the same as the
unit value and is not specified in the course listing.

In addition to the above abbreviations for class structure, the College
of Engineering and Mines uses the abbreviations ED and ES to design-
ate the number of units in the areas of "engineering design" and
"engineering science." Thus 1ED, 2ES signifies that the course meets
the requirement for 1 unit of engineering design and 2 units of engi-
neering science.

P—Prerequisites. Identifies courses or other experiences which must
be completed prior to enrolling in the course listed.

CR—Concurrent registration. Identifies courses which must be taken
during the same term as the course listed.

(Identical with Hist. 406)—Crosslisting. Identifies other departments
which give credit for the same course. The complete course listing is
shown in the course list of the "home" department, which has instruc-
tional responsibility for the course. An abbreviated listing appears in
the course list of the "crosslisting" department. Exceptions are house-
numbered courses, which do not have course descriptions.

Smith—Professor in charge.

Note: Not all of the above information may be noted in any individual course.

UNIVERSITY-WIDE "HOUSE-NUMBERED" COURSES

Most University of Arizona courses use a combination of lectures, discus-
sions and laboratories as their basic teaching format. University-
wide "house-numbered" courses identify alternative teaching formats
which emphasize student participation, typically in small group or indi-
vidual settings. Small-group courses are identified by numbers ending
in 95, 96 or 97. The area of study for such courses is indicated through
a subscript and subtitle. Individual-studies courses are those with num-
bers ending in 91, 93, 94, 98* and 99, as well as all 300-level courses.

Under their generic numbers and titles, and without subscripts, they are
available for use by all departments at the course-number levels appro-
priate to the departments' academic programs.

*See the Honors Center under the Departments and Courses of Instruction sec-
tion of this catalog for a description of 498H.

Small Group Courses

195, 295, 395, 495, 595, 695, 795. Colloquium (Credit varies) The
exchange of scholarly information and/or secondary research, usually
in a small group setting. Instruction often includes lectures by several
different persons. Research projects may or may not be required of
course registrants.

Grades Available: (195, 295, 395, 495)—A, B, C, D, E, I, P/F, S/P*, W.
(595, 695, 795)—A, B, C, D, E, I, S/P*, W.

196, 296, 396. Proseminar and 496, 596, 696, 796. Seminar (Credit
varies) The development and exchange of scholarly information, usu-
ally in a small group setting. The scope of work shall consist of re-
search by course registrants, with the exchange of the results of such
research through discussion, reports, and/or papers.

Grades Available: (196, 296, 396, 496)—A, B, C, D, E, I, P/F, S/P*, W.
(596, 696, 796)—A, B, C, D, E, I, S/P*, W.

197, 297, 397, 497, 597, 697, 797. Workshop (Credit varies) The prac-
tical application of theoretical learning within a group setting and in-
volving an exchange of ideas and practical methods, skills, and prin-
ciples.

Grades Available: (197, 297, 397, 497)—A, B, C, D, E, I, P/F, W.
(597, 697, 797)—A, B, C, D, E, I, W.

*Special (i.e., S,R,C,D,E) or regular grades may be used as departmental policy
dictates; however, in any single course offering, all registrants must be graded
by the same system.

Individual Studies

191, 291, 391, 491, 591, 691, 791. Preceptorship (Credit varies.) Spe-
cialized work on an individual basis, consisting of instruction and prac-
tice in actual service in a department, program, or discipline. Teaching
formats may include seminars, in-depth studies, laboratory work and
patient study.

Grades Available: S/P, C, D, E, I, W.

193, 293, 393, 493, 593, 693, 793. Internship (Credit varies) Spe-
cialized work on an individual basis, consisting of training and practice
in actual service in a technical, business, or governmental estab-
ishment.

Grades Available: S/P, C, D, E, I, W.

4931, 5931. Legislative Internship (493 12), 593 (9) II Working experi-
ence at the Arizona State Legislature; responsibilities draw upon stu-
dent's area of major expertise and include preparing written and oral
reports, summarizing legislative proposals, and providing information to
legislators and legislative committees. Participating programs include
but are not limited to: architecture, economics, English, geography and
regional development, history, hydrology, journalism, management,
management information systems, marketing, political science, psy-
chology, public administration, secondary education, sociology, statis-
tics, and urban planning. Students in other programs are eligible and
should consult the department head or, in the case of the College of
Law, the dean, for appropriate arrangements.

Grades Available: A, B, C, D, E, I, W.

194, 294, 394, 494, 594, 694, 794. Practicum (Credit varies) The prac-
tical application, on an individual basis, of previously studied theory
and the collection of data for future theoretical interpretation.

Grades Available: S/P, C, D, E, I, W.

199, 299, 399, 499, 599, 699, 799. Independent Study (Credit varies)
Qualified students working on an individual basis with professors who
have agreed to supervise such work.

Grades Available: S/P, C, D, E, I, W.

900. Research (Credit varies) Individual research, not related to thesis
or dissertation preparation, by graduate students.

Grades Available: S/P, C, D, E, K, W.

908. Case Studies (Credit varies) Individual study of a particular case,
or report thereof.

Grades Available: S/P, E, K, W.
909. **Master's Report** (Credit varies) Individual study or special project or formal report thereof submitted in lieu of thesis for certain master's degrees.
*Grades Available: S/P, E, K, W.*

910. **Thesis** (Credit varies) Research for the master's thesis (whether library research, laboratory or field observation or research, artistic creation, or thesis writing). Maximum total credit permitted varies with the major department.
*Grades Available: S/P, E, K, W.*

915. **Master's Recitals** (Credit varies) For master's students in performance.
*Grades Available: S/P, E, K, W.*

920. **Dissertation** (1 to 9) Research for the doctoral dissertation (whether library research, laboratory or field observation or research, artistic creation, or dissertation writing).
*Grades Available: S/P, E, K, W.*

925. **Doctoral Recitals** (1 to 9) For doctoral students in music performance.
*Grades Available: S/P, E, K, W.*

930. **Supplementary Registration** (1 to 9) For students who have completed all course requirements for their advanced degree programs. May be used concurrently with other enrollments to bring to total number of units to the required minimum.
*Grade Available: K.*

*Graduate students doing independent work which cannot be classified as actual research will register for credit under course number 599, 699, or 799.*
Academic Departments and Committees

Permanent courses offered by the University of Arizona are listed on the following pages by department or committee in alphabetical order.

Accounting (ACCT)
BPA Building, Room 308
(602) 621-2620

Professors Andrew D. Bailey, Jr., Head, William B. Barrett, Dan S. Dhalwal, William L. Felix, Jr., William S. Waller
Associate Professor Jane F. Mutchler
Assistant Professors Sanjay Kallapur, Sharon S. Lassar, Jeffrey W. Schatzberg, Galen R. Sevick, Brian P. Shapiro, E. Kay Stice, Mark A. Trombley, Shing-wu Wang
Lecturer Joan W. Norvelle, Associate Head

The accounting program prepares students for careers such as the independent practice of public accounting, controllership, and general accounting management. Graduate work in accounting is offered for those who wish more background for the positions described above and for those who wish to teach in colleges and universities. In many instances, a five-year program leading to a Master of Accounting degree will be desirable to achieve a student's objectives. (See the Graduate Catalog.)

Students who desire the Bachelor of Science in Business Administration with a major in accounting will follow the program of studies shown in the College of Business and Public Administration section of the catalog.

The department offers graduate instruction leading to the Master of Accounting degree and participates in the programs leading to the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration. For admission and degree requirements, please see the Graduate Catalog.


300a-300b. Intermediate Accounting (3-3)
Theory and methodology involved in contemporary accounting for assets, liabilities, stockholders' equity, net income, and funds; analysis and interpretation of financial statements. Credit allowed for this course or 553a-553b, but not for both. P. 210. Both 300a and 300b are offered each semester.

305. Inference in Accounting and Auditing (3) I II The application of statistical tools to accounting and auditing problems. P. Stat. 275.

310. Cost and Managerial Accounting (3) I II Concepts and analytical procedures necessary in the generation of accounting data for management planning and control. P, 210, Econ. 201a-201b or Econ. 300, M.A.P. 275, Math. 123.

320. Introduction to Federal Taxation (3) I II Principles of federal income taxation, with emphasis on how individuals are taxed; additional topics. Credit allowed for this course or 556, but not for both. P. 210.

401. Advanced Accounting (3) I II Theory and methodology involved in the preparation of consolidated financial statements and in accounting for partnerships. P, 300b or CR.

422. Advanced Federal Taxation (3) I II Introduction to advanced topics: taxation of corporations and stockholders' transactions in stocks; taxation of partnerships and fiduciaries; gift and estate taxation. P. 320. May be convened with 522.

431. Principles of Auditing (3) I II The opinion formulation process of the professional auditor; the auditor's report, professional standards, internal and operational auditing. P, 300b, 305.

461. Accounting Information Systems (3) I II The analysis, design and implementation of information systems, with special emphasis on accounting applications. P. 310 or 551. (Identical with M.I.S. 461)

471. Policy Formation and Accounting Information Systems (3) I II Integrative course using the case study approach and focusing on the financial impact of accounting, marketing and production strategies. Open only to BPA majors. P. 310, 300b, Fin. 311, M.A.P. 305, Mktg. 361, Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

472. Fund Accounting (3) I II Budgetary and financial accounting, control, and reporting for governments and other not-for-profit organizations. P. 210 or 272.

*Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.

510. Principles of Profit Planning and Control (3) I II The design and use of accounting information for managerial planning and control purposes. P. 310 or 551.

522. Advanced Federal Taxation (3) I II For a description of course topics, see 422. Graduate-level requirements include a special project. P. 320. May be convened with 422.

523. Estate Planning and Taxation (3) I II Advanced topics on gift and estate taxation; emphasis on the planning and structuring of financial activities to minimize the impact of income and wealth-transfer taxes. P. 422, M.A.P. 426 or CR.

526. Corporate Taxation (3) I II Advanced topics in the taxation of corporations and of stockholders' transactions in corporate shares. P. 401, 422.

527. Tax Aspects of Real Estate Transactions (3) I II Gains and losses on sales and exchanges of property for tax purposes; capital and ordinary gains and losses, realization, transfer by gift or at death, use in trade or business, installment sales, and depreciation recapture provisions. P. 401, 422.

528. Taxation of Partnerships (3) I II Concepts and principles of partnership income taxation and the uses of partnerships for tax planning. P. 401, 422.
Aerospace and Mechanical Engineering (AME)
AME Building, Room 301
(602) 621-2235


Associate Professors Abhijit Chandra, Kee-Ying Fung, An Glezer, Edward J. Kerschen, Seth H. Lichter
Assistant Professors Ara Arabyan, Cho-Lik Chan, Jeffrey W. Jacobs, Erdogan Madenci, Alfonso Ortega, K.R. Sridhar

The department offers the degrees of Bachelor of Science in Aerospace Engineering, Bachelor of Science in Mechanical Engineering, and Master of Science and Doctor of Philosophy with majors in aerospace engineering and mechanical engineering. (See the College of Engineering section of this catalog for specific undergraduate program requirements. Consult the Graduate Catalog for more information about graduate programs.)


250. Dynamics (3) I II Dynamics of particles and rigid bodies as applied to mechanical systems; introduction to mechanical vibrations. 3ES, P. C.E. 214; CR, Math. 254.

300. Instrumentation Laboratory (3) I II Basic principles of lab. practice and instrumentation. 2R, 3L. 2ES. P. 230, 331a, E.C.E. 208.


320. Aerodynamics (3) I II Basic equations and their approximation; potential flow theory; fundamentals of airfoil and wing theory; axisymmetric flows; application to aerodynamics of wings and bodies. 2ES, 1ED. P. 331a; CR, 302.

321. Aircraft Performance (3) I II Properties of the atmosphere, concepts in airflow and propulsion, airfoils and wings, airplane performance; energy methods. 2ES, 1ED. P. 230, 331a.

322. Gasdynamics (3) I II Thermodynamics review; equations for one-dimensional flow; wave propagation and acoustics; isentropic flow; shock waves; simple two-dimensional flows; friction and heat addition. 2ES, 1ED. P. 230, 331a.

324. Aerospace Structures (3) II Application of principles of mechanics to the structural analysis of aerospace components. Topics covered are: analysis of stress and strain, constitutive relations, plane problems of elasticity, torsion, bending, elastic stability, energy methods, finite element methods. 2ES, 1ED. P. 301, C.E. 217; CR, 302.

330. Intermediate Thermodynamics (3) I II Power systems; nonreacting and reacting mixtures; heat transfer, design exercises. 2ES, 1ED. P. 230.

331a-331b. Principles and Applications of Fluid Mechanics (3-3) I II 331a: Fundamentals of fluid mechanics covering properties of fluids, fluid statics and dynamics, concepts and definitions, design exercises. 3ES, P. 250, Math. 223. 331b: Turbomachinery, pump characteristics, lubrication theory, boundary layers, potential flow, compressible flow, and design project. 2ES, 1ED. P. 331a and Math. 254. Both 331a and 331b are offered each semester.

352. Dynamics of Machines (3) I II Analysis of motions and forces in machines, design exercises. 3ED. P. 250.

400. Senior Mechanical Laboratory (2) I II Investigations involving thermal power and mechanical systems. 3L. 2ES. P. 300. Writing-Emphasis Course. P. Satisfaction of the upper-division writing proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

401. Senior Aerospace Laboratory (2) I II Laboratory investigations involving aerospace dynamics, control, structural, and power systems. 1R, 3L. 3P. 300, 324, 420. Writing-Emphasis Course. P. Satisfaction of the upper-division writing proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

402. Senior Energy Laboratory (3) I I (Identical with N.E.E. 402)

410. Engineering Design (3) I II Role of design in engineering; strength design factors, stress analysis, application of Mohr's circle of stress and strain; deflection analysis and introduction to failure and fatigue theory. 1ES, 2ED. P. 250, C.E. 217.

411. Introduction to Production Engineering (3) I II Theory of machining and forming; machine tool principles, potentialities, and limitations; nonconventional material removal processes; design project. 2R, 3L. 1ED. CR. 410.

412a-412b. Mechanical Engineering Design (3-3) 412a: I II Engineering design process steps, idea generation techniques, optimal design of engineering systems, computer aided
413. Product Engineering Design (3) II Economic production principles; design relationship of materials and production processes; tooling, quality control and packaging; design project. 2R, 3L. 3ED. P, 411.


415. Material Selection (3) II A study of failure in engineering materials, yielding, fatigue, creep, buckling; an introduction to fracture mechanics and modern fatigue models; weight and cost considerations. 1.5ES, 1.5ED. P, C.E. 217.

420. Aircraft Conceptual Design (3) II Student groups develop conceptual designs for aircraft with specified performance and figures of merit. Design issues include program organization, configuration, aerodynamics, weights, and performance. Design groups develop computer flight simulators to evaluate performance. 3ED. P, 320, 321, 323. May be convened with 520.

422. Aerospace Engineering Design (3) II Application of engineering fundamentals, including structural analysis, structural vibrations, aero-elasticity and finite element methods to aerospace vehicle design project. 3ED. P, 420, 324.

424. Introduction to Space Technologies (3) [Rpt./1] II The space environment: vacuum, microgravity, radiation(s), free molecule flow and drag on bodies. Resource utilization in deep space. Introduction to orbital mechanics. Space transportation, space craft thermal design, automation and robotics, communications, space power, space structures. 1.5ES, 1.5ED. P, 323, 324; CR, 425, 455. May be convened with 524.

425. AEROSPACE AND MECHANICAL ENGINEERING

428. Aerospace Propulsion (3) II Basic laws; application to turbojets, ramjets, ramfans, turbo props and rockets; space flight. 2ES, 1ED. P, 230, 323, 331a.

426. Dynamics of Space Flight (3) I Spacecraft dynamics; orbital and attitude maneuvers, lunar and interplanetary transfer, re-entry. 3ES. P, 250.

427. Stability and Control of Aircraft Vehicles (3) I Static and dynamic stability of rigid and nonrigid vehicles; automatic control of aircraft, missiles and space craft. 2ES, 1ED. P, 321.


432. Heat Transfer (3) I Study of conduction, convection and radiation heat transfer, with applications to engineering problems. 3ES. P, 331a, 230.

441. Air Conditioning Engineering (3) I Analysis and design of systems and components for control of temperature, humidity, air cleanliness and acoustics; applications to residential and commercial buildings. 1.5ES, 1.5ED. P, 330, CR, 331a. (Identical with N.E.E. 441)

442. HVAC System Design (3) I (Identical with N.E.E. 442)

443. Power Systems Analysis (3) I I Performance of gas and vapor power cycles, processes and components; fundamentals of control of systems and controls. 1.5ES, 1.5ED. P, 330, CR, 331a.


447. Direct Energy Conversion (3) I (Identical with N.E.E. 447) May be convened with 547.

448. Wind Energy Conversion Systems (3) I Aerodynamic theory of vertical and horizontal axis propellers and windmills; optimal design of blades and electrical components; lab and field measurements of operating systems. 3R, 1.5ES, 1.5ED. P, 331a, E.C.E. 208.


454. Optimal Control of Parametric Systems (3) II Scalar minimization, vector minimization, continuous static games, matrix games, numerical techniques and applications. 2.5ES, 0.5ED. P, Math. 254.

455. Control System Design (3) II Classical control methods; transient response, root locus, state space methods, design of feedback control systems, digital control systems. 2ES, 1ED. P, 250, CR, 300.

460. Mechanical Vibrations (3) I Free and forced vibrations of simple mechanical systems; effects of damping; introduction to multi-degree of freedom systems. 3ES. P, 250, Math. 254.

461. Finite Element Methods of Structural Analysis (3) I I Matrix algebra, computers, theory of elasticity, work and strain energy, energy theorems, the finite element, the assembled system; open loop (explicit) and closed loop (implicit) applications; frequency and time domain representation; deterministic and stochastics inputs. P, 302; CR, 455.

462. Composite Materials (3) II Classification and characteristics of composite materials; mechanical behavior of composite materials; classical and macro-mechanical behavior of laminae; mechanical behavior of short fiber composites. 3ES. P, 302, C.E. 217. May be convened with 562.

466. Biomechanical Engineering (3) III One subject covered yearly from: biomechanical -solid mechanics (orthopedic, vascular, muscle, skin); feedback control (physiological systems); heat transfer, thermodynamics (temperature regulation exercise, hyperthermia, instrumentation). P, 302, 330, 331b. May be convened with 566.

472. Reliability Engineering (3) I Time-to-failure, failure-rate, and reliability determination for early, useful and wear-out lives; equipment reliability prediction; spare parts provisioning; reliability growth; reliability allocation. 1.5ES, 1.5ED. P, CR, 474 or S.I.E. 330. May be convened with 572.

473. Probabilistic Mechanical Design (3) I Application of probability theory and statistics to mechanical and structural design; modern mechanical reliability methods; design philosophy. 1.5ES, 1.5ED. P, C.E. 217; CR, 410. May be convened with 573.

474. Reliability and Quality Assurance (3) I Probability and statistics with applications to reliability engineering, discrete and continuous statistical models for engineering variables, fundamentals of statistics. 1.5ES, 1.5ED. P, Math. 254. May be convened with 574.

495. Colloquium s. Senior Colloquium (1) II


502. Modeling and System Identification in Dynamic Engineering Systems (3) I 1991-92 Principles of mathematical modeling of engineering problems; state and parameter identification techniques; lumped and distributed system; open loop (explicit) and closed loop (implicit) applications; frequency and time domain representation; deterministic and stochastic inputs. P, 302; CR, 455.

510. Design for Manufacturing (3) I Design methodology—axiomatic, algorithmic, hybrid. Concepts of design sensibility; applications to several manufacturing processes—metal forming, metal cutting, welding. P, 461 (AI programming ability; knowledge of plasticity).


515. Engineering Program Design (3) III I For a description of course topics, see 415. Graduate-level requirements include a special in-depth report and a seminar presentation on the subject. P, 302, Math. 254. May be convened with 415.

520. Aircraft Conceptual Design (3) II II For a description of course topics, see 420. Graduate-level requirements include development of a three degree-of-freedom flight simulator with active stability augmentation. P, 320, 321, 323. May be convened with 420.


542. HVAC System Design (3) II (Identical with N.E.E. 542) May be convened with 442.

543. Convective Transport Phenomena (3) I Convective energy, mass and momentum transfer; internal and external flow; exact, approximate and numerical solutions; application to current problems. P. 432; CR, 500a, computer programming ability.


545. Fluid Mechanics of Viscous Flows (3) I Behavior of viscous fluids over a range of Reynolds numbers; Navier-Stokes equations; boundary layer equations; flow components; compressible boundary layers. P. 536a.


547. Direct Energy Conversion (3) II (Identical with N.E.E. 547) May be convened with 447.

548. Combustion Generated Air Pollution (3) II Pollutant formation in combustion processes and methods of control; diffusion models for atmospheric dispersion, including plume rise calculations. P. 230, 331a. (Identical with Ch.E. 548)


555. Modern Control Theory (3) II 1992-93 Controllability and stability for linear and nonlinear systems; observer design; qualitative methods of optimal control and game theory applied to control system design. P. 455.


561. Advanced Structural Mechanics (3) II Advanced problems in structural analysis using the finite element method; analysis of complex systems; dynamics. Composite structures and material systems program development. P. 461.

562. Composite Materials (3) II For a description of course topics, see 462. Graduate-level requirements include an additional project on composite materials. P. 302, C.E. 217. May be convened with 462.

563. Finite Element Analysis in Nonlinear Solid Mechanics (3) II Finite element methods, including material nonlinearity (elastic, plastic, viscoelastic); geometric nonlinearity (finite deformations), numerical solution methods, and nonlinear programs. P. 461.

566. Biomechanical Engineering (3) II For a description of course topics, see 466. Graduate-level requirements include a project and additional reading assignments. P. 302, 330, 331b. May be convened with 466.

572. Reliability Engineering (3) I For a description of course topics, see 472. Graduate-level requirements include a special report of 30 pages on a specific reliability engineering topic. P. CR, 474 or S.I.E. 330.

573. Probabilistic Mechanical Design (3) I For a description of course topics, see 473. Graduate-level requirements include additional homework with focus on theoretical considerations, and a research project. P. C.E. 217; CR, 410. May be convened with 473.

574. Reliability and Quality Analysis (3) I For a description of course topics, see 474. Graduate-level requirements include additional assignments and independent study, Monte Carlo simulation. May be convened with 474.

575. Reliability Testing (3) II Mean-time-between-failure and reliability confidence limits; sequential testing; sampling; accelerated, sudden-death, and suspended-times, non-parametric, and Bayesian testing. P. 472, S.I.E. 420.


603. Boundary Element Method (3) Introduction to BEM, applications to Laplace equation, conduction-convection problems, transient problems, problems involving material nonlinearities, large strain problems, concepts of design sensitivity-analyses through BEM. P. 461, 561.

620. Advanced Computational Aerodynamics (3) I Governing equations for aero dynamic applications; iterative techniques for solving partial differential equations; grid generation and multi-grid techniques; applications to compressible viscous flows. P. 431, 500b, 536b.

632. Advanced Topics in Heat Transfer (3) II 1991-92 Topics will depend on instructor(s). Possible topics include linear and nonlinear convective stability, turbulent convective heat transfer, advanced analytical and numerical methods in heat transfer, boiling and condensation, multiphase flow, and heat transfer phenomena. P. 500a-500b, 532, 536a-536b.

635. Hydrodynamic Stability (3) I Introduction to linear stability theory in fluid mechanics, the Orr-Sommerfeld equation, behavior of eigen-solutions, stability limits, extensions to problems in two component systems. P. 500a-500b, 536a-536b.

African American Studies (AAS)
TKE Building, Room 305
(602) 621-5665

Committee on African American Studies

Professors James W. Clarke (Political Science)
Associate Professor Celestino Fernandez (Sociology)
Research Social Scientist Myra Dinnerstein (Women's Studies)
Director Glenn Smith (Graduate College)

The minor in African American studies consists of at least 20 units selected by the student in consultation with the advisor of the African American studies program. This minor is designed to provide all students with basic information about black heritage around the world. Students will have an opportunity to examine topics, materials and research methods to expand their knowledge of African and Black American history and culture.

160. Minority Relations and Urban Society (3) I (Identical with Soc. 160)

220. Introduction to Black Studies (3) I Introductory survey of the literature, history, culture and social issues affecting Black Americans.

222. Black Studies: A History of Ideas (3) [Rpt. 2] II Enduring problems in the black experience through an examination of some of the political and social ideas in the history of black thought.

330. Minority Groups and American Politics (3) I I (Identical with Pol. 330)

347. The Old South (3) (Identical with Hist. 347)

348. The South Since the Civil War (3) (Identical with Hist. 348)

351. Race and Class in Latin America (3) II (Identical with Hist. 351)

396H. Honors Proseminar (3) I I

429. Cultures and Societies of Africa (3) II (Identical with Anth. 429)

435. The Coming of the Civil War, U.S. 1845-1861 (3) I (Identical with Hist. 435)

436. Civil War and Reconstruction, U.S. 1861-1878 (3) II (Identical with Hist. 436)

450a-450b. French Literature of Black Africa and the West Indies (3-3) 1989-90 (Identical with Fren. 450a-450b)

452. American Ethnic History (3) II (Identical with Hist. 452)

467. Race and Ethnic Relations (3) I II (Identical with Soc. 467)

468. Government and Politics of Africa (3) II (Identical with Pol. 468)

483. Urban Economics (3) II Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog. (Identical with Econ. 483)

487. Race and Public Policy (3) I (Identical with Pol. 487)

495. Colloquium
   b. Studies in Black America (3) I I (Identical with Hist. 495b, which is home)

Agricultural and Biosystems Engineering (ABE/ABT)

Shantz Building, Room 507
(602) 621-1607


Associate Professors M.D. Cannon (Emeritus), Wayne E. Coates, William G. Gensler, Dennis L. Larson, William O. Rasmussen, Muluneh Yitayew

Assistant Professor Gregory J. Fleischman

Adjunct Professors Clarence Becker, Herman Bouwer, Martin M. Fogel, Kenneth G. Renard

Adjunct Associate Professor Kenneth E. Foster

Associate Specialist Thomas Scherer

The department offers the Bachelor of Science in Agricultural and Biosystems Engineering (see the College of Engineering and Mines section of this catalog for specific undergraduate program requirements and the following list of departmental courses available for the engineering program).

The department also offers the Bachelor of Science in Agriculture with a major in agricultural and biosystems technology. (See the College of Agriculture section of this catalog for specific undergraduate program requirements and the following list of departmental courses available for the engineering program).

The department graduate program offerings lead to the Master of Science with a major in agricultural and biosystems engineering and the Doctor of Philosophy with a major in agricultural and biosystems engineering. The graduate programs are detailed in the Graduate Catalog.

Agricultural and Biosystems Engineering (ABE)

The Bachelor of Science in Agricultural and Biosystems Engineering emphasizes several areas including: agricultural engineering, irrigation engineering and water resources management, bioenvironmental engineering, food engineering, biological engineering, and agribiosystems power and machine systems. The program emphasizes a base science program merging biological and physical sciences. Included in the major areas as appropriate are: energy issues and alternatives; food processing and production equipment development; biosystems analysis and design; biotechnology engineering developments; hazardous waste management and water quality control; soil, water, plant relationships; applications of sensors, control systems, digital imaging, computer vision, artificial intelligence and multispectral analysis; robotics; and other emerging technologies. Emphasis is placed upon the design of systems, processes and equipment to serve the engineering needs of the agricultural/biological materials processing industries and the water resources/environmental engineering needs of various government, industry, community, and engineering consulting organizations.

The Bachelor of Science in Agricultural and Biosystems Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.

121. Agri-biosystems Engineering Practices (1) II Agricultural and biosystems practices, a survey of applications. Larson


415. Agri-biosystems Process Engineering (3) I 1992-93 Application of basic engineering and biological principles to equipment and methods for processing, handling, refrigerating and drying food, biological, and agricultural materials. 2R, 3L, 2ES, 1ED. CH. 240 or Ch.E. 206. May be convened with 515.

423. Agricultural Systems Analysis and Design (3) II 1992-93 Application of systems analysis to agricultural and biologically related problems; computer modeling and use of operations research methods. 2ES, 1ED. P, Stat. 361. May be convened with 523. Larson

447. Sensors and Controls (3) I The selection, interfacing, and calibration of digital and analog sensors to measure physical variables for manipulation with microprocessors. The development of logic and process control circuits. 2R, 3L. 1.5ES, 1.5ED. P, E.C.E. 207. May be convened with 547.

455. Irrigation Engineering (3) II Introduction to soil and water relationships, irrigation systems, irrigation water supply, and irrigation management; basic designs. 2ES, 1ED. P, C.E. 321 or A.M.E. 331a. (Identical with C.E. 455) May be convened with 555.

456. Irrigation Systems Design (3) I Design and operation of surface, sprinkler, and trickle irrigation systems. Field trip. 1ES, 2ED. P, 455. May be convened with 556.

457. Irrigation Engineering Laboratory (2) I Methods of data acquisition and analysis which are pertinent to the design of irrigation systems. Computer-aided acquisition and processing will be used in many laboratory exercises. 1R, 3L, 2ES. Field trip. CR. 455. May be convened with 557.

458. Drainage of Irrigated Lands (3) I Origin and nature of drainage problems in arid lands;
drainage theories, investigations and design for irrigated agriculture. Field trip. 1.5ES, 1.5ED, P, C.E. 321 or A.M.E. 331a. (Identical with C.E. 458) May be convened with 558.

54.02 Soil and Water Conservation Engineering (3) II 1992-93 Methods for estimating runoff from croplands, Universal Soil Loss Equation, design of terraces, waterways, small earth dams, erosion control structures. 1.5ES, 1.5ED, P, A.B.T. 406 or C.E. 321 or A.M.E. 331a. May be convened with 562. Slack


b. Advanced Agricultural Engineering Design (3) II 1R, 6L, 3ED, P. 494a.

510. Agri-biosystems Power Engineering (3) II 1991-92 For a description of course topics, see 410. Graduate-level requirements include a special project. P, A.M.E. 232, 240 or Ch.E. 206. May be convened with 410. Coates

512. Agri-biosystems Machinery Design (3) II 1991-92 For a description of course topics, see 412. Graduate-level requirements include an additional design project. P, A.M.E. 232, C.E. 217. May be convened with 412. Coates

515. Agri-biosystems Process Engineering (3) I 1992-93 For a description of course topics, see 415. Graduate-level requirements include a special project. CR, A.M.E. 240 or Ch.E. 206. May be convened with 415.

523. Agricultural Systems Analysis and Design (3) II 1992-93 For a description of course topics, see 423. Graduate-level requirements include a simulation project. P, Stat. 361. May be convened with 423. Larson

547. Sensors and Controls (3) I For a description of course topics, see 447. Graduate-level requirements include a special project. P, E.E. 207. May be convened with 547.


555. Irrigation Engineering (3) II For a description of course topics, see 455. Graduate-level requirements include a special project on a current irrigation topic. P, C.E. 321. (Identical with C.E. 555) May be convened with 455.

556. Irrigation Systems Design (3) I For a description of course topics, see 456. Graduate-level requirements include a special project. P, 455. May be convened with 456.

557. Irrigation Engineering Laboratory (2) I For a description of course topics, see 457. Graduate-level requirements include a special project. CR, 455. May be convened with 457.

558. Drainage of Irrigated Lands (3) II For a description of course topics, see 458. Graduate-level requirements include a special project. P, C.E. 321 or A.M.E. 331a. (Identical with C.E. 558) May be convened with 458.

562. Soil and Water Conservation Engineering (3) II 1992-93 For a description of course topics, see 462. Graduate-level requirements include a special project. P, A.B.T. 406 or C.E. 321 or A.M.E. 331a. May be convened with 462. Slack


605. Soil-Water Dynamics (3) II 1992-93 (Identical with S.W. 605)


696. Seminar a. Agricultural and Biosystems Engineering (1) [Rpt./1] I II Yatayew

Agricultural and Biosystems Technology (ABT)

The degree of Bachelor of Science in Agricultural and Biosystems Technology provides an emphasis on the operation, management and design of crop production systems, evaluation of systems, selection of systems, basic irrigation scheduling, measurements of water flow, soil moisture, pump and system efficiencies. 2R, 3L. Field trip. P, Math. 117R/S, S.W. 200. May be convened with 504.

406. Applied Hydraulics (3) I GRD Fundamentals of hydraulics applicable to the irrigation of agricultural lands, including fluid properties, hydrostatics, irrigation flow characteristics, open channel and pipeline applications, and measurement of flowing water. P, Math. 118, 123 or 125a, Phys. 102a. May be convened with 506. Yatayev

408. Environmental Simulation (3) I Introduction to the design, development, and usage of simulation tools and techniques to assist in analyzing physical, chemical, and biological components of the environment. P, Math. 123 or 124a. Rasmussen


504. Irrigation Principles and Management (3) I GRD Principles of operating farm irrigation systems, evaluation of systems, selection of systems, basic irrigation scheduling, measurements of water flow, soil moisture, pump and system efficiencies. 2R, 3L. Field trip. P, Math. 117R/S, S.W. 200. May be convened with 404. Rasmussen

505. Irrigation Principles and Management (3) I For a description of course topics, see 404. Graduate-level requirements include a special project on a current irrigation topic. P, Math. 117R/S, S.W. 200. May be convened with 404.


512. Agri-biosystems Machinery (3) I 1992-93 Selection, operation and management of machines and equipment used in agriculture and the food processing industry. 2R, 3L, P, Math. 118, Phys. 102b. Coates


535. Environmental Technology (3) I Rasmussen


545. Irrigation Principles and Management (3) I GRD Principles of operating farm irrigation systems, evaluation of systems, selection of systems, basic irrigation scheduling, measurements of water flow, soil moisture, pump and system efficiencies. 2R, 3L. Field trip. P, Math. 117R/S, S.W. 200. May be convened with 504.
Agricultural Biochemistry and Nutrition
(See Nutritional Sciences)

Agricultural Economics (AEC)

Economics Building, Room 206
(602) 621-5241

Professors Bruce R. Beattie, Head, Robert C. Angus, Bartley P. Cardon (Emeritus), Dennis C. Cory, Roger W. Fox, Jimmye S. Hillman, Maurice M. Kelso (Emeritus), Robert O. Kuehl, William E. Martin (Emeritus), Jeffrey T. LaFrance
Associate Professors Bonnie B. Colby, Roger A. Dahlgren, Eric A. Monké, Paul N. Wilson
Assistant Professors Gary D. Thompson
Research Scientist Edwin H. Carpenter
Extension Specialists Harry W. Ayer, Russell L. Gum, Julie Leones, Russell E. Thonstad, James C. Wade

The department's program is designed to relate agricultural problems and issues in contemporary society to their underlying economic explanations. Through the choice of elective courses the major in agricultural economics may build programs in: agricultural business to prepare for careers in the management of farms, ranches and agribusiness firms; economic development for careers in rural area development and foreign agricultural development; resource economics for careers in the management of public resources of land and water; preparation for graduate study for careers in business, teaching and research.

The following degrees are offered: Bachelor of Science in Agriculture with a major in agricultural economics and Master of Science with a major in agricultural economics. The Doctor of Philosophy degree with a major in economics and an emphasis in agricultural economics is administered by the combined faculties of the departments of Economics and Agricultural Economics.

The major: A minimum of 22 units in upper-division agricultural economics courses including 339, 403, 404, 464, and 499. Additional required courses include Econ. 201a-201b, 300 or 361, 330, 332, Math. 119 and 123, 3 units of accounting, and 3 units of computer applications.

The minor: A minimum of 20 units of course work is required in agricultural economics. Introductory course work totaling 3 units, but not to exceed 9 units must be selected from 213, 215, 217 or 242. For a specialization in the minor, a minimum of 12 upper-division credits will be selected in consultation with a minor advisor. Students will be expected to have prerequisites and/or supporting courses that may be required for the courses in the minor.

An additional minor program, the agricultural business curriculum (see College of Agriculture), requires 20 units of course work in agricultural economics and business administration. Act. 200 and A.E.C. 213, 215, and 450 are required. Three additional courses must be selected from a list of nine optional courses. Interested individuals should consult an advisor in Agricultural Economics.

213. Introduction to Agricultural Marketing (3) II Basic economic principles and marketing methods for agricultural crops, livestock, and livestock products. Field trips. P. 3 units of economics.
215. Agricultural Business Management (3) II Applying economic principles in decision making for the agribusiness firm; analytical techniques and management control; problems in organization, management, and operation of an agricultural business. P. Econ. 201a.
217. Resource and Environmental Economics (3) I Relationship between man and use of natural resources and environmental systems, with emphasis on the economic implications of alternative environmental, energy and land-use policies. P. Econ. 201a. (Identical with Econ. 217)
242. World Food Economy (3) II World resources of agriculture; population and food supply; economics of hunger, world trade and agricultural policies. P. Econ. 201a. (Identical with Econ 242) Monké/Fox
313. Economics of Futures Markets (3) I II Futures market participants, evolution, functions, performance, regulation, financial instruments, and options on futures contracts, with emphasis on hedging uses of the futures market for agricultural commodities. P. Econ. 201b. (Identical with Econ. 313 and Fin. 313) Dahlgren
350. Ethical Considerations in Agricultural and Natural Resource Policies (3) I Develops the capability in students to critically identify and analyze, from an ethical/economical perspective, policy issues and decisions concerning agriculture and natural resources. P. 201a
416. Rural Area Development (3) I Identification of current U.S. nonmetropolitan problems, economic theories useful in analyzing these problems, and possible program alternatives for rural area development. P. Econ. 201b or Geog. 305. (Identical with Geog. 416) May be convened with 516.
442. Transformation of Agrarian Societies in the Middle East (3) II (Identical with N.E.S. 442) May be convened with 542.
450. Agricultural Finance (3) I Applying business and economic theory to problems confronting agribusiness firms in the acquisition, allocation, control, and transfer of capital resources. P. 215, or Econ. 300 and 3 units of accounting. May be convened with 550. Wilson
459. Agricultural Economic Development in Latin America (3) II Review and analysis of economic growth and development in Latin America with emphasis on the agricultural sector. P. Econ. 201a-201b. (Identical with Anth. 459, Econ. 459 and L.A.S. 459). May be convened with 559. Fox/Finan
454. Agricultural Policy (3) I II Economic analysis of the policy issues and proposals impacting on agriculture and rural America, with emphasis on the historical and continuing role of government in price and income policies. P. Econ. 201a.
457. Population and Development in the Middle East (3) I (Identical with N.E.S. 467) May be convened with 557.
471. Problems in Regional Development (3) I II (Identical with Geog. 471) May be convened with 571.
475. Economics of Land and Water in the American West (3) II Economic analysis of natural resource issues, policies and management alternatives. Case studies will focus on public and tribal lands, river basins, wildlife, mineral and forest resources in the western U.S. P. 217 or 476 or Econ. 201a. An Honors section is offered; consult department for information. (Identical with Econ 475 and R.N.R. 475) May be convened with 575. Colby
476. Natural Resource Economics (3) II Economic principles useful in analyzing natural resource problems and policies in the Southwest and nationwide. P. Econ. 201a-201b. (Identical with Econ. 476, H.W.R. 476, and R.N.R. 476)
500. Research Methodology in Agricultural Economics (3) II Study of the research process in agricultural economics as an efficient means for acquiring reliable knowledge for problem solutions. Cory
504. Production Economics (3) I Theory of the firm and industry; single and multiple products; risk and uncertainty. (Identical with Econ. 504)
512. International Agricultural Economic Development (3) II The role of agriculture in
513. Consumption Economics and Price Analysis (3) II Theory of the consumer, demand estimation and welfare analysis. Emphasizes the interactive between empirical specifications, theoretical implications, and appropriate econometric methods. P, 504, Econ. 518. (Identical with Econ. 513) LaFrance

514. Cost-Benefit Analysis (3) II Theoretical bases and empirical techniques, with emphasis on LDCs. Consumer-producer surplus; social include additional reading and a research paper on a development theory or program and selected readings in professional journals. (Identical with Econ. 514) and M.A.P. 514, Monke


516. Rural Area Development (3) I For a description of course topics, see 415. Graduate-level requirements include an in-depth research paper on a development theory or program and selected readings in professional journals. (Identical with Geog. 516) May be convened with 416.


540. Design and Analysis of Experiments (3) II Statistical principles of research design for experimental and observational studies; introduction to the linear statistical model for analysis of data from research studies including techniques for complete block and incomplete block designs; factorial experiments; covariates and polynomial response functions. P, 539a. Kuehl

542. Transformation of Agrarian Societies in the Middle East (3) II (Identical with N.E.S. 542). May be convened with 442.

544. In the Wake of the Green Revolution (3) [Rpt.] II (Identical with Anth. 544)

546. Consumer Economics (3) I II (Identical with C.S. 546) May be convened with 446.

549. Applied Econometric Analysis (3) II (Identical with Econ. 549) Dahlgren

550. Agricultural Finance (3) I For a description of course topics, see 450. Graduate-level requirements include a research paper of publishable quality which analyzes a current financial issue or problem in the agricultural sector and selected readings in professional journals. P, Econ. 300 and 3 units of accounting. May be convened with 450. Wilson

559. Agricultural Economic Development in Latin America (3) II For a description of course topics, see 459. Graduate-level requirements include additional reading and a research paper of publishable quality. (Identical with Econ. 559 and L.A.S. 559) May be convened with 459. Fox/Finanz

567. Population and Development in the Middle East (3) I (Identical with N.E.S. 567) May be convened with 467.

571. Problems in Regional Development (3) II (Identical with Geog. 571) May be convened with 471.

575. Economics of Land and Water in the American West (3) II For a description of course topics, see 475. Graduate-level requirements include demonstration of a significantly higher level of economic sophistication in preparation of the term research paper. P, 217, 476, or Econ. 201a. (Identical with Econ. 575 and R.N.R. 575) May be convened with 475. Colby


577. Natural Resource Economics and Public Policy (3) II Advanced economic theory and evaluation of land and water resource issues and public policies for graduate students in natural resource-related disciplines. Topics include water quality, water allocation, public lands management, and valuation of nonmarket resources. P, Econ. 361 or 476. (Identical with Econ. 577, H.W.R. 577, and Ws.M. 577) Colby

Agricultural Education (AED)

Forbes Building, Room 2224
(602) 621-1523

Professors Roger T. Huber, Acting Head, Gordon J. Graham (Emeritus), Clinton O. Jacobs (Emeritus), Floyd G. McCormick (Emeritus), Kenneth S. Olson, Phillip R. Zurbrick

Associate Professor David E. Cox
Assistant Professor Glen M. Miller

The programs of study in agricultural education prepare students for teaching careers at secondary and community college levels; for positions in agricultural mechanics sales and service, and international development. These positions require preparation in basic sciences, technical agriculture, knowledge of the principles and techniques of the teaching-learning process, communication skills and the ability to work with people.

The department offers the degree of Bachelor of Science in Agriculture with majors in agricultural education and general agriculture.

The department also offers programs of study leading to the degrees of Master of Science and Master of Agricultural Education. A strong emphasis in international development studies is offered at the graduate level. (See the Graduate Catalog for detailed information concerning graduate programs.)

Any student who plans to become a teacher must be formally admitted to the teacher education program prior to enrolling in professional education course work. Admission requires the completion of a formal application to the Department of Agricultural Education as well as successful completion of state prescribed tests. Contact an advisor for specific requirements. Degree requirements must complete course work in the appropriate study areas as described under the general education requirements in the College of Agriculture section of this catalog. The major in agricultural education requires students to complete the following courses according to their area of emphasis in agriculture courses. A minimum of 6 units each must be completed in these areas:

Animal Sciences, Plant Sciences, Agricultural Education or Agricultural Economics, and Soil and Water Science, or Agricultural and Bio-systems Engineering.

Under the plan of study for the major in agricultural education or general agriculture, students also may complete the agricultural business curriculum. Course requirements are Acct. 200; A.E. 215, 450, and 213 or 231, and three courses from the following: Econ. 300-330; M.A.P. 305, 320; Mktg. 372; Fin. 311, 362; A.E. 313, 403, 404.

211. Introduction to Agricultural Education (1) I Objectives, nature, and scope of vocational education in agriculture; types of programs; qualifications of personnel; career opportunities. Cox

301. Youth Leadership Development (3) I Characteristics of effective advisors; leadership styles; strategies for the management and organization of youth groups in agriculture; practice in leadership development techniques. Cox

338a. The Teaching of Agriculture (4) II (Identical with T.E.E. 338a)

350. Applications in Agricultural Mechanics (3) I Application of agricultural mechanics concepts and principles to electrical systems and internal combustion engines as used in urban and commercial agriculture. Miller

351. Operations in Agricultural Mechanics (3) II Operation of agricultural mechanics systems as utilized in urban and commercial agriculture. P. 100a. Miller

389. Supervised Teaching in Agriculture (1-8) [Rpt./II] II Observation and teaching vocational agriculture in the classroom and field under supervision. P. Admission to teacher education in agriculture.

396H. Honors Proseminar (3) I II

397. Workshop
   a. Writing for Applied Sciences (2) I II P, Engl. 101 or 103H and 102 or 104H. (Identical with F.C.R. 397d and R.N.R. 397d)

402. Agriculture and the Environment (3) I Examination and discussion of current environmental/regulatory issues facing agriculturists. Emphasis on pesticides, sustainability, biotechnology, risk assessment/communication and the related issues of worker safety, food safety, water quality/conservation, endangered species and multiple use of public lands.

409. Principles of Vocational Education (2) II (Identical with T.E.E. 409)

422. Communicating Knowledge in Agriculture (3) I Principles and processes of knowledge diffusion and methods of transferring appropriate technology to user/clientele groups. Communicating effectively within organizations. (Identical with Agr. 422)


485. Methods in Teaching Agricultural Mechanics (2) II Problems and procedures in teaching mechanics and operative skills; conducting demonstrations; providing space and teaching facilities. 1R, 3L. P, CR. 338a and 409. Miller

496. Seminar
   a. Instructional Materials Development (3) I Field trip. P. 389 or CR. Zurbrick
   b. Techniques in Teaching Agricultural Mechanics (1) I Open to majors only. P. student teacher placement.

497. Workshop
   a. Curriculum Development (1-3) [Rpt./3] I II
   b. Instructional Reailia (1) [Rpt./3 units] I II P CR 496a.
   c. Extension Communications (1-2) [Rpt./2] (Identical with H.E.E. 497)


539. Non-Formal Education (3) II For a description of course topics, see 439. Graduate-level requirements include an additional research report. (Identical with H.E.E. 539)

540. International Agricultural Extension Education (3) I 1992-93 Critical evaluation of case histories of international extension education models, and integration of successful components into composite models based on cultural, political and educational situations typically encountered in developing countries.

597. Workshop
   a. Occupational Experience Program (1-3) [Rpt./3] I II
   b. Youth Leadership Development (1-3) [Rpt./3] I II
   c. Extension Credibility and Accountability (1-2) [Rpt./2] (Identical with H.E.E. 597c)
   d. Administration, Management, and Supervision of Cooperative Extension (1-3) [Rpt./2] (Identical with H.E.E. 597d)
   e. Continuing Education in Agriculture (1-3) [Rpt./3] I II
   f. Program Planning and Evaluation (1-3) [Rpt./3] I II
   g. Microcomputers-Extension (1-2) [Rpt./2] (Identical with H.E.E. 597g)
   h. Video Communications and Methods (1-2) [Rpt./2] (Identical with H.E.E. 597i)
   i. Personal Effectiveness: The Human Factor (1-2) II (Identical with H.E.E. 597m)
   j. Public Policy Issues (1-2) II (Identical with H.E.E. 597n)
   k. Public Relations in Extension (1-2) I (Identical with H.E.E. 597r)
   l. Evaluation in Extension Education (1-3) I (Identical with H.E.E. 597u)
   m. Volunteer Staff Development in Extension (1-3) I (Identical with H.E.E. 597v, which is home)
   n. Administration of Extension Programs (1-3) I (Identical with H.E.E. 597w)
   o. *Offered only through the Cooperative Extension Winter School.

601. Advanced Agricultural Education Methods (3) [Rpt./3] I II Problems in organizing and conducting programs of instruction in vocational and extension education. P. eight units of A.Ed. or education.

615. Investigations and Studies in Agricultural Education (3) I Study and analysis of research literature, methods, techniques and procedures for conducting investigations; selecting a problem and developing plans for a study. Zurbrick

620. Program Evaluation in Agricultural Education (3) I Objective educational program evaluation procedures useful for strengthening and enhancing effectiveness of formal and non-formal programs in agricultural and vocational education. Field trips.

621. Program Planning (3) II Developing programs in agricultural teaching and extension; situation analysis, objectives, policies, content, procedures, and evaluative criteria. P. 6 units of agricultural education.

622. Adult Vocational Education (3) II Organization, content, and techniques for conducting adult educational education programs; characteristics of adult learners; issues affecting adult vocational education. P. Bachelor's degree and one year teaching experience.

Agriculture (AGRI)

Forbes Building, Room 201
(602) 621-3612

Several courses offered within the College of Agriculture are applicable to broad subject areas. Therefore, they are offered by the college rather than by a specific department. Courses are taught by faculty within the college. For specific questions, see the Associate Dean and Director of Instruction.

Agronomy and Plant Genetics

(See Plant Sciences)

American Indian Studies (AINS)

Social Sciences Building, Room 324
(602) 621-7108

Committee on American Indian Studies (Graduate)

Professors Barbara Babcock (English), James W. Clarke (Political Science), Lawrence J. Evers (English), Jerrold Levy (Anthropology), N. Scott Momaday (English), J. Jefferson Reid (Anthropology), Joseph Strauss (Family & Consumer Resources), Susan W. Steele (Linguistics), Robert K. Thomas (Political Science). Associate Professor Thomas M. Holm (Political Science), Alice S. Paul (Elementary Education)

Assistant Professors Jennie Joe (Family and Community Medicine), Ofelia Zepeda (Linguistics), Director

Lecturer Emory Sekaquaptewa (Anthropology) Adjunct Assistant Professor Eloise Jelinek (Linguistics) Adjunct Instructor David Wilkins (Political Science)

The minor in American Indian studies consists of at least 20 hours selected by the student in consultation with the chairperson of the committee and approved by the student's major professor. The minor provides a wide range of instruction in the history, culture, lifeways, and contemporary problems of the native people of the New World. The departments of Anthropology, Art, English, Linguistics, and Political Science, and Sociology and various depart-
ments in the College of Education contribute to this program, which provides American Indian students with basic information on their cultural heritage and its significance in the contemporary world. It also provides other students with a greater appreciation for the lifeways and value systems of American Indians. Prelaw students interested in legal problems of American Indians may combine prelaw and American Indian studies and American Indian policy courses in the Department of Political Science with the minor in American Indian studies.

A Master of Arts with a major in American Indian studies is also available. For admission and degree requirements, please see the Graduate Catalog. For information concerning the concentration in American Indian policy studies, see also the Department of Political Science.

102. Linguistics for Native American Communities (3) I S (Identical with Ling. 102)

203a-203b. Elementary Navajo Language (3-3) (Identical with Ling. 203a-203b)

205. Prehistoric Peoples of the Southwest (3) I II (Identical with Anth. 205)

206. Native Peoples of the Southwest (3) I II (Identical with Anth. 206)

210. Native Languages of North America (3) I (Identical with Ling. 210)

270. Colonization and Native People (3) I II (Identical with Pol. 270)

307a-307b. Elementary Papago Language (3-3) (Identical with Ling. 307a-307b)

334. Politics and the American Indians (3) I II (Identical with Pol. 334)

350. Oral Tradition (3) I II (Identical with Engl. 350)

359H. Honors Proseminar (3) I II

404. Sociology of the Southwest (3) I I (Identical with Soc. 404) May be convened with 504.

416. Contemporary Indian America (3) II (Identical with Anth. 416) May be convened with 516.

423. Peoples of Mexico (3) I I (Identical with Anth. 423) May be convened with 523.


430. The Anthropology of Visual Art (3) I I (Identical with Anth. 430) May be convened with 530.

445a-445b. Structure of a Non-Western Language (3-3) [Rpt./2] (Identical with Ling. 445a-445b)

449a-449b. Folklore (3-3) (Identical with Engl. 449a-449b) May be convened with 549a-549b.

467. Race and Ethnic Relations (3) III I I (Identical with Soc. 467) May be convened with 567.

477. American Indian Literature (3) (Identical with Engl. 477) May be convened with 577.

482. Hopi Language in Culture (3) I II (Identical with Anth. 482) May be convened with 582.

484a-484b. Development of Federal Indian Policy (3-3) (Identical with Pol. 484a-484b) May be convened with 584a-584b.

487. Race and Public Policy (3) I (Identical with Pol. 487) May be convened with 587.

490. Indian Religions and Spirituality (3) Examines the positive (curing, harmony with the natural world, etc.) aspects of Indian religions. Indian medicine men may participate in the course at various functions. (Identical with Reli. 490) May be convened with 590.

502a-502b. Dynamics of Indian Societies (3-3) Philosophies, institutions and characteristics of tribal life in North America. 502a: American Indian life-styles prior to European contact. 502b: Impact of European immigration on tribal groups of North America. (Identical with Anth. 502a-502b)

504. Sociology of the Southwest (3) I (Identical with Soc. 504) May be convened with 404.

516. Contemporary Indian America (3) II (Identical with Anth. 516) May be convened with 416.

523. Peoples of Mexico (3) I I (Identical with Anth. 523) May be convened with 423.


530. The Anthropology of Visual Art (3) II (Identical with Anth. 530) May be convened with 430.

549a-549b. Folklore (3-3) (Identical with Engl. 549a-549b) May be convened with 449a-449b.

567. Race and Ethnic Relations (3) I II (Identical with Soc. 567) May be convened with 467.

577. American Indian Literature (3) (Identical with Engl. 577) May be convened with 477.

582. Hopi Language in Culture (3) I I (Identical with Anth. 582) May be convened with 482.

584a-584b. Development of Federal Indian Policy (3-3) (Identical with Pol. 584a-584b) May be convened with 484a-484b.

587. Race and Public Policy (3) I (Identical with Pol. 587) May be convened with 487.

590. Indian Religions and Spirituality (3) For a description of course topics, see 490. Graduate-level requirements include an additional research paper based on past research and personal experience with related topic. May be convened with 490.


596. Seminar h. American Indian Law and Policy (3) [Rpt./2] I II (Identical with Pol. 596h, which is home.)

m. Studies in the Oral Tradition (3) [Rpt./9 units] I II (Identical with Engl. 596m, which is home)

631. Indian Law (3) I (Identical with Law 631)

Anatomy (ANAT)
Arizona Health Sciences Center Room 4205
(602) 626-6084

Professors Robert S. McCuskey, Head, Jay B. Angeline, Jr., Joseph T. Bagnara, William D. Barber, David E. Blask, Bryant Benson, Robert W. Gore (Physiology), Mac E. Hadley, Mary I. Johnson (Pediatrics), Philip H. Krutzsch (Emeritus), John Nolte, Donald P. Speer (Surgery), Nicholas J. Strausfeld (Arizona Research Laboratories, Neurobiology)

Associate Professors Mary J. C. Hendrix, C. Ward Kischer, R. Clark Lantz, Christopher A. Leadem, Albert V. LeBouton, Mary E. Morbeck (Anthropology), Leslie P. Tolbert (Arizona Research Laboratories, Neurobiology)

Assistant Professors Gail D. Burd (Molecular and Cellular Biology), Herman Gordon, Nathaniel McMullen, Mary Rykowski, Paul A. G. John, Jean M. Wilson (Pediatrics)

Lecturer Norman E. Koelling

Senior Clinical Lecturer James C. Dunn

The Department of Anatomy offers work leading to the Master of Science and Doctor of Philosophy degrees. For admission and degree requirements, please see the Graduate Catalog.

399H. Honors Independent Study (1-3) I II Opportunities in biomedical research. P, admittance to Honors Program, Chem. 103b, 104b, 243b, 245b.

401. Human Gross Anatomy (3) II Survey of the gross structure of the human body. 1F, 6L. Open to pharmacy students only. (Identical with Pohl 401).

415. Human Reproductive Biology (2) I Structure and function of the human reproductive system with emphasis on physiological mechanisms which regulate fertilization, pregnancy, birth, puberty, reproductive control and reproductive senescence. P, one semester of biology.

456. Developmental Biology (3) I (Identical with M.C.B. 456) May be convened with 556.

457. Experiments in Developmental Biology (4) II (Identical with M.C.B. 457) May be convened with 557.

467R. Endocrinology (3) II Neural and endocrine integration in the regulation of mammalian physiological functions. P, M.C.B. 103. (Identical with M.C.B. 467R) May be convened with 567R.

467L. Endocrinology Laboratory (1) II Techniques in endocrinology. P, CR 467R (Identical with M.C.B. 467L) May be convened with 567L.

471. Human Embryology (4) II Normal and abnormal development of the human with functional aspects stressed. Includes maturation of germ cells to fertilization to birth. Lecture, discussion and demonstration format. P, M.C.B. 181, 182; Ecol. 159a-159b, 160a-160b or M.C.B. 456 or 457; or consult with department. (Identical with Ecol. 471 and M.C.B. 471) May be convened with 571.

495. Colloquium y. Introduction to the Neurosciences I (2) 1991-92 (Identical with Med. 495y, which is home) May be convened with 595y.

499H. Honors Independent Study (3) I II Literature review. P, admittance to honors.

502. Principles of Neuroanatomy (4) II Cellular elements and recognized subsystems of the mammalian nervous system, with emphasis on general principles of neuroanatomical organization and their functional significance. Not open to premedical students. P, 8 units of biological lab. science; 401; Psych. 302, Psys. 480 desirable. Consult department before enrolling.
601. Human Gross Anatomy (8) I Comprehensive survey of the development and gross structure of the human body. P. Chem. 103b, 104b, 243b, 245b; Phys. 102b, M.C.B. 181, 182; consult department before enrolling.

602. Microscopic Anatomy (5) I Essentials of microscopic human anatomy. P. Chem. 103b, 104b, 243b, 245b; Phys. 102b; consult department before enrolling.

603. Microscopic Structure (1-3) I II Selected concepts of structural organization at light and electron microscopic levels of the anatomy and development of the cells, tissues, and organs of vertebrates. P. 601, 602.

604. Gross Human Anatomy (2-6) II I Study in depth of the gross human anatomy of selected areas or systems. P. 601, 602.

605a-605b. Human Neuroscience (3-3) 605a: Morphological organization of the human central nervous system. P. Chem. 103b, 243b, 245b, Phys. 102b, M.C.B. 410a-410b. Consult department before enrolling. 605b: Neurontransmitters and intrinsic regulatory functions. Consult department before enrolling. (Identical with Phol. 605a-605b and Psio. 605a-605b)

606. Advanced Vertebrate Neuroanatomy (4) I II Structure of the central nervous system in selected vertebrates. P. 605a-605b.

610a-610b. Anatomical Techniques (1 to 4-1 to 4) Introduction to special techniques and procedures of analytical anatomy. P. 601, 602; consult department before enrolling.

616. Introduction to Anatomical Literature (1) I II A problem-oriented, bibliographic approach to basic anatomical references. Primarily for those students planning a career in anatomy and wishing to prepare themselves for further graduate study. 3L.

696. Seminar
a. Biological, Structural and Functional Interactions (1) [Rpt. /4] Open to majors only. P. Chem. 103b, 104b, 243b, 245b, Phys. 102b.

801. Human Gross Anatomy (8) I Comprehensive survey of the development and gross structure of the human body. No grade is given until the full 8 units are completed.


805a-805b. Human Neuroscience (3-3) I II Morphological organization of the human central nervous system and neurotransmitters and intrinsic regulatory functions. (Identical with Neur. 805. Phol. 805, and Psio. 805)

Animal Physiology
(See Animal Sciences)

Animal Sciences (ANS)
Shantz Building, Room 205 (602) 621-7623


Associate Professors Sue K. DeNiese, William A. Schur, R. Spencer Swingle, Mark E. Wise

Assistant Professor Vincent Guerriero

Lecturer Thomas N. W. Negler

Adjunct Professor Franklin D. Rollins

Adjunct Lecturer Wendy Davis, David E. Hooper

Extension Specialists Dennis V. Armstrong, Albert M. Lane (Emeritus), Edward A. LeViness

Livestock Specialist Shanon S. Easterday

Animal sciences is a field of study involving the production, marketing, and utilization of animals in agriculture, entertainment, and companionship. Students gain knowledge in the biological processes involved in genetics, nutrition, and reproduction as well as in the practical business aspects of racing and livestock management. Students may find employment in production management, racing administration, or within other related industries serving the agricultural sector such as agribusiness firms, financial institutions, and breed associations. Students may also complete a field of study that prepares them for graduate programs in agriculture or the biological and life sciences or professional schools in veterinary medicine or medicine. A minor in animal sciences is available for nonmajors. The department also offers programs leading to the Master of Science and Doctor of Philosophy degrees for information regarding graduate degrees, see the Graduate Catalog.

 Majors must complete five of the six general education study areas, as described in the College of Agriculture section of this catalog, as well as completing Comm. 100, 102 or 103 or 104 or 105.

Majors must choose course work from options in animal industry, science and preprofessional, or race track industry. Requirements for the options are as follows:

Animal Industry Option: The following required courses also satisfy specific study area requirements: Biological and Life Sciences, Ecol. 100, P.I.S. 100 and An.S. 213; Physical and Environmental Sciences, Chem. 101a-101b and 102a-102b or 103a-103b and 104a-104b; Individuals, Societies and Institutions, Econ. 200 or 201. Foundation courses required are Acct. 200, S.W. 200, V.Sc. 403 or 405, and A.Ec. 213 and 215. In addition, three business and two plant/range courses must be selected from a departmentally approved list. Requirements of the major are An.S. 102, 180, 205, 215, 295, 395, 415, 415R, 430, 436, 436, and three courses selected from 472, 473, 474, 476, 477 and 478.

Science and Preprofessional Option: The following required courses satisfy specific study area requirements: Biological and Life Sciences, Ecol. 181 and 182; Physical and Environmental Sciences, Chem. 103a-103b and 104a-104b; Individuals, Societies and Institutions, Econ. 200 or 201. Foundation courses required are Acct. 200; An.S. 213 or Ecol. 320; Chem 241a-241b, 243a-243b, 322, 323; Math. 123; and Phys. 102a-102b and 180-180b. Recommended courses are Biol. 460, or 462a and Chem. 325, and Micr. 110. Requirements for the major are An.S. 102, 180, 295, 395, 413, 415R,
430, 496, V.Sc. 400a or 400b or Ecol. 464a, and 8 additional units of 400-level courses.

**Race Track Industry Option:** The following required courses also satisfy study area requirements: Physical and Environmental Sciences, Chem. 101a-101b and 102a-102b; individuals, Societies and Institutions, Econ. 200 or 201a. Foundation courses required are Acc. 200; A.Ec. 215 and a minimum of 9 units of business and communications courses from a departmentally approved list. Requirements for the major are: An.S. 142, 270, 340, 342, 344, 440 and 444. Students desiring an emphasis in business are required to complete the following courses: N.F.S. 358 and 458; M.A.P. 320 and 330; Mktg. 361 and 364; and An.S. 476 or A.Ed. 422. Students desiring an emphasis in racing animal management are required to complete the following courses: Ecol. 100; An.S. 213, 415R, 430, 436, and 476.

The **minor**: A minimum of 20 units is required for the minor. Students must take An.S. 102 in addition to the specific prerequisites for the courses selected for the minor. Students select 8 units from the following core courses: An.S. 134, 142, 270, 430, or 432, and 10 units from the following concentration courses: An.S. 413, 415R, 430, 440, 472, 473, 474, 476, and 477, and 478.

102. **Animal Industry** (3) I/II A comprehensive view of the livestock and poultry industries, including the ways the science of biology is used in modern livestock practice. 2R, 3L. Not open to students with more than 7 units of animal sciences.

134. **Feeds and Feeding** (3) II Selection, evaluation, and use of feeds for specific purposes; balancing rations for livestock and poultry. Not open to students with credit or CR in 430 or 436.

142. **Introduction to the Animal Racing Industry** (2) I Overview of the history, terminology, personnel, equipment and breeds of animals utilized in the racing industry.

180. **Science of Meat and Meat Products** (3) II Techniques used in meat processing, with special reference to structure and composition of the various meats. Student has option to select a processing or selection-identification lab. 2R, 3L. Field trip. (Identical with N.F.S. 180)

205. **Live Animal and Carcass Evaluation** (3) II A comprehensive view of meat animal, dairy and horse selection techniques, including the evaluation of meat animals and their carcasses as related to economic importance; the selection of breeding animals based upon visual appraisal and performance records. 1R, 6L.

213. **Animal Genetics** (3) I Principles of inheritance as applied to domestic animals. P, 4 units of biology (Identical with V.F.Sc. 213)

215. **Physiology and Anatomy of Domestic Animals** (4) II Systemic physiology and functional anatomy of domestic animals with emphasis on physiological systems of importance to animal production. 3R, 3L, 3 units of biology.

270. **Introductory Horse Science** (2) I The feeding, management and training of horses.

295. **Colloquium**
   a. Career Orientation (1) II

297. **Workshop**
   a. Cattle Management Practice (1) I 3L. Field trips.

340. **Race Track Marketing** (2) II Concepts and issues related to the marketing and promotion of the animal racing facility and industry. P, 142, CR, Mktg. 361 or A.Ec. 215.

342. **Organization and Administration of the Racing Department** (3) II Basic duties and functions of the racing office and department. Personnel required and procedures utilized in developing the racing program. P, 142.


395. **Colloquium**
   a. Professional Development in Animal Agriculture (1) I

397. **Workshop**
   a. Livestock Judging (2) I 6L. P, 205.
   b. Advanced Livestock Judging (1-3) [Rpt./4 units] I 3L. Field trips. P, 205, 397a.

413. **Principles of Animal Breeding** (3) II Basic concepts involved in the improvement of economically important traits of livestock through application of genetic principles. Field trips. P, 213 or Ecol. 321 or P.S. 228; Math. 117R/S. (Identical with Gene. 413) Writing-Emphasis Course.*


415L. **Physiology of Reproduction Laboratory** (1) I Practice in semen collection and storage, artificial insemination, and hormone assay. P or CR, 415R. (Identical with V.Sc. 415L)

430. **Principles of Nutrition** (3) II Digestion, absorption and metabolism of carbohydrates, lipids, proteins, vitamins and inorganic nutrients. Field trip. P, Chem. 101b and 102b or 103b and 104b. (Identical with V.F.Sc. 430) May be convened with 530.

436. **Applied Animal Nutrition** (4) II Application of principles of nutrition to the feeding of livestock and poultry, nutrient composition and characteristics of feeds, nutrient requirements and diet formulation. 3R, 3L, 430.


443. **Research Animal Methods** (3) I (Identical with V.F.Sc. 443) May be convened with 543.

444. **Development and Management of Racing Animals** (3) I Presentation of theoretical and applied management practices in the development and marketing of racing animals in the commercial sector. P, 142, 270, A.Ec. 215.

449. **Diseases of Wildlife** (3) II (Identical with V.Sc. 449) May be convened with 549.

463. **Food Analysis** (3) II 1992-93 (Identical with N.F.S. 463)

472. **Dairy Herd Management** (3) I Proper milking, efficient housing, and health management of dairy cattle; marketing milk from the farm; milk production costs. Field trip. P, 430.

473. **Swine Production** (2) I The production, feeding and management of swine in intensive production systems. Field trip. P, 430.

474. **Sheep Production** (2) II The production, feeding and management of sheep on the farm and ranch. 1R, 3L, P, 430.

476. **Horse Production** (3) II Production, feeding, management, reproduction, and business aspects of modern horse management. 2R, 3L. Field trips. P, 430.

477. **Beef Cattle Production** (2) I The production, feeding, and management of beef cattle prior to finishing. Field trip. P, 430.

478. **Feedlot Beef Production** (2) II Feeding and management systems of beef cattle in the feedlot. All-day field trips. P, 430, 436.

496. **Seminar**

497. **Workshop**
   a. Race Track (1) [Rpt./4 units] I II

* "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog.

501. **Animal Growth and Development** (2) II 1992-93 Growth and development of domestic animals, with emphasis on skeletal muscle, bone and adipose tissue growth, from the cellular level to the whole animal. P, N.F.S. 406a or Bioc. 460 or 462a.

513. **Quantitative Genetics** (3) I 1992-93 Theory of quantitative genetics including idealized populations, forces that change gene frequency, breeding systems, and estimation of genetic parameters in a population. P, 6 units of genetics. (Identical with Gene. 513)

530. **Principles of Nutrition** (3) II For a description of course topics, see 430. Graduate-level requirements include an in-depth research paper on a single nutritional topic of current interest. Field trip. P, Chem. 101b and 102b or 103b and 104b. (Identical with W.F.Sc. 530) May be convened with 430.

543. **Research Animal Methods** (3) I (Identical with V.Sc. 543) May be convened with 443.

549. **Diseases of Wildlife** (3) II (Identical with V.Sc. 549) May be convened with 449.

580. **Composition and Structure of Meat** (2) I 1992-93 The detailed structure and composition of muscle and its biochemical conversion to meat. P, N.F.S. 406 or Bioc. 460 or 462a. (Identical with N.F.S. 580)


596. **Seminar**
   a. Animal Sciences (1) [Rpt./3] I II

601. **Bioenergetics** (2) II 1991-92 Energy utilization and nutrient interactions in higher ani-
mals. Efficiency of energy use in body processes, P. 430 or N.F.S. 408. (Identical with N.F.S. 601) Reid

609. Nutritional Biochemistry Techniques (3) (Identical with N.F.S. 609)

615. Chemistry and Metabolism of Lipids (3) II 1991-92 (Identical with N.F.S. 615)

622. Mineral Metabolism (2) I 1991-92 (Identical with N.F.S. 622)

635. Ruminant Nutrition (3) Recent findings in ruminant nutrition; the physiologic processes of digestion and absorption; importance and metabolism of rumen microflora; normal metabolism and abnormal metabolic disorders; modes of action of feed stimulants. P. 430, 436; Chem. 241a, 243a.

636. Ruminant Protein Metabolism (2) II 1992-93 Digestion, absorption and metabolism of protein and ruminants, Importance of and factors influencing protein degradation and microbial synthesis. Amino acid needs for different production functions. Models for describing ruminant nitrogen metabolism. R. 635.


665. Chemistry of Food Proteins (3) III 1991-92 The chemical and physical properties of proteins important to their use as food; analysis and purification of proteins; biochemical properties of proteins in muscle, milk, eggs, cereals, and other foods. P. Bioc. 462a preferred. Bioc. 460 acceptable. (Identical with Bioc. 665 and N.F.S. 665) Goll


687. Environmental Physiology of Domestic Animals (3) II 1992-93 Physiological, behavioral and anatomical responses of domestic animals to their environment, with emphasis on adaptive mechanisms. P. 413, 415R, 430, 3 units of general physiology/anatomy.

696. Seminar a. Animal Sciences (1) [Rpt./3 units] III

Anthropology (ANTH)

Anthropology Building, Room 210
(602) 621-2565


Associate Professors Constance Cronin, Mary Ellen Morbeck, Mark Richter, John W. Olsen, Richard A. Thompson, Stephen L. Zegura, Assistant Professors Daniel Nugent, Thomas K. Park, Willem deReuse

Lecturers Jan Bell (Arizona State Museum), Bruce Hilpert (Arizona State Museum), Daniel S. Matson (Arizona State Museum), Nancy Odegaard (Arizona State Museum), Charles W. Potter (Arizona State Museum), Emory Sekaquaptewa (Bureau of Applied Research in Anthropology), R. Gwinn Vivian (Arizona State Museum)

Adjunct Professors Bryant Bannister (Laboratory of Tree-Ring Research), Jeffrey S. Dean (Laboratory of Tree-Ring Research), Paul R. Fish (Arizona State Museum), William J. Robinson (Laboratory of Tree-Ring Research)

Adjunct Associate Professors E. Charles Adams (Arizona State Museum), James Greenberg (Bureau of Applied Research in Anthropology), Kenneth Kvaerm (Arizona State Museum), Nancy M. Perez (Arizona State Museum), Thomas Sheridan (Arizona State Museum)

Adjunct Assistant Professor Timothy Finan (Bureau of Applied Research in Anthropology), Helen Henderson (Bureau of Applied Research in Anthropology), Thomas McGuire (Bureau of Applied Research in Anthropology)

The science of anthropology is the study of human beings, their origins, thought, and behavior. The Department of Anthropology offers graduate and undergraduate course work in four subdivisions: cultural anthropology, physical anthropology, archaeology, and linguistic anthropology, as well as specialized training for field research. Special programs in museum studies, cultural resource management, and forensic anthropology draw upon the extensive resources of the Arizona State Museum. The Bureau of Applied Research in Anthropology is a center for applied anthropological research in the American Southwest and similar multicultural and ecological settings elsewhere in the world. The department cooperates with the Arizona Health Sciences Center in offering a program in medical anthropology.

The major required for the B.A. requires a minimum of 36 units of anthropology, 18 of which must be in upper-division courses. All majors must take 101, 102, 200, 235, 265, and 276, which provide the student with basic training in all four subdivisions. The student may then select one of three programs: (1) a general program which requires one upper-division course in each of the four subdivisions plus two additional upper-division courses (a minimum of six courses); (2) a special program which requires three upper-division courses in each of two subdivisions (a minimum of six courses); (3) a special program which is limited to two upper-division courses in each of two subdivisions (a minimum of six courses) special approval granted by the department. A minimum of six upper-division courses.

The supporting minor may be chosen from any department within the University. The department participates in honors program.

101. Introduction to Physical Anthropology and Archaeology (3) I II Basic concepts and methods used by physical anthropologists and archaeologists.

102. Introduction to Cultural Anthropology and Linguistic Anthropology (3) I II Basic concepts and methods used by cultural and linguistic anthropologists.

110. Exploring Archaeology (3) I An introduction to the past as revealed by archaeological research; from Neanderthals and their antecedents to Stonehenge, Maya pyramids, and Homer's Troy.

111. Exploring Physical Anthropology (3) I II An introduction to human evolution for the non-sciences student. Credit is allowed for one course or 101, but not for both.

171. Ancient Civilizations of the Near East (3) (Identical with N.E.S. 171)

172. Islamic Civilization: Traditional and Modern Middle East (3) (Identical with Or.S. 172)

200. Cultural Anthropology (3) I II Controversary theories and methods in use among cultural anthropologists. Open to majors only.

205. Prehistoric Peoples of the Southwest (3) II Nontechnical discussion of the lifeways of the ancient people of the Southwest. (Identical with A.S. 205)

206. Native Peoples of the Southwest (3) II Nontechnical discussion of Western Indian cultures from historic times to the present. (Identical with A.S. 206)

235. Principles of Archaeology (3) I II History of anthropological research; survey of concepts and methods for the study of prehistoric cultures.

257. Materials Science of Art and Archaeological Objects (3) II (Identical with M.S.E. 257)

258. Materials Science of Art and Archaeological Objects Laboratory (1) II (Identical with M.S.E. 258)

265. Human Evolution (3) I II Neontological and paleontological approaches to human evolution and variation, nonhuman primate studies, bio-molecular and anatomical variation, biocultural responses to environmental stress. P. 101 or 111.

276. The Nature of Language (3) I II An introduction to the basic concepts of linguistic anthropology and their implications for the study of language and society.

301. Paranormal Anthropology (3) I Witchcraft and the occult in cross-cultural perspectives.


304. Introduction to Archaeological Fieldwork (3) II Practical excavation, class discussions, field trips. (Identical with Or.S. 264)

307. Ecological Anthropology (3) I Cultural adaptation, with emphasis on the systematic interaction of environment, technology, and social organization among hunter-gatherers, nomadic herders, and peasant farmers.

308. Family in the Modern World (3) I An introduction to the cross-cultural analysis of family and kinship systems in contemporary society. (Identical with Soc. 310)

310. Culture and the Individual (3) II Cultural and psychological dimensions of human development and human behavior. (Identical with Soc. 310)

315. World Ethnography (3) III The comparative study of selected societies of the world through extensive use of the media. Writing-Emphasis Course.

319. Mexican American Culture (3) I Historical background, cultural institutions, identity problems, social relations, and expectations of people who may be ancestral in the United States. (Identical with L.A.S. 319 and M.A.S. 319)

320. Evolution of the Earliest States (3) I 1991-92 Intensive introduction to the evolution of the world's earliest states: Mesopotamia, Egypt, Indus, China, Peru, Maya, Mexico. Comparative topics include urbanism, elites, economics, literacy, and collapse. P, 101, 110, or consult department before enrolling.

334. Art and Archaeology of Ancient Egypt (3) I 1991-92 (Identical with Class 334)

335. Archaeological Interpretation (3) II Survey of modern methods and theories in archaeology, with emphasis on current archaeological problems being investigated throughout the world. P, 235.

337. Studies in Modern Material Culture (3) I Studies relating contemporary behavior and material culture will be planned, implemented, and evaluated at test methods of archaeological interpretation in modern societies and to develop new non-consumeristic methods of social science research. P, 3 units of social science.

340a-340b. Introduction to Classical Art and Archaeology (3-3) 1991-92 (Identical with Class 340a-340b)

346. Primatology (3) II Comparative primate biology, behavior, ecology and evolution. P, 111 or 265.

348. Sociology of Latin American Societies (3) (Identical with Soc. 384)

396H. Honors Proseminar (3) III

400. Processes of Culture Change (3)II An intensive investigation of specific theories and varieties of culture change. P, 200. May be convened with 500.

401. Ancient Mesopotamia (3) I Sumerian, Babylonian, and Assyrian civilization from the first cuneiform documents to the fall of the neo-Babylonian empire, with special attention to issues of sociopolitical organization. P, N.E.S. 171, Anth. 101, 110 or consult department before enrolling. (Identical with Hist. 401 and Ju.S. 401) May be convened with 501.

403. Anthropology of Conflict Resolution (3) II Decision making, conflict, and violence from a cross-cultural perspective, aiming to build both understanding of conflict processes and skills for managing and resolving them. May be convened with 503.

404. Sociology of the Southwest (3) I (Identical with Soc. 404) May be convened with 504.

405. Urban Adaptation of Ethnic Groups (3) I A survey of adaptations of ethnic and social groups to urban areas, focusing on a different group or region each semester. May be convened with 505.

406. Gender and Social Identity (3) II An analysis of the social and cultural construction of gender across cultures. Emphasis will be on preindustrial societies, using data to test theories of gender. (Identical with W.S. 406) May be convened with 506. Writing-Emphasis Course.

407. Peasant Communities (3) I Comparative analysis of traditional and contemporary peasant communities throughout the cross-cultural research project. (Identical with Soc. 407) Research-Writing-Emphasis Course.

408. Anthropology and Public Policy (3) I Examinations of the development, goals, techniques, and practices of anthropology as a policy science. May be convened with 508.

409. Economic Anthropology (3) II Analysis of production, exchange, distribution, consumption, property, economic surplus, inheritance, and types of economic structure. P, 200, or 12 units of economics. (Identical with Econ. 409 and L.A.S. 409) May be convened with 509.

410. Ceramic Ethnoarchaeology (3) II 1992-93 Using ethnoarchaeological and ethnographic case studies from diverse geographical areas, the course examines relationships between ceramics and a range of matters traditionally of interest to archaeologists. May be convened with 510.

411. Anthropology of Religion (3) I Comparative approaches to the study of religion; systems of ritual and symbolism in the primitive world; shamanism and possession; religious movements; religion in the modern world. (Identical with Reil. 411) May be convened with 511.

413. Ethnology of the Southwest (3) II Culture history and economic, social, and religious institutions of the living people of the Southwest. P, 200. May be convened with 513. Writing-Emphasis Course.

414a-414b. Indians of the Southwest (3-3) S History, arts and crafts, economics, social institutions, religions, and mythology of the present-day Indians of the Southwest.

416. Contemporary Indian America (3) II The historical development and contemporary significance of the reservation system in the life of the Native American of the United States. (Identical with A.In.S. 416) May be convened with 516.

417. Cultures of Ancient Mexico (3) S Archaeological and ethnohistorical survey of the civilizations of ancient Mexico from earliest times to the period of the Spanish Conquest. Field trips. (Identical with L.A.S. 417) May be convened with 517.

418a-418b. Scientific Illustration-Photography (2 to 4 -2 to 4) (Identical with Ecol. 418a-418b) May be convened with 518a-518b.

419. Psychological Anthropology (3) II Cultural emphasis and experiences as basic shaping forces in personal development and emotion. Topics include psychoanalysis and anthropology, gender and sexuality, childhood, grief and mourning, dreaming, psychopathology. P, 102, 200 or other culture anthropology courses may be convened with 519.

420. Contemporary American Culture (3) Diversity perspectives on American values as expressed in organization of kinship, space, bureaucratic, mail, social classes, ethnic groups, religious sects, and movements. May be convened with 520.


422a-422b. Pre-Columbian Art (3-3) (Identical with Ar.H. 422a-422b) May be convened with 522a-522b.

423. Peoples of Mexico (3) II Cultural background and contemporary economic, social, and religious life of the Indian and mestizo populations of Mexico. (Identical with A.In.S. 423, L.A.S. 423 and M.A.S. 423) May be convened with 523.

427a. The Prehistory of East Asia (3) I The origins and subsequent development of prehistoric cultures in China, Japan, Korea, Mongolia, Siberia and Southeast Asia. Broader concepts such as cultural change and environmental adaptation are stressed in order to draw parallels among these geographically and culturally diverse regions. P, 101. (Identical with E.A.S. 427a) May be convened with 527a.

427b. The Archaeology of Pre-Han China (3) II The origin and florescence of Chinese culture and civilization from an archaeological perspective. An in-depth survey of Chinese prehistory and early history from the early Pleistocene to the third century BC. 427a is not a prerequisite for 427b. P, 101; consult department before enrolling. (Identical with Chn. 427b) May be convened with 527b.


430. The Anthropology of Visual Art (3) II An introduction to the anthropology of visual art and the interdisciplinary methodologies and techniques of studying art and aesthetics cross-culturally as sociocultural phenomena. P, 200. (Identical with A.In.S. 430) May be convened with 530.

431. Anthropology and Development (3) II The role of anthropology in interdisciplinary projects involving economic development and planned change on the national and international levels. P, 3 units of anthropology. (Identical with L.A.S. 431) May be convened with 531.

432. Peoples of the Pacific (3) I Populations and cultures of Polynesia, Micronesia, and
Melanesia; variability of these "natural laboratory" settings in an ecological framework. May be convened with 532.

433. Laboratory in Zooarchaeology (3) II Fragmentary animal remains in archaeological interpretation. Diagnostic morphological features; role in cultural interpretation. Analytical techniques; lab. analysis; report preparation. 1R, 6L. May be convened with 533.

434. Kinship and Social Organization (3) II Principles in the comparative study of social systems; types of social structure. P. 200, or 9 units of sociology (Identical with Soc. 434) May be convened with 534. Writing-Emphasis Course.*

435. Principles of Archaeological Fieldwork (3) If Introduction to the principles of archaeological fieldwork, with emphasis on method and theory of survey and excavation. 2R, 3L. P. 235. May be convened with 535.

436. Zooarchaeology (3) I Animals in relation to man, with emphasis on past cultures, especially in the Southwest; morphology of animal skeletons; identification and interpretation of fragmentary remains. May be convened with 538.


441. Organization of Museums (3) I An intensive introduction to museum studies, with emphasis on the history, philosophy, structure, and function of museums. May be convened with 541.

442a-442b. Field Training in Archaeology (3-3) S Archaeological methods, theory, and field techniques. 442a: Three-week field excavation and survey. Fee. 442b: Three-week laboratory processing and analysis. Fee. Registration restricted. Contact department for approval. This course must be returned by April 1.

443a-443b. The Archaeology of Neolithic and Bronze Age Greece (3-3) (Identical with Clas. 443a-443b) May be convened with 543a-543b.

445. Museum Exhibition (3) II Method and theory in museum exhibit design. May be convened with 545.

448. Writing Culture (3) [Rpt.] I The development of anthropological writing as it has moved toward cultural critique: the use of knowledge of other cultures to examine the assumptions of our own. Comparison of ethnographic examples. May be convened with 548.

449a-449b. Folklore (3-3) (Identical with Engl. 449a-449b) May be convened with 549a-549b.

450. Social Stratification (3) II Identical with Soc. 450)

451. Archaeology of North America (3) I An intensive survey of the development of culture in North America from the time of the initial peopling of the New World to the historic period. May be convened with 551.

453a-453b. Mesoamerican Archaeology (3-3) I II Development of culture in Mexico and Central America from the origins of agriculture through the Spanish Conquest. 453a: Maya culture. 453b: The culture of Mexico north of the Maya area. 453a is not prerequisite to 453b. (Identical with L.A.S. 453a-453b and M.A.S. 453a-453b) May be convened with 553a-553b. Writing-Emphasis Course.*

454. Andean Archaeology (3) II Development of culture in the Andean countries of South America from hunters and gatherers of the terminal Pleistocene through Inca civilization. (Identical with L.A.S. 454) May be convened with 554.

455. Ethnarchaeology (3) II History, method, and theory of ethnarchaeology with case studies of the use of ethnography in archaeological interpretation and theory-building. May be convened with 555.

456a-456b. Old World Prehistory (3-3) I A survey and interpretation of archaeological evidence for human cultural development of the Old World prior to the appearance of literate societies. 456a: The Paleolithic; from earliest tools to the cave artists at the end of the Ice Age. 456b: From hunting and gathering to megalithic monuments following the Ice Age. May be convened with 556a-556b.

457. Prehistoric Mesopotamia (3) I Theories of the rise of civilization tested against archaeological data from Mesopotamia with comparative material from other areas. Time period: end of the Paleolithic to historic (Sumerian) civilization. (Identical with N.E.S. 457) May be convened with 557.

458. Historical Archaeology (3) II 1991-92 Survey of the basic data and methods of research in the material culture of modern history. The New World from first European contacts to the 20th century. May be convened with 558.

459. Agricultural Economic Development in Latin America (3) II (Identical with A.Ec. 459) May be convened with 559.

461. Archai Greek Sanctuaries (3) I (Identical with Clas. 461)

462. Introduction to Quaternary Ecology (3) I (Identical with Geos. 462)

463. Classical Field Archaeology (3) [Rpt.] I S (Identical with Clas. 463)

464a-464b. Introduction to Dendrochronology (3-3) (Identical with Geos. 464a-464b) May be convened with 564a-564b.


466. Paleoanthropology (3) I Evidence for human and nonhuman primate evolution including laboratory study of fossil casts and modern primate anatomy. P. 265 or consult department before enrolling. May be convened with 566. Writing-Emphasis Course.*

467. Race and Ethnic Relations (3) II (Identical with Soc. 467) May be convened with 567.

468. Human Osteology (3) I Human osteology for the archaeologist and physical anthropologist; techniques of in situ and laboratory identification, preservation and measurement. P. consult department before enrolling. May be convened with 568.

470a-470b. Human Adaptability (3-3) Study of the means by which humans adjust to their environments through the processes of growth and development. Focus is on physiological, nutritional, and epidemiological factors. 470a includes discussion of the biology of human aging. P. 265 or consult department before enrolling. 470a is not prerequisite to 470b. (Identical with Gero. 470a) May be convened with 570a-570b.

472. The Relationship of Early Hominids and Contemporary Faunas (3) I The faunal association of contemporary animals and hominids with prehistoric hominids, the New World. Methods utilized to analyze fossil assemblages when associated with hominids. May be convened with 572.

473. Primate Anatomy (4) I Comparative primate functional anatomy from an anthropological viewpoint including extensive laboratory dissection and study of behavior, ecology, and evolution. P. 265 or consult department before enrolling. May be convened with 573.

474. Ethnobotany (3) II Survey, with emphasis on cultural uses of plants, both past and present, of the world-wide scope of ethnobotany and the theoretical and practical aspects of the emergence of agriculture. P. 8 units of biology or anthropology. May be convened with 574.

475. Origins and Development of Cultivated Plants (3) I Evaluation of theories of origins and early development of cultivated plants in general, with attention given to crop plants of world-wide economic importance and selected crops of local economic importance. Three-day field trip. P. Ecol. 321. May be convened with 575.

476. Language in Culture (3) II Survey of the nature of the interrelationships between language and other cultural phenomena. P. 102, Ling. 101 or Anth. 276. (Identical with Ling. 476) May be convened with 576.


478. Archaeological Analysis with Geographic Information Systems (3) II 1991-92 An overview of computer concepts, techniques, and algorithms fundamental to Geographic Information Systems (GIS). Emphasis is placed on the use of GIS to examine, analyze, and model archaeological and environmental distributions within areas of study. May be convened with 578.

479. Culture and Materials Technology (3) I Investigates the ways in which systems of technology are embedded in a cultural context and the resulting impacts on invention, innovation and conservation, technology transfer, and cultural change. (Identical with Engr. 479 and M.S.E. 479) May be convened with 579.

480. Historical Comparative Linguistics (3) I Types and mechanisms of linguistic change; language and dialect formation; determination of prehistoric connections; reconstruction of proto-languages and cultures, and their origins in time and space. P. 276. (Identical with Ling. 480) May be convened with 580. Writing-Emphasis Course.*
501. Ancient Mesopotamia (3) I A conversational introduction to Third Mesa dialect of Hopi, with emphasis on cultural context and covering essentials of Hopi language structure. (Identical with A.In.S. 482) May be convened with 582.

584a-584b. Akkadian Linguistics (3-3) Introductio to the standard literary language of the Babyloniains and Assyrans. (Identical with N.E.S. 484a-484b) May be convened with 584a-584b.

585. Social Organization of India and Pakistan (3) I (Identical with N.E.S. 485) May be convened with 586.

586. Comparative Community Development (3) I (Identical with Soc. 486) May be convened with 586.

507. Poverty and Health (3) II (Identical with Nrs. 487) May be convened with 587.

588. Governing Science and Technology (3) II (Identical with Geog. 488).

589. Women in Middle Eastern Society (3) I Middle Eastern society viewed from the perspective of women. Examines the extent to which formal definitions of women's nature and roles coincide with women's self-images and activities. (Identical with N.E.S. 490 and W.S. 490) May be convened with 590.

590. Colloquium a. Bilingual Health Communication (3) II (Identical with Nrs. 495a) May be convened with 595a.

596. Seminar f. Ceramic Analysis (3) I May be convened with 596f.

598. Experimental Archaeology (3) I May be convened with 598h.

Writing-Emphasis Courses. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

500. Processes of Culture Change (3) II For a description of course topics, see 400. Graduate-level requirements include an oral presentation and a research paper. (Identical with Hist. 501 and Ju.S. 501) May be convened with 401.

501a-501b. Dynamics of Indian Societies (3-3) I (Identical with A.In.S 501a-501b)

503. Anthropology of Conflict Resolution (3) II For a description of course topics, see 403. Graduate-level requirements include a major term paper. May be convened with 403.

504. Sociology of the Southwest (3) I (Identical with Soc. 504) May be convened with 404.

505. Urban Adaptation of Ethnic Groups (3) I For a description of course topics, see 405. Graduate-level requirements include a major research paper. May be convened with 405.

506. Gender and Social Identity (3) II For a description of course topics, see 406. Graduate-level requirements include additional readings and a detailed research paper. May be convened with 406.

507. History of Anthropological Theory (3) I Survey of the foundations of contemporary theory in the field of cultural anthropology.

508. Anthropology and Public Policy (3) II For a description of course topics, see 408. Graduate-level requirements include a term paper. May be convened with 408.

509. Economic Anthropology (3) II For a description of course topics, see 409. Graduate-level requirements include an in-depth research paper. (Identical with Econ. 509 and L.A.S. 509) May be convened with 409.

510. Ceramic Ethnoarchaeology (3) II 1992-93 For a description of course topics, see 410. Graduate-level requirements include a research paper. May be convened with 410.

511. Anthropology of Religion (3) I For a description of course topics, see 411. Graduate-level requirements include a major term paper. May be convened with 411.

513. Ethnology of the Southwest (3) II For a description of course topics, see 413. Graduate-level requirements include a research paper. May be convened with 413.

514. Later Quaternary Geology (3) I (Identical with Geos. 514).

515. Cultural Ecology of Agrarian Societies in the Middle East (3) II Emphasis is on land tenure, Islamic law, irrigation and agricultural development in the central Middle East, Nile valley, North Africa, and the Sahel from the Middle Ages to the present. May be convened with 415.

516. Contemporary Indian America (3) II For a description of course topics, see 416. Graduate-level requirements include a term paper based on original archival or field research. (Identical with A.In.S. 516) May be convened with 416.

517. Cultures of Ancient Mexico (3) S For a description of course topics, see 417. Graduate-level requirements include a term paper. (Identical with L.A.S. 517) May be convened with 417.

518a-518b. Scientific Illustration-Photography (2 to 4 to 2) (Identical with Ecol. 518a-518b) May be convened with 418a-418b.

519. Psychological Anthropology (3) I For a description of course topics, see 419. Graduate-level requirements include a term paper. May be convened with 419.

520. Contemporary American Culture (3) II For a description of course topics, see 420. Graduate-level requirements include a major term paper. May be convened with 420.

521. Ethnology of North America (3) I For a description of course topics, see 421. Graduate-level requirements include an oral presentation and a research paper. May be convened with 421.

522a-522b. Pre-Columbian Art (3-3) (Identical with Art.H. 522a-522b) May be convened with 422a-422b.

523. Peoples of Mexico (3) II For a description of course topics, see 423. Graduate-level requirements include a term paper based on original archival or field research. (Identical with A.In.S. 523 and L.A.S. 523) May be convened with 423.

524. Theoretical Population Genetics (3) I (Identical with Ecol. 524)

527a. The Prehistory of East Asia (3) I For a description of course topics, see 427a. Graduate-level requirements include a 20 to 30 page research paper. (Identical with E.A.S. 527a) May be convened with 427a.

527b. The Archaeology of Pre-Han China (3) II For a description of course topics, see 427b. Graduate-level requirements include a 20 to 30 page research paper. (Identical with Chn. 527b) May be convened with 427b.


529. Cultures and Societies of Africa (3) II For a description of course topics, see 429. Graduate-level requirements include a problem-oriented paper using ethnographic data. May be convened with 429.

530. The Anthropology of Visual Art (3) II For a description of course topics, see 430. Graduate-level requirements include analyzing and evaluating the history of a specific development project from a social science perspective. (Identical with L.A.S. 531) May be convened with 431.

532. Peoples of the Pacific (3) I For a description of course topics, see 432. Graduate-level requirements include an oral presentation and a research project and paper. May be convened with 432.

533. Laboratory in Zooarchaeology (3) II For a description of course topics, see 433. Graduate-level requirements include a research paper. May be convened with 433.

534. Kinship and Social Organization (3) II For a description of course topics, see 434. Graduate-level requirements include additional readings and a detailed term paper. (Identical with Soc. 534) May be convened with 434.

535. Principles of Archaeological Fieldwork (3) II For a description of course topics, see 435. Graduate-level requirements include a research paper. May be convened with 435.

536a-536b. Medical Anthropology (3-3) I (Identical with L.A.S. 536a) Anthropology of illness and health. Lay perceptions of health, ethnophysiology and pathology; pluralistic ideas about illness experiences; indigenous ideas about preventative and promotive health; folk dietetics; social labeling; and illness responsibility attribution. Emphasis on the study of health culture and how the subjective experience of illness and health is influenced by cultural variables. Draws upon cross-cultural ethnographic research and consideration of American health culture. 536b: Comparative medical systems and healing traditions, regional health arenas, and health care seeking. Topics include folk medicine, traditional medical systems, distinctive illnesses and public health patterns of illness and the use of pluralistic medical resources, and the way in which the practice of biomedicine has been adapted to regional culture. Explores the medical cultures of Mexico and Latin America, Native America, Africa and Asia. 536a is not prerequisite to 536b.
537a-537b. Readings in Akkadian (3-3) Readings in selected literary, religious and economic texts designed not only to improve language mastery but to use those documents in elucidation of specific topics in Mesopotamian culture. P. 484a-484b. (Identical with N.E.S. 537a-537b)

538. Zooarchaeology (3) I For a description of course topics, see 438. Graduate-level requirements include a research paper. May be convened with 438.

539. Beginnings of Animal Domestication (3) I For a description of course topics, see 439. Graduate-level requirements include a research paper. May be convened with 439.

540a-540b. Cross-Cultural Communication (3-3) 540a: Linguistic Fieldwork. 540b: Cultural Fieldwork. 540a is not a prerequisite to 540b.

541. Organization of Museums (3) I For a description of course topics, see 441. Graduate-level requirements include a volunteer project in a local museum providing practical, hands-on experience in museum work. May be convened with 441.

542. Museum Collections Management (3) I Principles and procedures governing the acquisition, documentation, care and use of museum collections. May be convened with 442.

543a-543b. The Archaeology of Neolithic and Bronze Age Greece (3-3) (Identical with Clas. 543a-543b) May be convened with 443a-443b.

544. In the Wake of the Green Revolution (3) [Rpt.] II Survey of agricultural and fisheries production, marketing, and research activities in Sonora, Mexico, locus of "Green Revolution" in wheat breeding. Field trip conducted during Spring Break. P, consult department before enrolling. (Identical with A.Ec. 544)

545. Museum Exhibition (3) II For a description of course topics, see 445. Graduate-level requirements include a concise research paper on some aspect of museum exhibition. May be convened with 445.

546. Museum Conservation (3) II An introduction to the examination of the nature and properties of materials in anthropological collections and their deterioration, restoration, and preservation.

548. Writing Culture (3) [Rpt.] I For a description of course topics, see 448. Graduate-level requirements include a major term paper. May be convened with 448.

549a-549b. Folklore (3-3) (Identical with Engli. 549a-549b) May be convened with 449a-449b.

551. Archaeology of North America (3) I For a description of course topics, see 451. Graduate-level requirements include a research paper. May be convened with 451.

552R. Archaeology of the Southwest (3) I Development of culture in the prehistoric Southwest from the late Pleistocene to the historic period.

552L. Archaeology of the Southwest (3) II The nature of archaeological data recovered in the Southwest, with emphasis on their potential for the drawing of both cultural and chronological inferences.

553a-553b. Mesoamerican Archaeology (3-3) I For a description of course topics, see 453a-453b. Graduate-level requirements include an additional research paper. 553a is not prerequisite to 553b. (Identical with L.A.S. 553a-553b) May be convened with 453a-453b.

554. Andean Archaeology (3) II For a description of course topics, see 454. Graduate-level requirements include two reviews of research monographs. (Identical with L.A.S. 554) May be convened with 454.

555. Ethnoarchaeology (3) II For a description of course topics, see 455. Graduate-level requirements include a research paper. May be convened with 455.

556a-556b. Old World Prehistory (3-3) I I For a description of course topics, see 456a-456b. Graduate-level requirements include a research paper. May be convened with 456a-456b.

557. Prehistoric Mesopotamia (3) I For a description of course topics, see 457. Graduate-level requirements include additional readings and a detailed research paper. (Identical with N.E.S. 557) May be convened with 457.

558. Historical Archaeology (3) II 1991-92 For a description of course topics, see 458. Graduate-level requirements include an additional research paper. May be convened with 458.

559. Agricultural Economic Development in Latin America (3) II (Identical with A.Ec. 559) May be convened with 459.

561. Paleoindian Origins (3) I Chronological development of Paleo-Indian occupation of the New World in relation to environmental changes of the Quaternary Period; site discoveries, case studies, hypothesis on the peopling of the Americas. Field trip. (Identical with Geos. 561)

562. Archaeological Quantitative Methods (3) I Intensive review of the theory and application of statistical and mathematical methods to archaeological data.

563. Evolution of Ancient States and Civilizations (3) II 1992-93 Classical and modern theories used to explain the rise of ancient states and civilizations are evaluated as systems of anthropological logic and for their ability to elucidate the archaeological record. Major topics include the nature of growth trajectories, variability in ancient states, the collapse of states, and constraints of growth in selected areas of the world. P, consult department before enrolling.

564a-564b. Introduction to Dendrochronology (3-3) (Identical with Geos. 564a-564b) May be convened with 464a-464b.

565. Women in International Development (3) II For a description of course topics, see 465. Graduate-level requirements include additional readings and a research paper. (Identical with F.C.R. 565 and L.A.S. 565) May be convened with 465.

566. Paleoanthropology (3) I For a description of course topics, see 466. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, or specialized examinations. May be convened with 466.

567. Race and Ethnic Relations (3) II (Identical with Soc. 567) May be convened with 467.

568. Human Osteology (3) I For a description of course topics, see 468. Graduate-level requirements include an additional research paper. P, consult department before enrolling. May be convened with 468.

570a-570b. Human Adaptability (3-3) For a description of course topics, see 470a-470b. Graduate-level requirements include a substantial research paper on a topic appropriate to the subject matter. (Identical with Gero. 570a) May be convened with 470a-470b.

571a-571b. Applied Medical Anthropology in Western Contexts (3-3) 1992-93 Investigations of the illness experience; symbolic interpretations of medicines and medical procedures; doctor-patient communications and illness narratives. 571a demonstrates the applicability of major social science theories in the related study of health-related behavior. 571b focuses on methods of data collection and presents case studies illustrating the application of methods in the study of designated health problem areas, interviewer transference and issues of reflexivity. P, 536a.

572. The Relationship of Early Hominids and Contemporary Faunas (3) I For a description of course topics, see 472. Graduate-level requirements include a research paper. May be convened with 472.

573. Primate Anatomy (4) I For a description of course topics, see 473. Graduate-level requirements include bimonthly abstracts of papers from recent or current literature. May be convened with 473.

574. Ethnobotany (3) II For a description of course topics, see 474. Graduate-level requirements include bimonthly abstracts of papers from recent or current literature. May be convened with 474.

575. Origins and Development of Cultivated Plants (3) I For a description of course topics, see 475. Graduate-level requirements include bimonthly abstracts of papers from the most recent or current literature. May be convened with 475.

576. Language in Culture (3) II For a description of course topics, see 476. Graduate-level requirements include a critical analysis of a major monograph. (Identical with Ling. 576) May be convened with 476.

577. Discourse and Text (3) II 1991-92 For a description of course topics, see 477. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, or specialized examinations. May be convened with 477.

578. Archaeological Analysis with Geographic Information Systems (3) II 1991-92 For a description of course topics, see 478. Graduate-level requirements include an additional research paper. May be convened with 478.

579. Culture and Materials Technology (3) I For a description of course topics see 479. Graduate-level requirements include an additional research paper. (Identical with M.S.E. 579) May be convened with 479.
580. Historical Comparative Linguistics (3) I
For a description of course topics, see 480. Graduate-level requirements include a research paper. May be convened with 480.

581. Quaternary Palynology (4) II 1991-92 (Identical with Geos. 581)

582. Hopi Language in Culture (3) II For a description of course topics, see 482. Graduate-level requirements include a research paper. (Identical with A.In.S. 582) May be convened with 482.

583. Sociolinguistics (3) I Contributions of the ethnography of communication, language variation studies, and conversational-discourse analysis to the interdisciplinary development of sociolinguistics. (Identical with Ling. 583)

584a-584b. Akkadian Linguistics (3-3) For a description of course topics, see 484a-484b. Graduate-level requirements include additional readings and a detailed research paper. (Identical with N.E.S. 584a-584b) May be convened with 484a-484b.

585. Social Organization of India and Pakistan (3) I (Identical with N.E.S. 585) May be convened with 485.

586. Comparative Community Development (3) I (Identical with Soc. 586) May be convened with 486.

587. Poverty and Health (3) II (Identical with Nurs. 587) May be convened with 487.

588. Clinical Anthropology (3) II I (Identical with Nurs. 588)

590. Women in Middle Eastern Society (3) I For a description of course topics, see 490. Graduate-level requirements include an additional paper. (Identical with N.E.S. 490) May be convened with 490.

595. Colloquium
a. Bilingual Health Communication (3) II I (Identical with Nurs. 595a) May be convened with 495a.

596. Seminar
a. Paleanthropology and Paleolithic Archaeology of Africa (3) II 1992-93 P introductory and upper-division courses in archaeology and physical anthropology.

b. The Dynamics of Human Subsistence (3) I 1991-92 Consult department before enrolling.

c. Pre-Columbian Art (3) [Rpt.] I (Identical with Ar.H. 596e, which is home)

d. Ceramic Analysis (3) I I May be convened with 496f.

e. Experimental Archaeology (3) I I May be convened with 496h.

f. Risk and Society (3) [Rpt.] I (Identical with H.W.R. 596k, which is home)

g. Near Eastern Archaeology (3) [Rpt.] I II (Identical with N.E.S. 596q, which is home)

r. Quaternary Geochronology (1-4) I II (Identical with Geos. 596r, which is home)

597. Workshop
a. Physical and Forensic Anthropology I (2) [Rpt.] I Consult dept. before enrolling.

b. Physical and Forensic Anthropology II (2) [Rpt.] I Consult dept. before enrolling.

600. Survey of Cultural Anthropology (3) I Intensive introduction, overview, and synthesis of cultural anthropology.

635. Foundations of Archaeology (3) II A comprehensive introduction to archaeology, including a survey of major problems in the cultural record and the methods and concepts employed in archaeological research and interpretation.

636. Foundations of Archaeological Interpretation (3) I Surveys the history of archaeological interpretation. Central concepts in archaeological method and theory are presented. Open only to graduate students with a concentration in archaeology.

642a-642b. Advanced Field Course in Archaeology (3-3) S Archaeological methods, theory, and field techniques. 642a: Three-week field excavation and survey. Fee. 642b: Three-week laboratory processing and analysis. Fee. Registration restricted. Contact department for application, which must be returned by April 1.

645. Early Civilizations (3) [Rpt./2] I Comparative analysis of early civilizations from both the Old World and the New World, with emphasis on regularities in cultural development. P. 454, 457, or 458f for 454; 455e for 455.

665. Survey of Physical Anthropology (3) II Modern physical anthropology including evolutionary theory, genetics, skeletal biology, primatology, paleoanthropology, human growth, adaptability and demography.


675a-675b. Anthropology and International Health (3-3) 1991-92 675a: An intensive overview of the field of international health and anthropologists' contributions to it. Responses to biotechnology, primary health care and child survival, diseases and development; health care utilization patterns; world systems and multinational pharmaceutical industry; health care bureaucracies; interaction between traditional medicine and public health. 675b: Health transitions and the household production of health with emphasis on anthropological investigations of health within a broader development context. P 536a

679. Language and Ethnography (3) I 1992-93 Training in the use of ethnographic method in linguistic and cultural research where naturally occurring speech is data. Analysis of data from observation, tape recording and videotaping. P. 6 units of linguistics.

680. Survey of Linguistic Anthropology (3) II Major theoretical and methodological issues in linguistic analysis. Language as a cultural code, and physical foundations, universals and typology, language and social reality, textual analysis.

695. Colloquium
a. Forensic Anthropology (2) [Rpt./6 units] II 2R, 1L. P or CR, 468 and 597b.

696. Seminar
a. Archaeology (1-3) [Rpt./3] I II
b. Cultural Anthropology (1-3) [Rpt./3] I II
   (Identical with N.E.S. 696b)

   c. Linguistic Anthropology (1-3) [Rpt./3] I II
d. Physical Anthropology (1-3) [Rpt./3] I II
e. Museology (1-3) [Rpt./3] I II

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**Applied Mathematics (APPL)**

Mathematics Building, Room 414
(602) 621-4664

**Committee on Applied Mathematics (Graduate)**

Professors David Arnett (Physics), Thomas F. Balsa (Aerospace and Mechanical Engineering), Bruce R. Barrett (Physics), Harrison H. Barrett (Radiology), Peter Carruthers (Physics), James M. Cushing (Mathematics), William L. Davis (Radiology), Chandra Desai (Civil Engineering), Donald G. Dudley (Electrical and Computer Engineering), William Faris (Mathematics), Hermann Fasel (Aerospace and Mechanical Engineering), Hermann Flaschka (Mathematics), Barry G. Danapal (Nuclear and Energy Engineering), W. Martin Greenlee (Mathematics), Joseph F. Gross (Chemical Engineering), Robert L. Hamblin (Sociology), Juan C. Heinrich (Aerospace and Mechanical Engineering), David L. Hetrick (Nuclear and Energy Engineering), William B. Hubbard (Lunar and Planetary Sciences), Bobby R. Hunt (Electrical and Computer Engineering), J. Randolph Jokipii (Astronomy, Planetary Sciences), John O. Kessler (Physics), Stephen Koch (Physics), George L. Lamb, Jr. (Mathematics, Optical Sciences), Willis E. Lamb, Jr. (Optical Sciences, Physics), Averill M. Law (Management Information Systems), Eugene H. Levy (Lunar and Planetary Sciences), David O. Lomen (Mathematics), H. Jay Melosh (Lunar and Planetary Laboratory), Pierre Meystre (Optical Sciences Center), Richard E. Michod (Ecology and Evolutionary Biology), Richard L. Morse, Donald E. Myers (Mathematics), Shlomo Neuman (Hydrology), Marcel F. Neuts (Systems and Industrial Engineering), Alan C. Newell (Mathematics, Arizona Research Laboratories), Charles M. Newman (Mathematics), Adrian N. Patrasciou (Physics), Robert Roemer (Aerospace and Mechanical Engineering), Michael L. Rosenzweig (Ecology and Evolutionary Biology), Hanno Rund (Mathematics), William M. Schaffer (Ecology and Evolutionary Biology), Alwyn C. Scott (Mathematics), Moshe Shaked (Mathematics), Vernon L. Smith (Economics), Malur K. Sundaresan (Electrical and Computer Engineering), Terry Triffet (Engineering Mechanics), Thomas L. Vincent (Aerospace and Mechanical Engineering), James R. Wait (Electrical and Computer Engineering), Arthur W. Warrick (Soil and Water Science), Arthur T. Winfree (Ecology and Evolutionary Biology)

Associate Professors Timothy W. Secomb, Acting Chairpersons (Pathology, Arizona Research Laboratories), Ronald G. Askin (Sys-
tems and Industrial Engineering), Adam S. Burrows (Physics), Francois E. Cellier (Electrical and Computer Engineering), Abhijit Chandra (Aerospace and Mechanical Engineering), Peter J. Downey (Computer Science), Nick Eroglu (Mathematics), William Filippone (Nuclear and Energy Engineering), K. Y. Fung (Aerospace and Mechanical Engineering), Thomas Kennedy (Mathematics), Edward J. Kershen (Aerospace and Mechanical Engineering), David Levermore (Mathematics), UD. Manber (Computer Science), S. Mazumdar (Physics), Eugene W. Myers, Jr. (Computer Science), John Palmer (Mathematics), Olgierd Palusinski (Electrical and Computer Engineering), Randall Richardson (Geosciences), Robert Schowengerdt (Electrical and Computer Engineering, Andi Lands, Optical Sciences), Suvaraj Sen (Systems and Industrial Engineering), Michael E. Sobel (Sociology), Dan Stein (Physics), Maciej Wojtkowski (Mathematics), A. Larry Wright (Mathematics), Lai-Sang Young (Mathematics)

Assistant Professors Bruce J. Bayly (Mathematics), Moysey Brio (Mathematics), Cho Lik Chan (Aerospace and Mechanical Engineering), Kwok Wing Chow (Mathematics), Jeffrey B. Goldberg (Systems and Industrial Engineering), Brenton LeMesurier (Mathematics), Jonathan I. Lunine (Planetary Science), Erdogan Madenci (Aerospace and Mechanical Engineering), William C. Tittermore (Planetary Science), J. Bruce Walsh (Ecology and Evolutionary Biology)

The Committee on Applied Mathematics offers courses of study leading to the Master of Science and Doctor of Philosophy degrees with a major in applied mathematics. Support and encourages research in the many areas of physical, biological, social and engineering sciences in which mathematics and modeling play intrinsic roles. For admission and degree requirements, please see the Graduate Catalog.

101. Architecture and Society (3) I An overview of architecture and its relationship to society through a study of its history, its contemporary forms and its future; designed for nonmajors.

112. Introduction to Design Communication (3) I I Overview of the principles of architectural drawing; lectures on various types of design communication supplemented by studio exercises; experience in graphic projections, perspective and freehand sketching.

114. Introduction to Architectural Theory (3) I I A broad introduction to the historical, physical and cultural forces that affect the formation of buildings and physical environments. Lectures with slides examine current and recurring problems and principles.

118. Structure in Architecture (2) I I An introduction to the role of structure in architecture; to the principles of structure, and to the behavior of structural elements, subsystems and systems.

201. Fundamentals of Architectural Design (6) Basic design principles and introduction to the concepts of built form and exterior space, with attention to site analysis and natural siting, horizontal circulation systems, basic materials and structural systems. P, admission to professional phase.

202. Environmental Influences in Architectural Design (6) Design of built form and exterior space, site planning, climatic analysis and passive methods of environmental conditioning, including daylighting; horizontal and vertical systems of circulation, advanced materials and structural systems. P, 201, 212.

212. Design Communication (3) I Methods used to study and communicate architectural ideas, concepts and space. Conceptual diagramming, alternative perspective methods and delineation. P, 112 and admission to professional phase.

222. Techniques of Design Communication (3) II Rendering techniques and media for use in finished architectural presentation. Shade and shadow, entourage, reflections, reproduction techniques, color rendering. P, 201 and 212.

226. Environmental Analysis (2) I Introduction to theory and methods of environmental analysis in architecture including the influences of site, climate and social/physical context. Open to majors only. P, admission to professional phase in architecture.

227. Architectural Programming (2) I I Introduction to theory and methods of architectural programming including influence of users, economics, time, technology, safety, and aesthetics. Open to majors only. P, admission to professional phase of architecture.


263. Architectural Design and Drawing (3) [Rpt.1] I I Studio-based coursework in architectural design or drawing with supplemental lectures. Emphasis in building design, perspective and rendering, or construction documents. Students must select one area of concentration. Open to non-majors.

270. Introduction to Architectural Computing (3) I I Study of micro-computer hardware, software and programming techniques in architecture, including; word processing, spreadsheets, design, data base management, graphics and structured programming using PASCAL. No previous computer experience required. P, professional phase admission.


302. Architectural Design (6) Design of built form with emphasis on theoretical issues, meaning, principles of order; alternative means of enclosing architectural space; synthesis of space, light, structure, materials, and environmental control systems. P, 301.

318. Elements of Structural Systems (3) I Study of systems of forces and rigid bodies in equilibrium, centroids, introductory mechanics of materials, moment and shear diagrams. Response of structural elements to force systems
including shear, compression, and bending stress. P. 118, admission to professional phase.

324. History of Architecture and Western Civilization: Renaissance through 19th Century (3) I History of architecture as a reflection of the western heritage of ideas, values and artistic expression and economic, social, and political conditions. P. for majors, admission to professional phase.

328. Wood and Steel Structural Systems (3) I Analysis and design of structural components and systems constructed of wood and steel including joists, beams, and columns. Analysis and design of members under single and combined loadings. Emphasis on behavior of individual elements and the total system. P. 318.

334. History of Architecture and Western Civilization: 1850 to Present (3) II History of architecture as a reflection of the western heritage of ideas, values and artistic expression and economic, social, and political conditions. P. for majors, admission to professional phase.

335. Construction Systems (3) I Analysis of contemporary systems of building construction with emphasis on assembly and integration of components; construction procedures and sequences; understanding how buildings go together. P. 235. Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

336. Environmental Control Systems (3) I Analysis of contemporary systems of environmental control including heating, ventilation, air conditioning, lighting, power distribution, plumbing, and hygiene. Emphasis on integration of these systems into buildings and understanding the impact of systems upon architectural design and each other. P. 236.

343. Watercolor Techniques for Architects (2) Techniques of watercolor communication utilized in architecture.


402. Topics in Architectural Design (6) Studio work emphasizing design of large buildings or building complexes in one of the following: building design, urban design, campus design, design competitions, computer-aided design. Offerings are limited by faculty availability, and all topics may not be offered each year. Other topics may be convened. P. 401. May be convened with 502.

403. Solar Utilization in the Built Environment (3) I Survey of solar energy utilization principles, methods and case studies focused upon building and site planning design. May be convened with 503.

404. Architecture in Mexico (3) I Study of architectural development in Mexico during the prehispanic, Spanish colonial and contemporary periods, with emphasis on design ideas from each period. May be convened with 504.

412. Topics in Design Communication (3) I [Rpt. 2] Directed studies in advanced design communications. Topics vary. Selected topics may include rendering, design publications, public relations, portfolio preparation. Other topics may be introduced. P. 222, 301. May be convened with 512.

413. Architecture and the Arid Region (2) I Studies of the relationship between architecture and the climatic characteristics of arid regions with emphasis on passive cooling techniques. P. 302. May be convened with 513.

414. History of American Architecture (3) II Developments in American architecture from the colonial to the early modern period. P. 6 units of art history or architectural history. Non-majors may petition to enroll. May be convened with 514.

416. Concrete and Masonry Structural Systems (3) I Analysis and design of structural components and systems constructed of concrete and masonry including slabs, joists, beams, columns, retaining walls, and foundations. Analysis and design of members under single and combined loads using working stress and ultimate strength procedures. Examination of the behavior of individual elements and the total system. P. 318.

422. Urban Design (3) I/II Study of design communication in urban settings including perception, way finding and systems of signage. Class project of a specific urban area required. P. 222, 301; upper-division standing. May be convened with 522.

424. Modern Architecture (3) I Study of recent architectural developments throughout the world, focusing on the personalities, theories and issues influencing built form since 1945. P. 334; upper-division standing. May be convened with 524.

427. Field Methods in Environmental Psychology (3) II (Identical with Psyc. 427) May be convened with 527.


429. Pre-Design Services (3) I Principles and operations of gathering, analyzing, interpreting, translating and presenting information and ideas pertinent to architectural design. P. 302. May be convened with 529.

433. Lightweight Construction Techniques (3) I Survey of lightweight construction techniques, including pneumatics, tensile membranes, three-dimensional cable nets, grid shells and flexure stiff plates. May be convened with 533.

434. History of the American House (3) I Survey of American domestic buildings from European settlement to the present including social, political, and economic forces affecting architectural change. P. 201, admission to professional phase. May be convened with 534.

439. Construction Documents (3) I Content, intent, functions and practice of preparing documents needed for various construction delivery systems. P. 302. May be convened with 539.

444. Site Planning (2) I Studies relating to design determinants for development of outdoor space. Lectures and exercises dealing with individual design criticism including topography, hydrology, site planning, and vegetation. Final project summarizing and applying all criteria to a realistic development project is required. P. 302. (Identical with Plng. 444) May be convened with 544.

451. Emphasis Areas in Architecture (6) I Studio work emphasizing one of the following: desert architecture, community design, historic preservation, design communication, computer-aided design, entrepreneurial design, architectural programming and evaluation. Offerings are limited by faculty availability, and all topics may not be offered each year. Other topics may be introduced. P. 334, 335, 336, 402, 428. May be convened with 551.

452. Senior Project (6) I II Studio-based project demonstrating a synthesis of knowledge or development of theoretical concepts. P. 451.

452H. Honors Senior Project (6) I II Studio-based honors project demonstrating a synthesis of knowledge or development of theoretical concepts. P. 451, admission into honors program.

455. Ethics and Practice (3) I Standards and values of architectural services and professional project and practice management. P. 270 and 402. May be convened with 559.

470. Computer Graphics in Architecture (3) I Introduction to the theory, techniques, and applications of computer-aided design, centering on computers in the design process using two and three dimensional graphics to represent architectural data bases. Lectures and seminars on technical topics, plus intensive experience on graphic work stations. P. 270 and 202. May be convened with 570.

473. Introduction to the Conservation of Cultural Resources (3) I An overview of the Historic Preservation movement in America, including discussion of concepts, rationale for and methods of resource utilization, implementation of plans, legislation, etc. Field trips may be convened with 573.

477. Architecture and Human Process (3) Social science-based theoretical continuum of built environment as human information. Begins with individual responses from environmental psychology, defines social uses of places, and addresses culturally expressive meanings in environment. Projects analyzing actual settings provide the link to design applications. P. 302. May be convened with 577.

480. Computer Applications in Architecture (3) I Advanced self selected projects exploring potential applications in computer-aided design with emphasis on graphic modeling. Seminars on technical topics with intensive use of graphic work stations. P. 470. May be convened with 580.

484. Planning the Built Environment (2) I A lecture survey dealing with the origins and implications of the physical manifestations of communal ordering systems. An analytic vocabulary is developed with which current and historic settlement patterns are visually compared to discover spatial attributes as a dimension of human experience. P. 302 and 334.
487. Space: A Social-Cultural View (3) [Rpt./1] I Human, socio-cultural use of space including processes of symbolic expression. Investigation of the role of space through ethnographic readings describing both ritual and architectural examples. Consult department before enrolling. May be convened with 587.

496. Seminar
a. Readings in Architecture (2-4) [Rpt.] I II Open to majors only. May be convened with 596a.

g. Workshop
b. Special Projects in Architecture (1-3) [Rpt./6 units] I II S Consult college before enrolling. May be convened with 597b.
i. Community Design for Non-Designers (3) I Field trips. Open to nonmajors only. (Identical with L.A. 497i and Ping. 497h) May be convened with 597h.

501. Systems Approach in Architectural Design (6) For a description of course topics, see 401. Graduate-level requirements include additional programming documentation demonstrating theoretical understanding of systems theory in design. May be convened with 401.

502. Topics in Architectural Design (6) For a description of course topics, see 402. Graduate-level requirements include additional documentation of the understanding of the impact of complex buildings on human experience. May be convened with 402.

503. Solar Utilization in the Built Environment (3) I For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper focusing on appropriate design applications of a particular solar strategy. May be convened with 403.

504. Architecture in Mexico (3) I For a description of course topics, see 404. Graduate-level requirements include an additional research paper on a particular aspect of Mexican architecture. May be convened with 404.

512. Topics in Design Communication (3) I II [Rpt./2] For a description of course topics, see 412. Graduate-level requirements include a research paper on one aspect of state-of-the-art design communication techniques. May be convened with 412.

513. Architecture and the Arid Region (2) I For a description of course topics, see 413. Graduate-level requirements include a research paper focusing on a particular passive cooling strategy. May be convened with 413.

514. History of American Architecture (3) II For a description of course topics, see 414. Graduate-level requirements include an additional research paper that focuses on and develops one of the major themes of the course. May be convened with 414.

522. Urban Design (3) [Rpt./6 units] II For a description of course topics, see 422. Graduate-level requirements include an in-depth research paper or project. May be convened with 422.

524. Modern Architecture (3) II For a description of course topics, see 424. Graduate-level requirements include an additional in-depth research paper or project. May be convened with 424.

527. Field Methods in Environmental Psychology (3) II (Identical with Psych. 527) May be convened with 427.

529. Pre-Design Services (3) II For a description of course topics, see 429. Graduate-level requirements include an in-depth research paper focusing on a particular methodology used in architecture programming. May be convened with 429.

533. Lightweight Construction Techniques (3) II For a description of course topics, see 433. Graduate-level requirements include an additional project demonstrating a comprehensive grasp of one lightweight construction technique. May be convened with 433.

534. History of the American House (3) I For a description of course topics, see 434. Graduate-level requirements include an additional research paper. May be convened with 434.

539. Construction Documents (3) I For a description of course topics, see 439. Graduate-level requirements include an in-depth research paper focusing on one particular aspect of developing new techniques in the field. May be convened with 439.

544. Site Planning (2) II For a description of course topics, see 444. Graduate-level requirements include an in-depth research paper focusing on one particular aspect of developing new techniques in the field. (Identical with Ping. 544h) May be convened with 444.

551. Emphasis Areas in Architecture (6) I For a description of course topics, see 451. Graduate-level requirements include additional project development focusing on a particular aspect of the topic under study. May be convened with 451.

559. Ethics and Practice (3) I For a description of course topics, see 459. Graduate-level requirements include an in-depth research paper focusing on a particular aspect of contemporary professional practice. May be convened with 459.

570. Computer Graphics in Architecture (3) I For a description of course topics, see 470. Graduate-level requirements include a special project demonstrating in-depth understanding of one particular theory or technique covered in the course. May be convened with 470.

573. Introduction to the Conservation of Cultural Resources (3) I For a description of course topics, see 473. Graduate-level requirements include an in-depth research paper focusing on a particular concept or methodology utilized in preservation practice. Field trips. May be convened with 473.

577. Architecture and Human Process (3) I For a description of course topics, see 477. Graduate-level requirements include an additional in-depth research paper or project. May be convened with 477.

580. Computer Applications in Architecture (3) II For a description of course topics, see 480. Graduate-level requirements include additional project development demonstrating in-depth comprehension of the potential of the application under study. May be convened with 480.

584. Planning the Built Environment (2) I For a description of course topics, see 484. Graduate-level requirements include an additional research paper that focuses on and develops one of the major themes of the course. (Identical with Ping. 584) May be convened with 484.

587. Space: A Social-Cultural View (3) [Rpt./1] I For a description of course topics, see 487. Graduate-level requirements include an additional research paper that focuses on and develops one of the major topics of the course. May be convened with 487.

596. Seminar
a. Readings in Architecture (2-4) [Rpt.] I II Open to majors only. May be convened with 496a.
b. Special Projects in Architecture (1-3) [Rpt./6 units] I II S Consult college before enrolling. May be convened with 497b.
i. Community Design for Non-Designers (3) I Field trips. Open to nonmajors only. (Identical with L.A. 597i and Ping. 597h) May be convened with 497h.

Committee on Arid Lands Resource Sciences (Graduate)
Professors Paul G. Bartels (Plant Sciences), Robert B. Bechtel (Psychology), Michael E. Bonine (Geography/Near Eastern Studies), Herbert E. Carter (Biochemistry, Emeritus), Dennis C. Cory (Agricultural Economics), Stanley Davis (Hydrology), Michael J. Donoghue (Ecology and Evolutionary Biology), Peter F. FloiUott (Renewable Natural Resources), Martin M. Fogel (Renewable Natural Resources), Kenneth E. Foster (Arid Lands), Roger Fox (Agricultural Economics), Lay J. Gibson (Geography), Gail G. Harrison (Family and Community Medicine), C. Vance Haynes (Anthropology), Helen M. Isbellam (Political Science), Paul S. Martin (Geosciences, Emeritus), Fred S. Matter (Architecture), James W. O'Leary (Plant Sciences/Arid Lands), Stanley J. Olson (Anthropology), Richard W. Reeves (Geography), Michael Schiffer (Anthropology), Donald Slack (Agricultural Engi-
Associate Professors Charles F. Hutchinson, Chair (Arid Lands), D. Robert Atschul (Geography), Bonnie G. Colby (Agricultural Economics), Owen K. Davis (Geosciences), Joseph J. Hofmann, Eric A. Monke (Agricultural Economics), John W. Olsen (Anthropology), Robert Robichaux (Ecology and Evolutionary Biology), Steven E. Smith (Plant Sciences), Barbara N. Timmerner (Arid Lands), James C. Wade (Agricultural Economics), Donovan Wilkin (Renewable Natural Resources)

Assistant Professors Steven P. McLaughlin (Arid Lands), Thomas K. Park (Anthropology)

The Committee on Arid Lands Resource Sciences offers a program of graduate study leading to a Ph.D. degree. The program focuses on the intersection of two or more of the physical, resource, agricultural, and social sciences, as they relate to use and development of arid lands resources. The interested student should request additional information from the coordinator of the program. For admission and degree requirements, please see the Graduate Catalog.

Art (ART/ARH/ARE)

Art Building, Room 104
(602) 621-7570


Associate Professors Rosemarie T. Bernardi, Jerold Bishop, Jackson Boelts, James G. Davis, John F. Henic, Harold H. Jones, D. Keith McElroy, Bart J. Morse, Andrew Polk, Kenneth Shorr, Robert P. Tobias, Gayle E. Wimmer

Assistant Professors Jeannie M. Carrigan, Auremore M. Chabot, Lynn Galbraith, Sheila Pitt, Alfred Quiroz, Jolian Saunders, Stacie G. Widdifield, Jane Welch Williams, Jeryl K. Wood

The Department of Art provides a broad spectrum of theoretical, historical, and creative programs of instruction designed to prepare students for professional careers in studio art, graphic design and illustration, art history, and art education.

The department offers the following degrees: Bachelor of Fine Arts with majors in studio art and art education, and Bachelor of Arts in Art with a major in art history. The graduate degrees of Master of Fine Arts and Master of Arts are also available. For graduate admission and degree requirements, please consult the Graduate Catalog.

The major in studio art is for students planning professional careers as creative artists. The Bachelor of Fine Arts degree requires 45 units to be taken and approved by the major department, including the general education requirements described under the College of Arts and Sciences/Faculty of Fine Arts in this catalog. All BFA students are also required to take at least one 3-unit course specifically focused on gender, race, ethnicity, or non-western civilization. This course can be part of the major, general education, or elective course work selected with the approval of the major advisor. In addition, the student must complete 75 units in art, at least 18 of which must be taken in residence at the University of Arizona. These 75 units in art are subdivided as follows:

Foundations requirements — 15 units: 101, 102, 104, 117, 118.

Distribution requirements — 30 units: 2-Dimensional Studies: 9-12 units chosen from 205, 241, 250, 251, 253, 255, 265, 266, 280. 3-Dimensional Studies: 6-9 units chosen from 271, 273, 276, 287. Art history: 9-12 units of upper-division art history and/or related courses.

Major area of concentration — 24 units in any one emphasis area.

- 2-D (studio emphasis in drawing, painting, the print processes, or an approved combination: 24 units of upper-division studio art courses.

- 2-D emphasis in sculpture, ceramics, fibers, or metals: 24 units of upper-division courses including 15 units in primary medium and 3 units in each of 2 secondary media.

Photography emphasis: 24 units of upper-division courses to be selected from 341, 342, 344, 445, 447, and 590p.

Graphic Design emphasis: 24 units of upper-division courses including 364, 365, 368, 369, 464, 465, 468 (twice).

Illustration emphasis: 24 units of upper-division courses including 363, 364, 365, 366, 367, 466, 467, and 469.

Art education: 6 units from other courses in studio art and/or art history.

The major in art education is for students planning to teach art in the elementary and secondary schools. Graduates qualify for the K-12 Art Specialist Endorsement on a Secondary Certificate for the State of Arizona. This program approximates certification requirements of most states. At least 12 units of art must be taken in residence at the University of Arizona.

In addition to the general education requirements for the Bachelor of Fine Arts degree described under the College of Arts and Sciences/Faculty of Fine Arts in this catalog, the following major area of study requirements must be met: 101, 102, 104, and 6 credits from 271, 273, 276, 287, and 9 units of upper-division course work in one area (ceramics, sculpture, fibers, metals).

Graphic Design: Required courses include 101, 102, 118, 250, 351, 453, 455.

Photography: 241, 341, 343, 346, 441, 443.

3-D Studio: Required courses are 101, 102, 104, and 6 credits from 271, 273, 276, 287, and 9 units of upper-division course work in one area (ceramics, sculpture, fibers, metals).

Graphic Design: Required courses include 101, 102, 118, 250, 351, 453, 455.

For the art history minor, required courses are 101, 102, 118, and 15 upper-division units in art history.

Writing-Emphasis Course: A writing-emphasis course may be selected from specifically designated 400 level art history courses. Students must have passed the writing proficiency examination or completed work in lieu of a 400 level writing-emphasis course. Consult advisor before selection. (See "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog.)

The Department of Art participates in the Honors Program.
101. Drawing (3) II S Visual perception and the principles of composition presented through various drawing problems and materials. 6S.

102. Color and Design (3) II S Elements and principles of two-dimensional composition, with emphasis on color mixing, interaction and control. 6S.

104. Three-Dimensional Design (3) III Study of volume, mass, and space relationships through modeling, casting, carving, and construction. 6S. Fee.

205. Figure Drawing I (3) III Drawing from the model and other subjects to develop pictorial and perceptual skills. 6S. P, 101.

241. Beginning Photography (3) [Rpt./2] II Fundamental techniques and aesthetics of relief printmaking. 6S. Fee. P, 101, 102. or permission of department.

250. Relief Printmaking I (3) III Introductory course in the fundamental techniques and aesthetics of relief printmaking. 6S. Fee. P, 101, 102.

251. Intaglio (3) III Introductory course in the fundamental techniques and aesthetics of intaglio printmaking with emphasis on etching. 6S. Fee. P, 101, 102, or permission of department.

253. Alternative Methods in Printmaking I (3) III I Introductory course in the nontraditional approaches to printmaking. Monotype, industrial techniques, and handmade paper. 6S. Fee. P, 101, 102, or permission of department.

255. Lithography I (3) III Introductory course in the fundamental techniques and aesthetics of black and white, and color lithography. Stone and metal plate processes are covered. 6S. Fee. P, 101, 102, or permission of the department.


266. Beginning Illustration I (3) III Exploration of principles of techniques, styles and media for illustration. 6S. Fee. P, 102, 205, 265.

271. Beginning Jewelry and Metalsmithing I (3) III Introduction to the fundamentals of jewelry and metalwork processes. 6S. Fee. P, 104.

273. Beginning Ceramics I (3) III Introduction to the basic clay processes of hand construction, potter's wheel, surface decoration and glaze application, kiln firing and ceramic history. 1R. 4S. Fee. P, 104.

276. Beginning Fibers I (3) II Structural development of fibers into woven forms, using the frame loom; fiber as a fine arts medium. 6S. Fee. P, 104.

280. Painting I (3) III Elementary course in the methods and techniques of painting with oils and/or acrylics. 6S. P, 101, 102.


287. Beginning Sculpture I (3) III I Composition in various sculpture techniques. 6S. Fee. P, 104, 205.

295. Figure Drawing II (3) [Rpt./2] III Intermediate course in drawing problems using the model. 6S. P, 205.

314a-341b-341c. Intermediate Photography (3-3-3) III Principles and processes of photography. 341a: Introduction for artists to the principles and nature of black-and-white documentary photography. 341b: Creating untrue narrations; students are challenged to deconstruct the familiar photo essay and create new ways of telling stories. 341c: Introduction to principles of synchronized color slide-audio tape production for artists. 341a is not prerequisite to 341b, etc. 2R, 2S. Fees. P, 241, acceptance by portfolio.

342. Photography Since 1950 (3) III I Slide presentations and discussions of major photographers since 1950. 2R, 2S.

343a-343b. Photographic Techniques (3-3) III 343a: Fundamentals of exposure and development control, print control, studio and portrait lighting, slide copying and view camera operation. 343b: Manipulation and extension of boundaries of traditional photography using polarized light, perpendicularly, montage, toning and bleaching. 343a is not prerequisite to 343b. 2R, 2S. Fees. P, 241.


350. Relief Printmaking II (3) III Intermediate course in the techniques and aesthetics of relief printmaking. Continuation of 250. 6S. Fee. P, 250.

351. Intaglio II (3) III Intermediate course in techniques and aesthetics of intaglio printmaking. Continuation of 251. 6S. Fee. P, 251.


355. Lithography II (3) III Intermediate course in stone and metal plate lithography. Continuation of 255. 6S. Open to majors only. Fee. P, 255.

356. Intermediate Printmaking (3) [Rpt./6 units] III Intermediate course in printmaking with emphasis on format aesthetics and personal expression. 6S. Open to majors only. Fee. P, 250, 251, 253, or 255.

363. Typography I (3) II I GRD The study of letterforms and their appropriate and effective use in visual communications, from a historic as well as from a contemporary perspective. 6S. Fee. P, 285, acceptance of portfolio.

365. Intermediate Graphic Design I (3) [Rpt./1] III Preparation of visual material for reproduction by various printing processes. 6S. Fee. P, 265, 266, and acceptance of portfolio.

365. Intermediate Graphic Design II (3) [Rpt./1] II Further exploration of design as a communications tool. Solutions to realistic promotional programs are executed from rough to comprehensive stage. 6S. Fee. P, 102, 205, 265, acceptance of portfolio.

366. Rendering Techniques I (3) [Rpt./1] I Drawing and rendering techniques with various media in the creation of editorial and advertising illustration. 6S. Fee. P, 265, 266, acceptance of portfolio.


371. Intermediate Jewelry and Metalsmithing I (3) [Rpt./2] I Design and creation of jewelry and metalsmithing forms by construction methods. Emphasis on form development through raising, forging, repousse, casting, etc. 6S. Fee. P, 271.

372. Intermediate Jewelry and Metalsmithing II (3) [Rpt./2] II Emphasis on surface enrichment through stone setting, reticulation, enameling, mokume, etc. 6S. Fee. P, 271.


376. Intermediate Fibers I (3) [Rpt./3] III Two-dimensional fibers techniques including harness loom weaving (loom and weaver-controlled weaves) and tapestry weaving (cartoon as well as spontaneous methods). Emphasis on individual interpretation of traditional woven techniques. 6S. P, 276.


380. Painting II (3) [Rpt./2] II Intermediate course in developing expressive and pictorial skills in oil and/or acrylic media. 6S. P, 280.


386. Intermediate Sculpture I (3) III I In-depth exploration of the media and concepts of sculpture. 6S. Fee. P, 287.

405. Figure Drawing III (3) [Rpt./5] II Advanced drawing with emphasis on personal expression development. 6S. P, 6 units of 305.

409. Drawing Critique I (3) [Rpt./5] II Individual exploration and development of visual concepts through drawing, accompanied by individual and class critiques. P, 6 units of 405.

441. Advanced Photography I (3) [Rpt./1] II Current trends, philosophies and experimentation in art photography. 2R, 2S. Fee. P, 341, acceptance of portfolio. May be convened with 541.


446. Experimental Color Photography I (3) [Rpt./1] I Nontraditional approaches to color photography including the use of black-and-white and color negatives, manipulation of the negative, dye and paints applied to the print. Development of personal vision encouraged. 2R, 2S. Fee. P. 241; 341a, 341b or 341c, acceptance by portfolio. May be convened with 546.

473. Mixed Media Book I (3) [Rpt./1] II Investigation of the book as a format for presenting visual material; the process of making simple books. Contemporary bookmakers will be pre-
485. Graphic Design Studio (3) [Rpt./1] I Classroom experience in a professional designer capacity with studio solutions to graphic design problems submitted from campus and community. 6S. Field trips. Consult department before enrolling. Fee. P. 9 units of graphic design courses, acceptance of portfolio. May be convened with 566.

486. Experimental Illustration (3) [Rpt./2] II Experimentation, interpretation and problem-solving through illustration. 6S. Field trips. Fee. P. 368, 369, acceptance of portfolio.

487. Portfolio Preparation (3) [Rpt./1] II Final approach to completion of portfolio. Student's portfolio is critiqued in areas of order, style, and degree of presentation to bring it to a professional level. 6S. Fee. P. 9 units of metalwork. May be convened with 571.

488. Video for Artists (3) [Rpt./4] I Advanced study in the various materials and methods in the construction of jewelry and metalwork. 6S. Field trips. P. 12 units of studio art courses. May be convened with 547.

489. Combining Media (3) [Rpt./5] I II Individual and group projects, including collages, constructions, image sequences, and elements from other art forms (sound, language, movement, etc.). May be convened with 583.


491. Advanced Sculpture (3) [Rpt./5] I II 6S. Fee. P. 387.

492. Workshop a. Gallery Management (3) [Rpt./2] II Field trips.

500. Graduate Figure Drawing (3) [Rpt./5] I II Special problems in drawing, using the classroom model and outside sources as references for personal expression. 6S.

501. Graduate Drawing Critique (3) [Rpt./5] I Individual exploration in drawing media and visual concepts. Classroom and individual critiques.

502. Advanced Photography (3) [Rpt./1] I II For a description of course topics, see 441. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Fee. P. 341, acceptance of portfolio. May be convened with 441.

503. Photographic Processes (3) [Rpt./2] I For a description of course topics, see 445. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Fee. P. 341, acceptance of portfolio. May be convened with 445.

504. Experimental Color Photography (3) [Rpt./1] I For a description of course topics, see 446. Graduate-level requirements include more rigorous grading and expectation. 2R, 2S. Fee. May be convened with 446.

505. Mixed Media Book (3) [Rpt./1] I II For a description of course topics, see 447. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Field trips. P. 12 units of studio art courses. May be convened with 447.

506. Video for Artists (3) [Rpt./5] I II For a description of course topics, see 448. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Field trips. P. 12 units of studio art courses. May be convened with 448.

507. Graduate Relief Printmaking (3) [Rpt./1] I II Relief printmaking with emphasis on individual research, personal direction and professional standards. 6S. Fee.

508. Graduate Intaglio (3) [Rpt./1] I II Intaglio printmaking with emphasis on individual research, personal direction and professional standards. 6S. Fee.

509. Graduate Alternative Methods in Printmaking (3) [Rpt./2] I II For a description of course topics, see 453. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Field trips. P. 12 units of studio art courses. May be convened with 453.

510. Graduate Lithography (3) [Rpt./1] I II Lithography with emphasis on individual research, personal aesthetic, and professional standards. 6S. Fee.

511. Graduate Graphic Design Projects (3) [Rpt./1] I II Two- and three-dimensional design considerations with emphasis on conceptualization and presentation. 6S. Field trips. Fee. P. acceptance of portfolio.

512. Final Examination (3) [Rpt./1] I II For a description of course topics, see 466. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Fee. P. 9 units of illustration courses and approval of portfolio. May be convened with 466.

513. Advanced Jewelry and Metalsmithing I (3) [Rpt./4] I Advanced study in the various materials and methods in the construction of jewelry and metalwork. 6S. Fee. P. 9 units of metalwork. May be convened with 571.

514. Advanced Jewelry and Metalsmithing II (3) [Rpt./1] I II High level experimentation in personal expression with watercolor and related media. Demonstration and critique.
317. Western Civilization and the Arts: Baroque through Nineteenth Century (3) II (Identical with F.A. 317)

*Not for credit toward the completion of the art history major.

319. Introduction to American Art (3) II Survey of American architecture, painting, sculpture, photography, and the decorative arts from colonial times to present.

320. Introduction to European Modern Art (3) I Painting and sculpture in Europe from about 1886 to recent times.

321. Introduction to Contemporary Art (3) I Survey of contemporary art in the United States and Europe since the 1960s. P, 118.

322. Introduction to Prehispanic, Hispanic and Chicano Art (3) II 1992-93 Survey of the native, prehispanic arts of Meso-, Central and South America; art since the conquest of Mexico, Central and South America; and Hispanic arts of the Southwest and contemporary Chicano art.

329. Art History of the Cinema (3) I (Identical with Clas. 329)

334. Art and Archaeology of Ancient Egypt (3) II 1991-92 (Identical with Clas. 334)

410a-410b. Introduction to Classical Art and Archaeology (3-3) 1991-92 (Identical with Clas. 340a-340b)

412a-412b-412c-412d. Medieval Art (3-3-3-3) The history of art and architecture in Western Europe and Byzantium between ca. 300 and ca. 1300. 412a: Early Christian and Byzantine Art. 412b: Early Medieval Art. 412c: Romanesque Art. 412d: Gothic Art. 412a is not prerequisite to 412b, etc. May be taken with 512a-512b-512c-512d.

413a-413b-413c. Renaissance Art in Italy (3-3-3) 13th-14th centuries. 413b: 15th century. 413c: 16th century. 413a is not prerequisite to 413b or 413c. May be taken with 513a-513b-513c.

414a-414b. Northern Renaissance Art (3-3) 414a: Development of Netherlandish painting during the late 14th through the 15th centuries. 414b: Art of the Reformation (16th century) in Germany and the Netherlands. P, 6 units of art history. 414a is not prerequisite to 414b. May be taken with 544a-544b.

417a-417b. 19th-Century European Art (3-3) Painting and sculpture. 417a: From the French Revolution to about 1850. 417b: From about 1850 through Impressionism. P, 6 units of history or art history. May be taken with 517a-517b.

418a-418b. 20th-Century Art (3-3) Painting and sculpture in Europe. 418a: 1886 to World War I. 418b: Between the World Wars. P, 6 units of history or art history. 418a is not prerequisite to 418b. May be taken with 518a-518b.

422a-422b. Pre-Columbian Art (3-3) 422a: Art of the high cultures of Mesoamerica, with particular attention to the Andean area. 422a is not prerequisite to 422b. May be taken with 522a-522b.

423a-423b. The Art of Mexico (3-3) 423a The art of Colonial Mexico, from the early 16th century to the late 18th century. The effects of the Spanish conquest on native traditions; public, private and sacred patronage; the effects of the Bourbon reforms. Painting, sculpture, architecture, graphic and minor arts. 423b: The art of Modern Mexico, from the late 18th century to the early 20th century. The Independence Period, the National Period, and the Revolutionary Period. Painting, sculpture, architecture, graphic and minor arts. 423a is not prerequisite to 423b. May be taken with 523a-523b.

424a-424b. History of Photography (3-3) 424a: From its invention to 1935; impact of photography on the art and culture of the 19th century. 424b: As an art medium from 1935 to 1965. P, 6 units of art history. 424a is not prerequisite to 424b. May be taken with 524a-524b.


426. 17th- and 18th-Century Art in Italy (3) Painting, sculpture, and architecture of the Baroque and subsequent periods. P, 6 units of history or art history. May be taken with 526.

429a-429b-429c-429d. American Art Anthology (3-3-3-3) 429a: Colonial art. 429b: 19th century art. 429c: From 1900 through 1940. 429d: Twentieth century American art from the 1930s to recent times. May be taken in any order. P, 6 units of history or art history. May be taken with 529a-529b-529c-529d.

545. Greek and Roman Sculpture (3) (Identical with Clas. 454) May be taken with 554.

546. Greek and Roman Painting (3) (Identical with Clas. 456) May be taken with 556.

547. Greek Architecture (3) (Identical with Clas. 457) May be taken with 557.

548. Contempory Theory and Criticism (3) I Discussion of the theory and criticism of contemporary art since 1960 based on assigned readings and slide presentations. Field trips. May be taken with 548.

549. Roman Art and Architecture (3) (Identical with Clas. 484) May be taken with 584.

511. Methods of Art History (3) I Major intellectual approaches to the visual arts developed within the past 150 years. Field trips. Open to majors only.

512a-512b-512c-512d. Medieval Art (3-3-3-3) For a description of course topics, see 412a-412b-412c-412d. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. May be taken in any order. P, 6 units of history or art history. May be taken with 412a-412b-412c-412d.

513a-513b-513c. Renaissance Art in Italy (3-3-3) For a description of course topics, see 413a-413b-413c. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. May be taken with 413a-413b-413c.

514a-514b. Northern Renaissance Art (3-3) For a description of course topics, see 414a-414b. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. May be taken with 414a-414b.
of current scholarly interest. P, 6 units of history or art history. 514a is not prerequisite to 514b. May be convened with 414a-414b.

517a-517b. 19th-Century European Art (3-3) For a description of course topics, see 417a-417b. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P, 6 units of history or art history. May be convened with 417a-417b.

518a-518b. 20th-Century Art (3-3) For a description of course topics, see 418a-418b. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P, 6 units of history or art history. 518a is not prerequisite to 518b. May be convened with 418a-418b.

522a-522b. Pre-Columbian Art (3-3) For a description of course topics, see 422a-422b. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. 522a is not prerequisite to 522b. May be convened with 422a-422b.

523a-523b. The Art of Mexico (3-3) I-II For a description of course topics, see 423a-423b. Graduate-level requirements include a critical bibliography as well as a research paper. 523a is not prerequisite to 523b. May be convened with 423a-423b.

524a-524b. History of Photography (3-3) For a description of course topics, see 424a-424b. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P, 6 units of history or art history. 524a is not prerequisite to 524b. May be convened with 424a-424b.

525. Northern Baroque Painting (3) I-II For a description of course topics, see 425. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P, 6 units of history or art history. May be convened with 425.

528. 17th- and 18th-Century Art in Italy (3) For a description of course topics, see 428. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P, 6 units of history or art history. May be convened with 428.

529a-529b-529c-529d. American Art (3-3-3-3) For a description of course topics, see 429a-429b-429c-429d. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. May be taken in any order. P, 6 units of history or art history. May be convened with 429a-429b-429c-429d.

554. Greek and Roman Sculpture (3) (Identical with Clas. 554) May be convened with 454.

556. Greek and Roman Painting (3) (Identical with Clas. 556) May be convened with 456.

557. Greek Architecture (3) (Identical with Clas. 557) May be convened with 457.

581. Contemporary Theory and Criticism (3) I-II For a description of course topics, see 481. Graduate-level requirements include an in-depth research project on a single aspect of current scholarly interest. Field trips. May be convened with 481.

584. Roman Art and Architecture (3) (Identical with Clas. 584) May be convened with 484.

ART--ASTRONOMY 117

Astronomy (ASTR)

949 N. Cherry Avenue, Room 203 (602) 621-2288

Professors Peter A. Strittmatter, Head, J. Roger Angel, W. David Arnett, John Black, Thomas Gehrels (Lunar and Planetary Laboratory), William F. Hoffmann, J. R. Jokipii, James W. Liebert, Frank J. Low, George H. Rieke, Elizabeth Roemer, Thomas L. Swihart, Rodger I. Thompson, William G. Tifft, Simon White (Physics), Neville J. Woolf (Physics)

Associate Professors John Bieging, Adams Barrows, William J. Cocke, Robert C. Kennicutt, Jr., Andrzej G. Pacholczyk, Marcia Rieke, Gary D. Schmidt, Raymond E. White, Erick T. Young

Assistant Professors Jill Bechtold, Christopher Impey

Adjunct Professor Charles J. Lada

The Department of Astronomy offers the degrees of Bachelor of Science and Bachelor of Arts with a major in astronomy. Graduate programs leading to the Master of Science and
Doctor of Philosophy are also offered. For graduate admission and degree requirements, consult the Graduate Catalog.

The major for the B.S. is designed for students who plan to pursue graduate studies in astronomy or a related science. The requirements for the major are 30 units of courses in astronomy, physics, and mathematics, including Astr. 301, 311, and 400a-400b. Courses at the 100 level do not qualify. At least 20 units must be from the upper division. Courses are to be selected in consultation with the departmental advisor.

Entering freshmen should take a mathematics class (Math. 117e and/or Math. 118, or Math. 125a), followed by Astr. 301 and Phys. 110. The supporting minor should be physics, although other minors may be selected with the consent of the advisor. A double major in astronomy and physics is also possible.

The major for the B.A. is oriented toward students with interests in science education, such as high school or junior college teaching, planetarium work, library science, and journalism. The requirements for the major are 30 units including 120, 301, 311, and 400a. The remaining units must be chosen from science, mathematics, engineering, or history or philosophy of science. Courses at the 100 level may be counted only if they are in the Astronomy Department. The minor need not be in the sciences.

With foresight in course selection, a student could maintain the option of obtaining either the B.S. or the B.A. degree into the senior year.

The department participates in the Honors Program.

100.* Essentials of Astronomy (3) I II S A survey of astronomy, with attention to its interdisciplinary aspects and its relationships to other sciences. Planetarium work and some night-time observing sessions and field trips supplement class lectures. Primarily for non-science majors.

101L Astronomy Laboratory (1) I I S Projects, telescope observing, planetarium work, discussions. Can be taken alone or with 100. Combination is equivalent to 110a.

105. The Universe and Humanity: Origin and Destiny (3) I I (Identical with Pys. 105)

106. Survey of the Solar System (4) I I (Identical with Pys. 106)

110a-110b.* Introductory Astronomy (4-4) A broad introduction to traditional and modern astronomy combining class lectures, planetarium and lab. work, and night-time observing and field trips. 110a: P, one semester high school algebra. 110b: P, 100 or 110a.

*Credit will be allowed for only one of the following: 100 or 110a.

120. Philosophical and Historical Aspects of Astronomical Thought (3) I I Historical development of astronomical concepts and the scientific method; cosmological concepts from ancient times to the present; controversies in astronomy in the recent past and at present.

301. Astronomy (3) I A quantitative approach to general astronomy, P, Math. 125a; CR, Phys. 110 or 111a.

302. Introduction to Observational Astronomy (3) I Observational applications of coordinate systems and time; basics of astronomical instruments; photodetectors; measuring equipment and reduction techniques. Practice in observing, 2R, 3L. P, Math. 125a.

311. Classical and Solar System Astronomy (3) I I Coordinated systems and time; orbits and ephemeredes; atmospheres, surfaces, and interiors of planets and satellites; the small bodies; the Sun; origins, P, CR Phys. 410.

300a-400b. Theoretical Astrophysics (3-3) Stars, interstellar matter, galaxies, radio sources, cosmology. P, Math. 254, 6 units upper-division physics. 400a is a Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).


502. Astronomical Instrumentation Project (3) I I 1991-92 Design, construction, and testing of an astronomical instrument chosen by each student under the guidance and supervision of the instructor. Regular class sessions are devoted to discussing techniques and reporting progress and problems.


515. Interstellar Medium and Star Formation (3) II 1992-93 Derivation of physical conditions from spectral data. Ionized, atomic and molecular clouds, interstellar dust and magnetic fields. Ionization equilibrium, heating and cooling, shocks, dynamics, collapse and fragmentation, outflows and protostellar evolution.

516. Modern Astronomical Instrumentation and Techniques (3) I I 1991-92 Radiant energy; signals and noise; detectors and techniques for imaging, photometry, polarimetry and spectroscopy. Examples from stellar and planetary astronomy in the x-ray, optical, infrared and radio. (Identical with Pys. 516)

522. Atomic and Molecular Astrophysics (3) I I 1992-93 Interpretation of astronomical spectra: basics of atomic and molecular spectra and processes that enable one to infer physical conditions in astronomical environments from analysis of their electromagnetic spectra. Familiarity with basic quantum mechanics is assumed.

523. Statistical Mechanical Problems in the Space Sciences (3) I I 1992-93 (Identical with Pys. 523)


541. Extragalactic Astronomy and Cosmology (3) I I 1992-93 The structure, origin and evolution of the physical universe from theory and observations of systems outside our own galaxy. Relativistic cosmology; galaxy evolution and clustering; active galaxies and quasars; the microwave background; galaxy formation; the hot big bang; and physics of the early universe. P, 540.

545. Stellar Atmospheres (3) I 1991-92 Radiative transfer, gray atmosphere, opacity, line formation, non-LTE, curves of growth, stellar hydrodynamics, planetary applications. (Identical with Pys. 545)


555a-555b. Electrodynamic Processes in Conducting Fluids and Plasmas (3-3) 1992-93 (Identical with Pys. 555a-555b)

575. General Relativity and Cosmology (3) I I 1992-93 General relativity with application to celestial mechanics, stellar structure, gravitational radiation, black holes, gravitational lensing and cosmology. Cocke

582. High Energy Astrophysics (3) I I 1991-92 Radiation mechanisms, synchrotron radiation, charged particle acceleration, pulsars, black holes, accretion disks, X-ray binaries, gamma-ray sources, radio galaxies, active galactic nuclei. (Identical with Phys. 582 and Pys. 582)


589. Topics in Theoretical Astrophysics (3) (Rpt.) I (Identical with Phys. 589)

Atmospheric Sciences

Physics-Atmospheric Sciences Building, Room 542
(602) 621-6831

Professors E. Philip Krider, Head, George A. Dawson, Robert E. Dickinson, Robert L. Gail, Benjamin M. Herman, A. Richard Kasander, Jr. (Emeritus), Richard M. Schotland, William D. Sellers, Dean O. Staley
Associate Professor Kenneth C. Young Assistant Professors Eric A. Betterton, Steven L. Muller, Joseph A. Zehnder

The department offers the degrees of Bachelor of Science, with a hydrometeorology option. Master of Science, and Doctor of Philosophy, all with a major in atmospheric sciences.

The major: 30 upper-division units in Atmo- sphere Sciences. The following courses are required: Math. 124 or 125a, 125b, 223, 254: Stat. 361 or 461 or Atmo. 463; Engr. 101 (or Trans.) Phys. 110, 116, 121, Chem. 103a-103b, 104a-104b; Atmo. 300, 350, 441a-441b, 451a, 465, 471. Students selecting the hydrometeorology option do not need to take Chem. 103b-104b, but must take H.W.R. 250, 440, and 445, which will count as 7 of the 30 upper-division units in Atmospheric Sciences.

The minor: The department offers a structured minor consisting of Math. 124 or 125a, 125b, 223, 254 and Phys. 110, 116, 121.
For graduate admission and degree requirements, consult the Graduate Catalog.

The department participates in the honors program.

71. Introduction to Meteorology and Climatology (3) I II Basic elements that constitute the weather, including fronts and cyclones, precipitation processes, the wind systems of the world, severe storms, and weather modification. P, Math. 116/S. Credit will not be given for both 236b and 171. (Identical with Geog. 171)

236a-236b. A Survey of the Atmospheric Sciences (4-4) Quantitative introduction to the chemistry, physics and dynamics of the atmosphere. Topics include air pollution, stratospheric ozone, greenhouse effects, structure of the atmosphere, global circulation, development of weather patterns and severe storms. 236a emphasizes chemical processes; 236b emphasizes physical and dynamical processes. 3R, 3L. Credit is allowed for 236b or 171, but not for both. P, Math 117R/S.

300. General Meteorology (3) I Survey of physical and dynamical meteorology, recommended for students wanting a more quantitative approach to meteorology than provided in 171. P, Math. 123.

336. Weather, Climate and Society (3) I The effects of weather on society, including its influence on history, comfort and health, and music and art.


421. Physical Climatology (3) II Heat and water balances of the earth-atmosphere system viewed from both the local and global scales; paleoclimatology and theories of climatic change; relations impact on climate. P. 171. May be convened with 521.


441a-441b. Dynamic Meteorology (3-3) Thermodynamics and its application to planetary atmospheres, hydrostatics, fundamental concepts and laws of dynamic meteorology. P, Phys. 121; Math. 254. (Identical with Ptsy.S. 441a-441b) May be convened with 541a-541b.

451a-451b. Introduction to Physical Meteorology (3-3) Introduction to atmospheric physics that includes chemistry of the atmosphere, kinetic theory, the gas law and transport coefficients, the mechanics of ideal and real fluids, aerosol mechanics, atmospheric acoustics, atmospheric radiation, scattering, radiative transfer, atmospheric optics, cloud physics, and atmospheric electricity. P, Phys.
Biochemistry (BIOC)

Biochemical Sciences West Building, Room 357
(602) 621-5770

Professors Michael A. Wells, Head, Hans J. Bohnert (Molecular and Cellular Biology, Plant Sciences), Michael F. Brown (Chemistry), Herbert E. Carter (Emeritus), Michael A. Cusanovich (Chemistry), Leslie S. Forscher (Chemistry), Eugene W. Gerner (Radiation Oncology), William J. Grimes (Molecular and Cellular Biology), Darrel E. Goll (Animal Sciences), Richard B. Hallick (Molecular and Cellular Biology), David J. Hartshorne (Animal Sciences), Mark R. Haussler, John G. Hildebrand (Molecular and Cellular Biology, Division of Neurobiology/ARL), Victor J. Hurby (Chemistry), Richard G. Jensen (Plant Sciences), Henry Koffler (Microbiology and Immunology; Molecular and Cellular Biology), John H. Law (ARL, Division of Biotechnology), David W. Mount (Molecular and Cellular Biology), David F. O'Brien (Chemistry), John S. Rupley (Chemistry), Eugene G. Sander, Gordon Tolin (Chemistry), Marc E. Tischler (Physiology), Henry I. Yamamura (Pharmacology, ARL)

Associate Professors Don P. Bourque (Molecular and Cellular Biology), Danny L. Brown (Molecular and Cellular Biology), Louise M. Caracciolo (Family and Community Medicine), Carol L. Diekmann (Molecular and Cellular Biology), Robert J. Gillies (Radiology), Jennifer D. Hall (Molecular and Cellular Biology), Martinez J. Hewlett (Molecular and Cellular Biology), John W. Little (Assistant Professor, Molecular and Cellular Biology), Neil E. MacKenzie (Pharmaceutical Sciences)

Assistant Professors James F. Deatherage (Molecular and Cellular Biology), Roger L. Miesfeld (Molecular and Cellular Biology), William R. Montfort, Elizabeth Vierling (Molecular and Cellular Biology)

Biochemistry provides the fundamentals for study of the molecular principles in biology, medicine, and the health sciences and agricultural sciences. Teaching and research in biochemistry are carried out in several locations in the University. The faculty members listed above constitute the University Department of Biochemistry, which is responsible for instruction in biochemistry in the Colleges of Agriculture, Arts and Science, and Medicine. These programs serve as an excellent background for professional schools of medicine, dentistry and graduate study in biochemistry or the many health-related sciences, including a major preprofessional program for qualification for professional schools of medicine, dentistry and osteopathy.

The University Department of Biochemistry offers the Bachelor of Science, Bachelor of Arts, Master of Science and Doctor of Philosophy degrees with a major in biochemistry. Applications are not admitted directly to the Master of Science program. The degree is awarded only in rare instances when individuals admitted to Ph.D. programs terminate early.

The major for the B.S.: Chem. 103a-103b, 104a-104b, or 105a-105b, 241a-241b, 245a-245b, 325, 326, 480a and 480b or 481, Math. 125a-125b, 223; Phys. 110, 116; Bioch. 181, 182, 462a-462b, 463, 494, 496a (2 units), and 6 upper-division units in biology, chemistry, mathematical physics, or physical science. All students will participate in a senior research practicum (494) for a minimum of six units after taking 462a-462b and 463. Senior research is conducted in the laboratory of a faculty member with approval of the advisor, and must include the writing of a senior thesis. Graduation for the B.A.: Chem. 103a-103b, 104a-104b, or 105a-105b, 241a-241b, 243a-243b, 325, 326, 480a; Math. 125a; Phys. 102a-102b; Bioch. 181, 182, 462a-462b, 463, 496a (2 units), 499 (one unit) and 6 upper-division units in biology, chemistry, mathematics, or physics, exclusive of individual studies. All B.A. students will sign up for Bioch. 499 for a minimum of one hour. The credit will be given for the writing of a senior research paper under the direction of a faculty advisor. Those who apply for medical school should take Ecol. 320 in preparation for the Medical College Admissions Test (MCAT). The minor for both undergraduate degrees consists of 20 units of lower-division courses in chemistry and mathematics. It includes Bioch. 462a-462b and 465a (2 semesters). In addition, the department will accept one other course in the biological sciences, as approved by a biochemistry advisor, toward the completion of the minor. This course must be from the upper division.

The department participates in the honors program.

181. Introductory Biology I (4) (I) (Identical with M.C.B. 181)

182. Introductory Biology II (4) (II) (Identical with Ecol. 182)

296. Proseminar
  a. Biological Chemistry (1) (II) (Identical with Chem. 296a, which is home)
  b. Biological Chemistry (1) (II) (Identical with V.Sc. 296a, which is home)

443. Research Animal Methods (3) (I) (Identical with V.Sc. 443) May be convened with 553.


463. Biochemistry Laboratory (2) (II) Introduction to experimentation with biochemical systems, processes and compounds of biochemically important. 1R, 2L, P, 460 or 462a, and CR, 462b. May be convened with 563.

473. Recombinant DNA Methods and Techniques (4) (II) (Identical with M.C.B. 473)

496. Seminar
  a. Biochemistry (1) (Rpt./1) I (Identical with M.C.B. 496a) Open to majors only. P, 462a or CR. Consult department before enrolling. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirements (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).


505. Eukaryotic DNA Replication (3) (Rpt./1) I 1992-93 (Identical with C.Bio. 505)


543. Research Animal Methods (3) (I) (Identical with V.Sc. 543) May be convened with 443.

545. Concepts in Genetic Analysis (3) (I) (Identical with M.C.B. 545)

555. Molecular Mechanisms of Development (3) (II) (Identical with M.C.B. 555)

560. General Biochemistry (5) (I) For a description of course topics, see 460. Graduate-level requirements include additional in-depth material. Open to nonmajors only. P, Chem. 241b. (Identical with Chem. 560) May be convened with 460.

561a-561b. Introduction to Biochemical Literature (1-1) I Discussion of the biochemical literature aimed at helping the student evaluate and report the published literature. Primarily for first year graduate students planning a career in biochemistry and desiring to prepare themselves for continued study. P, CR 462a-462b. 561a is not prerequisite to 561b. (Identical with Chem. 561a-561b)

562a-562b. Biochemistry (3-3) For a description of course topics, see 462a-462b. Graduate-level requirements include additional in-depth material. P, Chem. 241b, CR, 322, 325. (Identical with Chem. 562a-562b and Bioch. 562a-562b) May be convened with 462a-462b.

563. Biochemistry Laboratory (2) (II) For a description of course topics, see 463. Graduate-level requirements include additional in-depth material. P, 460 or 462a, and CR, 462b. May be convened with 463.


574. Advances in Mammalian Genetics (2) (Rpt./1) 1992-93 Student participation in the presentation and discussion of current literature concerning recent advances in the molecular analysis of mammalian genetic loci. P, upper-division courses in genetics and molecular biology. (Identical with Gene. 574 and M.C.B. 574)
Biomedical Engineering—Biophysics—Business Administration

588. Principles of Cellular and Molecular Neurobiology (4) I (Identical with Nsc. 588)

595. Colloquium
b. Topics in Electron Microscopy (2) [Rpt./2]
   1991-92 II (Identical with M.C.B. 595b, which is home)

621. Molecular, Plant, Microbe Interaction (3) II 1992-93 (Identical with Ptl. P. 621)

665. Chemistry of Food Proteins (3) II 1991-92 (Identical with An.S. 665)

681. Introduction to Bioclical Research (1-5) I II Supervised research experiences in the labs. of individual faculty members. 3 or 6L. Open only to first-year majors. P, CR 561a--561b.

696. Seminar
a. Biochemistry I (1-3) I
b. Biochemistry II (1-3) II

800. Research (1-16) Yr.


891. Preceptorship
a. Biochemistry (3-12) [Rpt./12 units]

Biology

Three departments (Ecology and Evolutionary Biology, Microbiology and Immunology, and Molecular and Cellular Biology) teach and do research in biology. They share a common core of courses. Details of their programs may be found under their respective listings.

Biomedical Engineering

1326 E. Mabel Street
(602) 626-7559

Committee on Biomedical Engineering

Professors Peter H. Bartels (Optical Sciences, Pathology), Joseph F. Gross (Chemical Engineering, Physiology), Paul C. Johnson (Physiology), Murray A. Katz (Internal Medicine, Physiology), Kenneth C. Mylrea (Electrical and Computer Engineering), Robert Roemer (Aerospace and Mechanical Engineering), Bruce Simon (Aerospace and Mechanical Engineering)

Associate Professor Timothy W. Secomb (Physiology, ARL)

Biomedical engineering can be defined as a multidiscipline in which physical scientists and engineers interact with life scientists and physicians to solve problems ranging from basic biomedical engineering research to applications in clinics and health care delivery systems. The University Committee on Biomedical Engineering coordinates options available to students in the College of Engineering and Mines.

Upper-division undergraduate students may select biomedical engineering courses and projects as technical electives. Graduate students working toward the Master of Science or Doctor of Philosophy in an engineering department may select courses and research topics in biomedical engineering as part of their minor programs. No biomedical engineering degrees are offered.

Courses available in biomedical engineering are offered through engineering departments and include A.M.E. 466, A.M.E. 566, E.C.E. 411, 415, 471, 515; Ch. E. 485, 586; Psio. 418, 419 and S.I.E. 551. Additional courses in biomedical engineering are being developed, and supporting course work in the life sciences is also available. Collaborative research projects permit the student to participate in interdisciplinary associations which can enhance progress in the fields of biology, medicine, and engineering. Individual programs are determined by the student and an engineering departmental advisor.

For additional information contact Dr. J. F. Gross (Chemical Engineering), Chairperson, Committee on Biomedical Engineering, or Dr. K. C. Mylrea (Electrical and Computer Engineering) Director, Clinical Engineering.

Biophysics (BIP)

Biological Sciences West,
Room 453
(602) 621-1224

Committee on Biophysics (Graduate)

Professors R. P. Gruener (Physiology), Chair, H. H. Barrett (Radiology), M. F. Brown (Chemistry), P. M. Capp (Radiology), P. A. Carruthers (Physics), J. R. Cassady (Radiation Oncology), T. C. Cetas (Radiation Oncology), M. A. Cusanovich (Biochemistry), M. B. Denton (Chemistry), D. J. Donahue (Physics), J. H. Enemark (Chemistry), L. S. Forster (Chemistry), E. W. Gerner (Oncology), D. E. Goll (Animal Sciences), R. W. Gore (Physiology), J. F. Gross (Chemical Engineering), V. J. Hruby (Chemistry), P. C. Johnson (Physiology), J. O. Kessler (Physics), R. Kilkson (Physics), B. McNaughton (Psychology), N. H. Mendelson (Molecular & Cellular Biology), K. C. Mylrea (Electrical & Computer Engineering), L. Nadel (Psychology), D. F. O'Brien (Chemistry), R. B. Roemer (Radiation Oncology), D. Sarid (Optical Sciences), D. G. Stuart (Physiology), G. Tillino (Biochemistry), R. S. Weinstein (Pathology)

Associate Professors J. M. Burt (Physiology), L. M. Canfield (Biochemistry), T. P. Davis (Pharmacology), E. D. French (Pharmacology), C. J. Gillies (Biochemistry), A. F. Gmitro (Radiology), P. B. Hoyer (Physiology), D. L. Kreulen (Pharmacology), R. Clark Lantz (Anatomy), N. E. MacKenzie (Pharmaceutical Sciences, Biochemistry), T. W. Secomb (Physiology), D. Stein (Psychology)

Assistant Professors J. M. Burt (Physiology), V. Guerrero, Jr. (Animal Sciences), B. A. Lulu (Radiation Oncology), R. Lynch (Physiology), W. R. Montfort (Biochemistry), M. C. Rykowski (Anatomy), S. S. Rossie (Pharmacology), P. St. John (Anatomy)

Research Assistant Professor A. L. Baldwin (Physiology)

Associate Research Scientist J. L. Lauter (Speech and Hearing Sciences)

The graduate interdisciplinary program in biophysics offers the opportunity for study in a wide range of research areas which lie at the interface between physics and mathematics (in the physical sciences) and the biological sciences (for example: biochemistry, physiology, radiology). Because biophysics covers such a wide range of research topics, the program is designed for flexibility for students from the physical sciences with an interest in biology, and for biological sciences students with interests in applying quantitative approaches based in physics and mathematics. To accomplish this goal, faculty committee members with overlapping expertise in biological and physical sciences have been selected to direct thesis research.

Degrees

The Graduate Committee on Biophysics offers a major in biophysics for the Doctor of Philosophy degree. Students may select a minor in several concentration areas in the biological as well as the physical sciences.

Admission Requirements

In addition to an undergraduate degree (ordinarily in the physical sciences), applicants should provide scores of the Graduate Record Examination. In addition, three letters of recommendation, from faculty members, are required. For additional information, contact Dr. R. P. Gruener.

578a-578b. Introduction to Biophysics (3-3)

Introduction to the structure of cells and the chemistry of macromolecules, followed by a survey of the principal areas of biophysics: molecular biophysics, membrane and cellular biophysics, and systems biophysics. P. Phys. 415b, Chem. 480a–480b.

681. Introduction to Biophysical Research (1-2) [Rpt./3 units] I II Supervised research experiences in the labs of individual faculty members. 3-6L. Open only to first-year majors.

696. Seminar
a. Biophysics I (1-2) [Rpt./8 units] I Open to majors only.
b. Biophysics II (1-2) [Rpt./8 units] II Open to majors only.

Business Administration (BAD)

BFA Building, Room 230
(602) 621-2388

Committee on Business Administration

Professors William B. Barrett (Vice Dean), Chair, Lee Roy Beach (Management and Policy), Gerald O. Bierwag (Finance and Real Estate), William L. Feix, Jr. (Accounting), Jay F. Nunemaker, Jr. (Management Information Systems)

Associate Professors Christopher P. Puto (Marketing), Stanley S. Reynolds (Economics)

Assistant Professor Asoo J. Vakharia (Management Information Systems)
The graduate program in business administration is designed to meet the demand for professors, consultants, and management personnel trained in the application of scientific research to business problems. Both the Master of Business Administration and the Doctor of Philosophy degrees are offered. For admission and degree requirements, please see the Graduate Catalog.

Cancer Biology (CBIO)
Arizona Health Sciences Center, Room 0914
(602) 626-7479

Committee on Cancer Biology (Graduate)

Professors Eugene W. Gerner, Chair (Radiation Oncology), David S. Alberts (Internal Medicine), Harris Bernstein (Microbiology and Immunology), G. Tim Bowden (Radiation Oncology), Evan M. Hersh (Internal Medicine), Neil H. Mendelson (Molecular and Cellular Biology), David W. Mount (Molecular and Cellular Biology), Raymond B. Nagle (Pathology), Sydney E. Salmon (Cancer Center). I. Glenn Sipes (Pharmacology and Toxicology), Samuel Ward (Molecular and Cellular Biology)

Associate Professors David L. Brower (Molecular and Cellular Biology), Louise Canfield (Biochemistry), Anne E. Cress (Radiation Oncology), William S. Dalton (Internal Medicine), Carol Dieckmann (Biochemistry), Harinder S. Garewal (Internal Medicine), Mary J. C. Hendrix (Anatomy), John W. Little (Biochemistry and Molecular and Cellular Biology)

Assistant Professors Alison E. Adams (Molecular and Cellular Biology), Kit S. Lam (Internal Medicine), Stanley P. L. Leong (Surgery), Roger L. Meisfeld (Biochemistry)

Scientists from various departments comprise the interdepartmental Committee on Cancer Biology which offers programs leading to the Master of Science and Doctor of Philosophy degrees with a major in cancer biology. The curriculum of the cancer biology graduate program is designed to introduce students to the body of knowledge that has been derived from experiments on the production, properties, and therapy of cancer and to assure that the student has the necessary background in one or more areas of related fundamental science to enable them to do original research.

For more information concerning admissions and degree requirements, see the Graduate Catalog.

505. Eukaryotic DNA Replication (3) [Rpt/1] I 1992-93 Molecular and biochemical aspects of DNA replication in mammalian cells will be described in conjunction with discussions of recent journal articles on selected topics. Includes the regulation of S phase within the eukaryotic cell cycle; nuclear organization during DNA synthesis; DNA replication enzymes; viral, yeast and embryo models of DNA replication; the initiation of DNA replication; DNA replication origins and the reconstitution of DNA replication complexes. P Bioc 462b. (Identical with Bioc 505, M.C.B. 505, and Micr. 505)

551. Environmental Carcinogenesis (3) II 1991-92 Phenomenological and mechanistic aspects of cancer etiology as induced by physical and chemical agents in our environment, with special emphasis on possible molecular and cellular mechanisms involved in cancer etiology. P, consent required. (Identical with Micr. 551 and R.Onc. 551)

555. Cancer Biology (3) II 1992-93 Fundamental biological aspects of neoplastic growth at the organ, cellular, and molecular levels; emphasis on the etiology, behavior, and therapy of neoplasms. (Identical with Anat. 555, Micr. 555, R.Onc. 555, L.Med. 555)


896. Seminar h. Cancer Biology Series (1) I (Identical with R.Onc. 596h)

681. Introduction to Cancer Biology Research (2) I II S 1992-93 Supervised research experience in the laboratories of individual faculty members.

851. Environmental Carcinogenesis (3) II 1991-92 For a description of course topics, see 551. (Identical with Micr. 851 and R.Onc. 851)


896. Seminar h. Cancer Biology Series (1) I (Identical with R.Onc. 896h)

*Available on both 500 and 800 levels.

Chemical Engineering (CHE)
Geology Building, Room 120
(602) 621-2591

Associate Professor William P Cosart
Assistant Professors Heriberto Cabezas, Roberto Guzman

Chemical engineering is concerned with utilization and application of scientific theory and principles to develop economically sound manufacturing processes in which chemical and/ or physical changes take place. The curriculum prepares the student for employment in the research, development, design and operations aspects of the chemical, petroleum, metals, plastics, food, pharmaceutical, energy and related industries.

The department offers the following degrees: Bachelor of Science in Chemical Engineering, Master of Science and Doctor of Philosophy with a major in chemical engineering. For graduate admission and degree requirements, consult the Graduate Catalog.

The major requires 136 units of science, engineering and humanities—social science courses as shown in the College of Engineering and Mines section of this catalog. No minor is required but opportunity for specialization is offered through a number of technical electives options.

201. Elements of Chemical Engineering (4) I Chemical engineering calculations and principles of energy and material behavior. 2ES, 2ED, P Chem. 103a-103b, 104a-104b, Math. 125a, 125b, 126a, 126b, Engr. 101, 102

202. Introductory Engineering Analysis (3) II Application of selected mathematical and numerical procedures to the formulation and solution of chemical engineering problems. 1.5ED, P Math. 223, Engr. 101, 102

203. Chemical Engineering Heat Transfer and Fluid Flow (3) II Theory and calculations in the unit operations of fluid flow, heat transfer, and evaporation. 1.5ES, 1.5ED, P 201, 203

204. Chemical Engineering Mass Transfer (3) I Theory and practice in the unit operations of distillation, gas absorption, extraction, drying, and filtration. 1.5ES, 1.5ED, P 201, 203

206. General Thermodynamics (2) I Properties and equations for solids, liquids, gases and vapors; first law energy balance; second law entropy balance; heat cycles, compressors, engines. 2ES, P 201, CR, Chem. 480a

304. Chemical Engineering Operations Laboratory (3) II Lab. investigation of process equipment. A field trip is made in mid-January of the junior year. 1.5ES, 1.5ED, P 201, 203, 204

305. Chemical Engineering Transport Phenomena (3) II Theory and calculations pertaining to fundamental transport processes. 3ES, P 201, 402

306. Chemical and Physical Equilibrium (3) II Applications of thermodynamics to equilibrium processes; chemical and physical equilibrium in multicomponent systems. 3ES, P 206, Chem. 480a

307. Chemical Engineering Science Laboratory (3) I Practical verification of fundamental principles of thermodynamics, kinetics, and transport phenomena. 3ES, P 201, 304, 305, 306, CR 402

402. Intermediate Engineering Analysis (3) I Solution of complex chemical engineering problems utilizing both analytical and numerical techniques. 1.5ES, P Math. 254, Ch. E. 202, CR, 204

413. Process Control and Simulation (3) I Theory of automatic control as applied to elementary chemical engineering processes. Use of continuous system simulation languages for study of practical control problems in the process industries. 1.5ES, 1.5ED, P, CR 402

418. Physiology for Engineers (4) I (Identical with Psio. 418)

419. Physiology Laboratory (2) I (Identical with Psio. 419)
494. Practicum

a. Senior Project (1-3)


505. Advanced Chemical Engineering Transport Phenomena (3) I Momentum, energy and mass transport in continua, solution of multidimensional laminar flow problems, turbulence, boundary layer theory. P. 305.

506. Advanced Chemical Engineering Thermodynamics (3) I Advanced applications of First and Second Laws, nonideal gases and liquids and their mixtures, principles of chemical equilibrium, and molecular theory. P. 306.


520. Chemical Reaction Engineering (3) I For a description of course topics, see 420. Graduate-level requirements include an indepth research paper on a current topic. May be convened with 420.

521. Topics in Real-Time Computing (3) I For a description of course topics, see 421. Graduate-level requirements include a special project. May be convened with 421.


532. Solid-Fluid Reactions (3) I Characterization of solid structural properties; principles of heterogeneous reactions involving a fluid and a reacting solid. P. 306 and 420, or M.S.E. 450R and 412. (Identical with M.S.E. 532)

535. Corrosion (3) II (Identical with M.S.E. 535) May be convened with 435.

541. Industrial Energy and Power Management (3) II (Identical with N.E.E. 541)

548. Combustion Generated Air Pollution (3) II (Identical with A.M.E. 548)

551. Chemical and Physical Fundamentals of Air Pollution (3) II For a description of course topics, see 451. Graduate-level requirements include a special project. P. 305, 420. May be convened with 451.


560. Aerosol Science and Engineering (3) I 1991-92 Physics, chemistry, mechanics, and optics of atmospheric aerosol particles. Topics include formation, dynamics, nucleation and growth, coagulation, scattering and absorption of radiation, deposition and aerosol technology. (Identical with Atmo. 560 and E.C.E. 560)

561. Chemical Process Simulation (2) II For a description of course topics, see 461. Graduate-level requirements include a special project. P. 442. May be convened with 461.

570. Fundamentals of Polymeric Materials (3) II For a description of course topics, see 470. Graduate-level requirements include a special project. P. Chem. 241b, M.S.E. 331R; CR, Chem. 480b. May be convened with 470.

580. Bioseparation Techniques for Engineers (3) II For a description of course topics, see 480. Graduate-level requirements include a special project. P. Chem. 243b-243b. May be convened with 480.

581. Bioreactor Engineering (3) I For a description of course topics, see 481. Graduate-level requirements include a special project. P. Math. 254, Chem. 241a, Chem. 480a-480b. May be convened with 481.

583. Remote Sensing Instrumentation and Techniques (3) II (Identical with E.C.E. 583)

585. Biomedical Transport Phenomena (3) I 1992-93 For a description of course topics, see 485. Graduate-level requirements include a special project. P. 305 or A.M.E. 331a, and Math 223. May be convened with 485.


645. Advanced Solar Engineering (3) II (Identical with N.E.E. 645)


696. Seminar

a. Chemical Engineering (1) [Rpt./6] I
b. Combustion (1) [Rpt./6] I
c. Corrosion (1) [Rpt./6] I
d. Fluid Mechanics (1) [Rpt./6] I
f. Biomedical (1) [Rpt./6] I
g. New Developments (1) [Rpt./6] I
h. New Developments (1) [Rpt./6] I

Chemistry (CHEM)

Old Chemistry Building, Room 227
(602) 621-6343

David F. O'Brien, Herbert D. Rhodes (Emeritus), John Rupley (Biochemistry), William R. Salzman, Richard Shoemaker (Optical Sciences), Cornelius Steinhil (Emeritus), Gordon Tolchin (Biochemistry), F. Ann Walker, Edward N. Wise (Emeritus)

Associate Professors Peter F. Bernath

Michael F. Burke, Eugene A. Mash, Jr.

Jeanne E. Pemberton, John V. Rund, Greg L. Verna, Venkat Vempula

Assistant Professors Ludwig Adamowicz, Steven W. Buckner, Daniel P. Dolata, Robin L. Poll, Mark A. Smith, David E. Wigley

Lecturer Walter B. Miller III

The Department of Chemistry provides both general and professional training, giving a strong foundation upon which to base a career in the fields of medicine and related health sciences, in secondary education, or leading to industrial work or graduate specialization in chemistry.

The degrees of Bachelor of Science and Bachelor of Arts with a major in chemistry, Bachelor of Science in Education and Bachelor of Arts in Education with a teaching major or minor in chemistry are offered. A Master of Arts, Master of Science and Doctor of Philosophy with a major in chemistry are also available, as is a Master of Education with a teaching major in chemistry.

The major for the B.A.: 103a-103b and 104a-104b, or 105a-105b; 241a-241b; 243a-243b or 245a-245b; 325; 326 or 323. P, 121; 122; CR, 104 encouraged. The major for the B.S.: 103a-103b and 104a-104b, or 105a-105b; 241a-241b; 243a-243b or 245a-245b; 325; 326 or 396H. P, 121; CR, 104 encouraged. The teaching major includes 103a-103b and 104a-104b, or 105a-105b; 241a-241b; 243a-243b or 245a-245b; 325; 326 or 396H; 400a; 424; 480a-480b. P, 121b, 122; CR, 104 encouraged. The teaching minor includes 103a-103b and 104a-104b, or 105a-105b; 241a-241b; 243a-243b or 245a-245b; 325; 326 or 396H; 400a; 424; 480a-480b.

The department participates in the honors program.

101a*-101b*-101C. Lectures in General Chemistry (3-3) 101a: An introduction to chemical principles designed for students with a minimal background in science and math. 101b: Application of chemical principles presented in 101a to problems of interest to prenursing and allied health majors. 101c: Application of chemical principles presented in 101a to problems of interest to nonscience majors. A modular approach is used with case studies of "real world" problems. Credit is allowed for only 101b or 101c, not for both. These courses are designed for nontechnical students and are not

prerequisites for higher level chemistry courses. P, algebra recommended; CR, 102 encouraged.

102a*-102b*-102C. General Chemistry Laboratory (1-1-1) An introduction to the basic functions of a chemical laboratory including how to safely perform chemical experiments, interpret the results, and an introduction to some basic chemical techniques, instruments and calculations. The experiments performed in 102a-102b-102c are designed to complement the principles concurrently presented in 101a-101b-101c, respectively. Fees for 102a and 102b. P, CR, the corresponding 101 lecture class.

103a-103b. *Fundamentals of Chemistry (3-3) Essential concepts and problem-solving techniques, with emphasis on chemical bonding, structure and properties, stoichiometry, kinetics, equilibria, and descriptive organic and inorganic topics. 103a: P, completion of Math. 117R/S or an equivalent level of proficiency as demonstrated by the student's score on the Math Readiness Test; CR, 104 encouraged. Both 103a and 103b are offered each semester. For Honors listing, see 105a-105b.

104a-104b. *Fundamental Techniques of Chemistry (1-1) Basic techniques in college chemistry, with emphasis on experimental methods, techniques of measurement, separation, purification, and analysis of organic and inorganic substances. Fees. P, CR, the corresponding 103 lecture class. Both 104a and 104b are offered each semester. For Honors listing, see 105a-105b.

105a-105b. *Honors Fundamentals of Chemistry (3-3) General principles of organic chemistry. P, 103b and 104b, or 105b. Both 241a and 241b are offered each semester.

106a-106b. *Honors Fundamentals of Chemistry (3-3) General principles of organic chemistry. P, 103b and 104b, or 105b. Both 241a and 241b are offered each semester.

241a-241b. **Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P, 103b and 104b, or 105b. Both 241a and 241b are offered each semester.

242a-242b. **Honors Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P, 103b and 104b, or 105b. Both 241a and 241b are offered each semester.

243a-243b. **Organic Chemistry Laboratory (1-1) Preparation, reactions, and analysis of organic compounds and an introduction to the lab. techniques of organic chemistry. 1R, 6L. Fees. P, CR, the corresponding 103 laboratory class. Both 243a and 243b are offered each semester.

245a-245b. **Organic Chemistry Laboratory (2-2) Similar to 243a-243b. Designed for chemistry and biochemistry majors and chemical engineers. 6L. P, CR, 241a-241b or 242a-242b.

296. Seminar

a. Biological Chemistry (1) I Open to introductory students in chemistry or the life sciences and premedical students. P, 103b and 104b, or 105b. (Identical with Bio 296a)

302. Scientific Glassblowing (1 to 2) I Methods of design and construction of scientific glass apparatus. 6L.

322. **Principles of Analysis I (2) I Principles of modern quantitative analysis. Open to nonmajors only. P, 103b and 104b, or 105b; CR, 322 encouraged.

323. **Principles of Analysis I Laboratory (1) I Experiments in modern quantitative analysis. Designed for chemistry majors. 6L. P, CR, 322 or 325.

325. **Analytical Chemistry (2) I Principles of modern quantitative analysis, including consideration of stoichiometry, equilibrium principles, treatment of experimental data, titrimetric and photometric analysis, and analytical separation procedures. P, 103b and 104b, or 105b; CR, 323 or 326 recommended.

326. **Analytical Chemistry Laboratory (2) I II Experiments in modern quantitative analysis. Designed for chemistry majors. 6L. P, CR, 325.

396. Proseminar


396H. Honors Proseminar (3) II P, 245b.

400a-400b. Chemical Measurements Laboratory (2-2) I II Lab. work on modern chemical measurements and instrumentation. 1R, 6L. P, 400a; P, 424 or CR; for majors, Engr. 101, 104b, 242b; P, CR, 400b; 424; 480b. Writing-Emphasis Course (400a). P, satisfaction of the upper-division writing proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

410. Inorganic Chemistry (3) I Fundamentals of inorganic chemistry. P, 480a or CR.

412. Inorganic Preparation (3) II Standard inorganic lab. preparations, including coordination compounds, isomeric compounds, and compounds typifying the groups of the periodic table. 9L. P, two semesters of lab. chem. beyond the first yr.

424. Instrumental Analysis (3) II Principles of modern instrumental methods of analysis treating basic instrumentation, data acquisition, and spectroscopic, electroanalytical, and chromatographic methods. P, 241b, 242b, 322 or 325; Phys. 102b, 180b.

440. Qualitative Organic Analysis (3) II The systematic classification and identification of organic compounds. 1R, 6L; P, 241b, 242b, 243b or 245b, 325 or 322.

446. Organic Preparations (3) I Special experimental methods for the synthesis of organic compounds. 1R, 6L; P, 241b, 242b, 243b or 245b.

460. **General Biochemistry (5) I (Identical with Bio 460) May be convened with 560.

462a-462b. **Biochemistry (4-3) (Identical with Bio 462a-462b) May be convened with 562a-562b.

**Credit is allowed for one course only in each of the following groups: 101b, 241a-241b or 242a-242b; 102b, 243a-243b, 245a-245b; 325, 322, 326, 460a, 462a-462b.
and Doctor of Philosophy degrees with majors in civil engineering and engineering mechanics. (See the College of Engineering and Mines section of this catalog for specific undergraduate program requirements.) Additional information relating to each of these programs may be obtained by contacting the department head.

Civil Engineering (CE)

In addition to the courses listed below, the faculty of the Department of Civil Engineering and Engineering Mechanics is prepared to offer temporary courses in the following areas, subject to faculty availability and student interest: public works planning and engineering, construction engineering, hydraulic engineering, environmental engineering, structural engineering, soils engineering, transportation engineering, surveying and mapping, and urban planning and engineering. Credit for these courses is offered in both civil engineering and engineering mechanics.

202. Personal Computers for Civil Engineers (1) I II Fundamentals for computer graphics, data preparation and analysis, and use of spreadsheet, word processors, and basic software for civil engineering applications. 1R, 1L. 0.2ES. Open to majors only. P, Engr. 101.

210. Engineering Graphics (3) I II S GRD Representation and analysis of systems of orthographic projection and graphical methods used in engineering design and production, correlated with technical sketching. 1R, 6L. 2ES, 1ED.

214. Statics (3) I II S GRD Equivalent force systems; equilibrium; geometric properties of areas and solids; friction; virtual work; potential energy. Honor section is available. 3ES, P, Phys. 110, Math. 125b.

217. Mechanics of Materials (3) I II S GRD Material behavior; relationship between external forces acting on elastic and inelastic bodies and the resulting behavior; stress and deformation of bars, beams, shafts, pressure vessels; stress and strain; combined stresses; columns. Honor section is available. 2ES, P, 217.

251. Elementary Surveying (3) I II S GRD Theory of measurements and errors; vertical and horizontal control methods; topographic, public land, and construction surveys; use of surveying instruments. 2R, 3L. 3ES, P, Math. 118.


320. Fluid Mechanics Laboratory (1) I II Open-channel and closed conduit studies of basic flow phenomena, with emphasis on continuity, conservation of momentum, and exchange of energy; calibration of flow-measuring devices. 9L. 1ES, CR, 321, A.M.E. 250.

321. Civil Engineering Hydrodynamics (3) I II S Hydrostatics, continuity, irrational flow, pressure distributions, weirs and gates, momentum and energy, surface drag, pipe friction, form drag, pipe fitting losses. 3ES, P, 214, Math. 223.

322. Water Resources Engineering (3) I II Open-channel flow, natural streams and waterways, hydrologic analysis, fluid measurement apparatus, hydraulic models; economic aspects of water resources. 1.5ES, 1.5ED. P, 321, A.M.E. 250.

330. Structural Engineering I (3) I II S Analysis of statically determinate structures, including beams, arches, and frames and trusses; stress and strain analysis; virtual work, moment area and conjugate beam; Bettis' theorem and Castigliano's theorem. 3ES, P, 217.

331. Structural Engineering II (3) I II S Analysis of statically indeterminate frames, beams, arches, and trusses; use of computer programs. 3ES, P, 330; CR, 302.

336. Structural Design in Steel (3) I II S Design of steel members, connections and simple structures, including tension members, laterally supported and unsupported beams, columns, beam-columns, bolted and welded connections; introduction to load and resistance factor design. 3ED, P, 330; CR, 331.

337. Structural Design in Concrete (3) I II S Introduction to reinforced concrete design. 3ED, P, 330.

340. Soil Engineering (4) I II S Physical and mechanical properties of soils, shear strength, consolidation, settlement, lateral earth pressure, and bearing capacity. 3R, 3L. 3ES, P, 217, Chem. 103b.

360. Transportation Engineering (3) I II S CDT Basis for planning, design, and operation of transport facilities; transport modes discussed include mass transit, passenger cars, bicycles, and pedestrian movement. 1ES, 2ED, P, 251, 214.

361. Highway and Airport Engineering (3) I II CDT Materials, construction and structural design of highways and airports. 1ES, 2ED, P, 340.


371. Water and Wastewater Treatment Processes (3) I II CDT Analysis of processes controlling water quality in natural water systems and design of water and wastewater treatment systems. 1ES, 2ED, P, 370.

380. Materials Laboratory (2) I II CDT Mechanical properties of concrete, concrete aggregates, steel, and other metals as engineering materials. 1R, 3L. 2ES, P, 217, Chem. 103b.

394. Practicum (1) I II S Field Trip Students are urged to take this trip in the junior year.

400. Civil Engineering Design (3) I II S Integral study of the overall background in civil engineering course work for processes and problems.
537. Prestressed Concrete Structures (3) I 1991-92 Behavior, analysis, and design of statically determinate and indeterminate prestressed concrete structures. P. 337.

540. Foundation Engineering (3) II For a description of course topics, see 440. Graduate-level requirements include the development of computer codes for the solutions of specified foundation problems or an in-depth research paper on a specific aspect of foundation engineering. P. 340. May be convened with 440.

541. Stability Problems in Geotechnical Engineering (3) I For a description of course topics, see 441. Graduate-level requirements include a research paper and/or a comprehensive design project. P. 340. May be convened with 441.


547. Seepage and Earth Dams (3) II 1991-92 Principles of flow in porous media; analytical and approximate solutions of confined and unconfined flow; seepage, erosion, piping and failure design; earth and rock fill dam construction and design; stability analyses. P. 340.

548. Numerical Methods in Geotechnical Engineering (3) I 1992-93 Brief statements and applications of numerical methods based on closed-form solutions, finite difference, finite element and boundary element methods for problems involving soil structure interaction such as piles, retaining walls, group piles, underground works; seepage; and consolidation. P. 340, 402 or 502.

552. Engineering Surveys (3) I CDT For a description of course topics, see 452. Graduate-level requirements include a comprehensive surveying project. P. 251. May be convened with 452.

555. Irrigation Engineering (3) II (Identical with A.B.E. 555) May be convened with 455.

558. Drainage of Irrigated Lands (3) II (Identical with A.B.E. 558) May be convened with 458.

561. Ground-Water Management (3) II (Identical with H.W.R. 561)

562. Bituminous Materials (3) II I For a description of course topics, see 462. Graduate-level requirements include an in-depth research paper. P. 340, or consult department before enrolling. May be convened with 462.

563. Traffic Engineering (3) I For a description of course topics, see 463. Graduate-level requirements include a research paper or project. P. 360. May be convened with 464.

564. Airport Planning and Design (3) II 1992-93 For a description of course topics, see 464. Graduate-level requirements include a research paper or project. P. 360. May be convened with 464.

565. Project Planning and Modeling (3) II For a description of course topics, see 465. Graduate-level requirements include a research paper or project. P. senior standing in civil engineering or consult with department. (Identical with Ping. 565) May be convened with 465.

568. Urban Transportation Planning (3) II CDT For a description of course topics, see 468. Graduate-level requirements include a research paper or project. P. 360 or consult department before enrolling. (Identical with Ping. 568) May be convened with 468.

571. Water Quality Control (3) II For a description of course topics, see 471. Graduate-level requirements include a research project on some aspect of water quality control. P. Chem. 103b. (Identical with H.W.R. 571 and M.S. 571) May be convened with 471.

573. Biodegradation of Hazardous Organic Compounds (1-2) I Chemical and microbiological considerations which affect the thermodynamics and kinetics of transformations of hazardous organic compounds in treatment facilities and in natural settings. P. 340, 3L, P. 577, or consult with department.

574. Chemical Transport in Environmental Processes (3) I Engineering concerns in toxic and hazardous waste management with focus on aspects of chemical transport between air, water and soil systems, and microbial degradation processes in the natural environment.

575. Microbiology of Environmental Engineering (3) I Microbiological concepts and their application to natural and engineered systems for upgrading water and wastewater quality. 2R, 4L. P. 370.

576. Environmental Chemistry Laboratory (1) I For a description of course topics, see 476R. Graduate-level requirements include a paper on the properties of a chemical pollutant of environmental interest and application of computer models for chemical equilibrium computations. May be convened with 476R.

576L. Environmental Chemistry Laboratory (1) I (Identical with E.M. 576L) May be convened with 476L.

577. The Physiological Bases of Microbial Treatment Processes (3) II Principles of bacterial physiology including morphology, metabolism and genetics. Applications of importance to wastewater treatment and environmental quality. P. 370, or consult with department.

578. Introduction to Hazardous Wastes (3) II I For a description of course topics, see 478. Graduate-level requirements include a report on an in-depth review of inter-disciplinary aspects of an existing project (with a non-university project engineer). P. 370 or 471, or consult department before enrolling. May be convened with 478.

579. Environmental Air Pollution (3) I For a description of course topics, see 479. Graduate-level requirements include a research project on a particular aspect of air pollution. May be convened with 479.

580. Fundamentals of Industrial Hygiene (3) I (Identical with O.S.H. 580) May be convened with 466.

587. Advanced Industrial Hygiene and Safety (3) II (Identical with O.S.H. 587) May be convened with 487.

596. Seminar
a. Sanitary and Environmental Engineering (1-3) I


613. Theory of Elastic Stability (3) I 1992-93 Bending and buckling of prismatic bars, beams, rings, curved bars, thin shells, and plate under axial and lateral loads. 417 or E.M. 60; and C.E. 402, or consult department before enrolling.

621. Sediment Transportation (2) I Erosion, transportation and deposition of sediments by flowing water; sediment properties and the measurement; bed load and suspended load movement; river behavior and control. P. 322.

622. Open-Channel Flow (3) I 1992-93 Continuity, energy and momentum principles applied to steady and unsteady flow in open channels; channel controls, transects, flow routing, and models. P. 322 or consult dept. before enrolling.


624. Planning and Design of Multipurpose Water Resources Projects (3) I 1991-92 Design of water resource systems for surface water supply, flood control, hydropower and navigation, either as single purpose or as multipurpose projects; brief review of environmental, economic and legal aspects. Field trips P. 321, 423 or 523.

633. Reinforced Concrete Members (3) I 1992-93 Inelastic behavior of beams and columns; short- and long-term beam deflections; combined bending, shear, and torsion in beams; behavior under load reversals; analysis and design of beam to column connections and shear walls. P. 437 or departmental approval.

637. Soil-Structure Interaction (3) I 1991-92 Explanation of soil-structure interaction, closed form and numerical solutions, beams, axially and laterally loaded piles and walls, wave equation for piles, group piles, slabs on deformable media. P. 640 or 641 or consult department before enrolling.

640. Advanced Soil Mechanics (3) I Site investigation and in situ testing; shear strength of sands and clays; interpretation of laboratory test results; consolidation theory; one-dimensional infinitesimal and finite strain; slope stability. P. 340.


642. Engineering Characteristics of Soil (3) I 1991-92 Advanced theories of mechanics and physical aspects of soil. Lab testing including index parameters, compaction, consolidation, shear strength; introduction to critical state and plasticity aspects. 1R, 6L. P. 640.


651. Structural Design of Flexible Pavements (3) I Analysis of loads, stresses, material characteristics, and environmental factors for the theoretical and practical design, construction and maintenance of pavements. P. 340, 361.

652. Structural Design of Rigid Pavements (3) II Analysis of loads, stresses, material characteristics, and environmental factors for the theoretical and practical design, construction and maintenance of these pavements. P. 340, 361.

664. Transportation Economics (3) I 1991-92 Economic analysis of transport projects, including rural and urban roadways, control systems, and mass transit; discussion of environmental and financial factors. P. 463 or 663.

665. Quick Response Transportation Planning Methods (3) II 1992-93 Quick response transportation tools for subarea, problem and policy analysis, and strategic planning in the urban setting. (Identical with Png. 565)

666. Highway Geometric Design (3) I 1992-93 Study of geometric elements of streets and highways, with emphasis on analysis and design for safety. P. 463 or 563.


673L. Advanced Water-Wastewater Treatment Laboratory (1) II Experiments in physical-chemical treatment of water and wastewater designed to illustrate treatment design principles in that subject area. 3L. CR, 673R.

674. Toxic and Hazardous Waste Treatment (3) I 1991-92 Study of hazardous waste management from which treatment strategies and process treatment trains can be synthesized to control toxic and hazardous wastes. Both traditional and emerging technologies will be considered. Emphasis will be placed on integrated water, air and land interfacial environmental interactions. Field trips. P. 574, or consult with department.

675R. Wastewater Treatment (3) I Theoretical and applied principles of aerobic and anaerobic wastewater treatment systems. P. 370.

675L. Wastewater Treatment Laboratory (1) I 1991-92 Experiments in biological treatment of wastewater plants and aerobic digestion designed to illustrate treatment principles. 3L. CR, 675R.


676L. Water Treatment System Design Laboratory (1) II 1992-93 Experiments in advanced water treatment developed to illustrate design principles in the potable water production field. CR, 676R.

Engineering Mechanics (EM)

In addition to the courses listed below, the faculty of the Department of Civil Engineering and Engineering Mechanics is prepared to offer temporary courses in the following areas, subject to faculty availability and student interest: analytical mechanics, plates and shells, structural dynamics and earthquake engineering, experimental mechanics, and fluid mechanics.

502. Introduction to Finite Element Methods (3) I (Identical with C.E. 502)

505. Continuum Mechanics (4) I 1991-92 Analysis of deformation, principal stresses and strains, velocity fields, and rate of deformation; constitutive and field equations; elementary elasticity. P. C.E. 417 or consult department before enrolling.

508. Fracture Mechanics (3) II 1991-92 Analysis of fracture, crack propagation, Griffith energy balance, crack tip plasticity, J-integral; fatigue cracks; analytical and numerical techniques; constitutive models for damaged materials. P. 505, or consult with department.


596R. Seminar b. Geomechanics/Soil Mechanics (1) (Rpt./2) II (Identical with C.E. 596b)

Classics (CLAS/GRK/LAT)

Modern Languages Building, Room 371 (602) 621-1689

Professors Norman Austin, Albert Leonard, Jr., David Soren
Associate Professors Thomas D. Worthen, Acting Head, Richard C. Jensen, Jon Solomon Assistant Professors Holt Parker, Mary Voyatzis Lecturer Robert A. Burns

The cultural environment of Greece and Rome is the subject matter taught in the Classics Department. Courses are given in the language, literature (in the original and in translation), art and archaeology and in the development and heritage of these civilizations. The department offers a degree of Bachelor of Arts with majors in Greek, Latin, and classics and a degree of Master of Arts with a major in classics with concentrations in ancient Greek, Latin, or classical archaeology. Programs leading to a Bachelor of Arts in Education and a Master of Education with a teaching major in Latin are also available. In addition, a number of the department's courses may be used to...
ward a supporting minor in other graduate programs. Requirements for the B.A. are as follows:

The major in Greek: 34 units in Greek and classics, including Grk. 101, 102, 201, 202, Clas. 250a-250b, 12 units at the 400 level—of which at least 9 must be Greek.

The major in Latin: 34 units in Latin and classics, including Lat. 101, 102, 201, 202, Clas. 250a-250b, 12 units at the 400 level—of which at least 9 must be Latin.

The major in classics: 34 units, including either Latin or Greek to the 16-unit level (101, 102, 201, 202), 6 units in ancient history, and at least 12 upper-division credits in classics, classical archaeology, Latin or Greek. The program of study should be planned in consultation with an advisor.

The supporting minor should be chosen in consultation with the major advisor.

The teaching minor: 25 units in Latin, including Lat. 101, 102, 201, 202, and 9 units at the 400 level.

For information on the graduate degrees, please see the Graduate Catalog.

The department participates in the honors program.

Greek (GRK)

101. Elementary Classical Greek I (4) Introduction to ancient Greek for students of the Bible and of the classical authors.


103. Elementary Modern Greek I (4) Development of skills in conversation, composition, and reading with emphasis upon audiovisual practice.

104. Elementary Modern Greek II (4) Second semester modern Greek. P. 103.

201. Intermediate Classical Greek I (4) Selections from classical Greek chosen in accordance with the student’s needs and interest. P. 102.


203. Intermediate Modern Greek I (4) Pronunciation, grammar, and vocabulary of modern Greek; development of skills in conversation, composition, and reading; emphasis on aural-oral skills. P. 104.


401. Latin Reading Course (3) [Rpt.] Readings in major Latin authors including Homer, Plato, and the historians and dramatists. P. 202. May be convened with 502. Writing-Emphasis Course.

402. Greek Reading Course (3) [Rpt.] For a description of course topics, see 402. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 402.

409. Greek Composition (3) [Rpt.] Analysis of Greek prose style and practice in composing Greek prose. P. 202. May be convened with 509.

412. Readings in Greek Philosophy (3) [Rpt./1] Extensive readings in Greek in one of the following areas of Greek philosophy: the pre-Socratics, Plato’s ethics and epistemology, Aristotle’s Nicomachean Ethics. P. 202. (Identical with Phil. 412) May be convened with 512. Writing-Emphasis Course.

421. Greek Lyric Poetry (3) [Rpt.] Study in Greek of the early Greek Lyric writers from Archilochus to Bacchylides, including Pindar. P. 202. May be convened with 521. Writing-Emphasis Course.

422. Readings in Greek Drama (3) [Rpt.] Close reading in Greek of either (1) tragedy—one play each by Aeschylus, Sophocles and Euripides or (2) comedy—two plays of Aristophanes, one of Menander. P. 202. May be convened with 522. Writing-Emphasis Course.


431. Greek Orators (3) [Rpt.] Readings in Greek from Lylias, Isocrates and Demosthenes as sources for ancient rhetoric, politics, and private life. P. 202. May be convened with 531. Writing-Emphasis Course.


479. Workshop b. Techniques of Foreign Language Teaching (1) I (Identical with Ger. 497b, which is home)

"Writing-Emphasis Courses. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)."

502. Greek Reading Course (3) [Rpt.] For a description of course topics, see 402. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 402.

509. Greek Composition (3) [Rpt./1] For a description of course topics, see 409. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 409.

512. Readings in Greek Philosophy (3) [Rpt./1] For a description of course topics, see 412. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 412.

521. Greek Lyric Poetry (3) [Rpt./1] For a description of course topics, see 421. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 421.

522. Readings in Greek Drama (3) [Rpt./1] For a description of course topics, see 422. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 422.

524. Homer (3) [Rpt./1] For a description of course topics, see 424. Graduate-level requirements include extensive reading and an in-depth paper. May be convened with 424.

530. Readings in the Greek Historians (3) [Rpt.] For a description of course topics, see 430. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 430.

531. Greek Orators (3) [Rpt.] For a description of course topics, see 431. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 431.

532. Literature of Archaic Greece (3) [Rpt.] For a description of course topics, see 432. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 432.

596. Seminar a. Ancient Greek Literature (3) [Rpt./30 units]

Latin (LAT)

101. Elementary Latin I (4) The Latin language presented as far as possible from the point of view of its influence on English.


401. Latin Reading Course (3) [Rpt./1] Readings in one of the following: epic, lyric, drama, history, oratory, satire, epistles, novel, philosophical, technical or medieval literature. P. 202. May be convened with 501. Writing-Emphasis Course.


413. Augustan Literature (3) [Rpt./1] Survey of the major writers of the Augustan Age, the period from about 30 B.C. to 14 A.D., with the exception of the Elegiac poets. Readings in Latin. P. 202. May be convened with 513. Writing-Emphasis Course.


425. Cicero (3) [Rpt.] The life of Cicero illustrated by means of close reading of selected works in Latin (pro Caelio, selections from the Philippics, the Verre Orations) as well as selections from his letters. P. 202. May be convened with 525. Writing-Emphasis Course.

428. Silver Age Latin (3) [Rpt.] Readings from Latin writers of the early Empire. Selections will be drawn from Petronius, Martial, and Apuleius. P, 202. May be convened with 528. Writing-Emphasis Course.

497. Workshop
   a. Techniques of Foreign Language Teaching (1) (Identical with Ger. 497b, which is home)
   "Writing-Emphasis Courses. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

501. Latin Reading Course (3) [Rpt./1] For a description of course topics, see 401. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 401.

505. Latin Composition (3) [Rpt./1] For a description of course topics, see 405. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 405.

513. Augustan Literature (3) [Rpt./1] For a description of course topics, see 413. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 413.

514. Medieval Latin (3) For a description of course topics, see 414. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 414.

515. Latin Love Elegy (3) [Rpt./1] For a description of course topics, see 415. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 415.

518. Roman Satire (3) [Rpt.] For a description of course topics, see 418. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 418.

520. Latin Paleography (3) Identification and reading of major Latin bookhands of the Middle Ages and the Renaissance. Problems in text transmission, corruptions and emendation. P, 3 units of Latin at the 400 level.

523. Roman Drama (3) [Rpt./1] For a description of course topics, see 423. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 423.

525. Cicero (3) [Rpt./1] For a description of course topics, see 425. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 425.

526. Roman Historians (3) [Rpt.] For a description of course topics, see 426. Graduate-level requirements include extensive readings and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 426.

528. Silver Age Latin (3) [Rpt.] For a description of course topics, see 428. Graduate-level requirements include extensive readings and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 428.

506. Seminar
   a. Latin Literature (3) [Rpt./30 units]

Classical Literature and Civilization (CLAS)

115. The Study of English Words (3) I Vocabulary building through the systematic study of English words derived from Latin and Greek. Readings in translation.

126. Greek Mythology I (3) I The myths, legends, and folktales of the Greeks and their origins. Readings in translation. (Identical with Rel. 126)

204. Ancient History: Greek History (3) I (Identical with Hist. 204)

205. Ancient History: Roman History (3) II (Identical with Hist. 205)

250a-250b. Classical Literature in Translation (3-3) Historical survey of the major authors and works of ancient Greece and Rome. 250a: From Homer to the Greek novel. 250b: Roman literature of the Republican period and the early Empire. 250a is not prerequisite to 250b.

360. Ancient Philosophy (3) I (Identical with Phil. 260)

285. Introduction to Humanities Computing (3) S (Identical with Ger. 285)

326. Greek Mythology II (2-4) [Rpt./9 units] II S An intermediate examination of Greco-Roman mythology which focuses on source materials or the influences of classical myths. Field trip to Greece, Italy, or elsewhere.

330. Women in Antiquity (3) Women in literature, archaeology and history from the Bronze Age to the Roman Empire. (Identical with Hum. 330 and W.S. 330)

342. Homer (3) A study of the Homeric poems, the Iliad and the Odyssey, in translation.


345. Cosmology (3) Investigation of ancient Greek concepts of the universe, with emphasis on theories regarding nature, matter, and the soul. Readings in translation.

346. Classical Greek Tragedy (3) Readings in ancient Greek tragedy in translation.

347. Love in Classical Literature (3) Love as a theme in Greek and Roman literature of various genres: lyric, tragedy, comedy, philosophy, satire, and romance read in English translation.

348. Myth and Archetype (3) An investigation of modern psychological theories and their relevance to ancient Greek and Roman myths. Readings in translation. P, 126 (Identical with Rel. 348)

370. Issues in Greek Philosophy (3) (Identical with Phil. 370)

396H. Honors Proseminar (3) I II

403a-403b. History of Greece (3-3) (Identical with Hist. 403a-403b)

404a-404b. History of Rome (3-3) (Identical with Hist. 404a-404b)

470. Greek Philosophy (3) [Rpt./1] (Identical with Phil. 470) May be convened with 570.

472a-472b. Ancient Philosophy (3-3) [Rpt.] (Identical with Phil. 472a-472b) May be convened with 572a-572b.

485. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Ger. 485) May be convened with 585.

486. History of Byzantium (3) (Identical with Hist. 486) May be convened with 586.


570. Greek Philosophy (3) [Rpt./1] (Identical with Phil. 570) May be convened with 470.

572a-572b. Ancient Philosophy (3-3) [Rpt.] (Identical with Phil. 572a-572b) May be convened with 472a-472b.

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Ger. 585) May be convened with 485.

588. History of Byzantium (3) (Identical with Hist. 588) May be convened with 488.

595. Colloquium
   f. Advanced Studies in Ancient History (3) [Rpt./5] II (Identical with Hist. 595f, which is home)

Classical Art and Archaeology (CLAS)

310. Classical Art (3) (Identical with Ar.H. 310)

329. Art History of the Cinema (3) I Survey of major artistic movements, including academism, expressionism, cubism, and surrealism, and their influence on film in Germany, Italy, America, and France. (Identical with Ar.H. 329, T.A.V. 329)

334. Art and Archaeology of Ancient Egypt (3) II 1991-92 Ancient art and archaeology of the Egyptian civilization from the beginning of the Pharaonic Period to the Alexandrian Age. (Identical with Ar.H. 334 and Anth. 334)

340a-340b. Introduction to Classical Art and Archaeology (3-3) 1991-92 An archaeological history of Greece and Italy through the study of major excavations and monuments, with emphasis on cultural developments and relationships. 340a is not prerequisite to 340b. (Identical with Anth. 340a-340b, Ar.H. 340a-340b)

341. Ancient Greek Monuments (3) [Rpt./2] S Firsthand study of the monuments and material culture (sculpture, vase painting, minor arts, etc.) of the ancient greeks; reading from history, philosophy and literature in English translation. Five-week tour in Greece.

355. Ancient Egyptian Architecture (3) Architecture of ancient Egypt with special emphasis on its relationship to the social, religious and political needs of the culture. A two-week study tour in Egypt follows the end of the semester.
443a-443b. Archaeology of Neolithic and Bronze Age Greece (3-3) History, art and culture of prehistoric Greece through the study of archaeological excavations. 443a: Paleolithic through the end of the Middle Bronze Age. 443b: The Minoan and Mycenaean cultures of the Late Bronze Age. 443a is not prerequisite to 443b. Pr: 6 units in classics, history, or anthropology. (Identical with Anth. 443a-443b). May be convened with 543a-543b.

453. Research Methods in Classical Archaeology (3) Analysis of various methods of research in classical archaeology emphasizing the critical use of source material, the development of independent thought and the production of the finished, written product. P: 340a or 340b. May be convened with 553. *Writing-Emphasis Course*.


456. Greek and Roman Painting (3) Greek vase painting from the Dipylon vases of the geometric period in Athens to the Orientalizing animal style of Corinth and the black and red figured Attic style. Also, survey of ancient Roman painting and mosaics. P: 340a-340b. (Identical with Ar.H. 456) May be convened with 556.


458. Greek and Roman Provincial Archaeology (3) Survey of classical archaeology in ancient Tunisia, Cyprus, Portugal and Turkey. P: 340a or 340b. May be convened with 558.

461. Archaic Greek Sanctuaries (3) Archaeology of the sanctuary sites from the Archaic period in Greece, both those which became panhellenic and those associated with individual states. Relationships between the polis and the local sanctuary. (Identical with Anth. 461) May be convened with 561.

463. Classical Field Archaeology (3) [Rpt./1] Field training and lecture program for students beginning in archaeology; includes trench supervision, stratigraphy, locus theory, and oral and written reports on field techniques. Offered on several archaeological sites in the Mediterranean area. P: consult department before enrolling. (Identical with Anth. 463). May be convened with 563.

481. Greek Pottery 1200-400 B.C. (3) The development of Greek pottery from the collapse of the Mycenaean empire to the close of the classical period. Special attention to shapes, decoration, function, and artistic and technical skills. (Identical with Anth. 481) May be convened with 581.

484. Roman Art and Architecture (3) The origin and development of Italian art and architecture from Etruscan beginnings through the Republic to the late Empire. P: Art 117, 118, or 6 units of ancient history. (Identical with Ar.H. 484) May be convened with 584.

489. Topography and Monuments of Athens (3) II 1992-93 Analysis of the historical an archaeological evidence for the development of the city of Athens from the Neolithic Period through Roman times P: 340a or 340b; consult department before enrolling. May be convened with 589. *Writing-Emphasis Course*.

543a-543b. Archaeology of Neolithic and Bronze Age Greece (3-3) For a description of course topics, see 443a-443b. Graduate-level requirements include extensive reading and an in-depth paper. 543a is not prerequisite to 543b. Pr: 6 units in classics, history, or anthropology. (Identical with Anth. 443a-443b). May be convened with 443a-443b.

553. Research Methods in Classical Archaeology (3) For a description of course topics, see 453. Graduate-level requirements include a 25-page written paper and oral presentation. May be convened with 453.

554. Greek and Roman Sculpture (3) For a description of course topics, see 454. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a-340b. (Identical with Ar.H. 554) May be convened with 454.

556. Greek and Roman Painting (3) For a description of course topics, see 456. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a-340b. (Identical with Ar.H. 556) May be convened with 456.

557. Greek Architecture (3) For a description of course topics, see 457. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a-340b. (Identical with Ar.H. 557) May be convened with 457.

558. Greek and Roman Provincial Archaeology (3) For a description of course topics, see 458. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a-340b. May be convened with 458.

561. Archaic Greek Sanctuaries (3) For a description of course topics, see 461. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a-340b. May be convened with 461.

563. Classical Field Archaeology (3) [Rpt./1] For a description of course topics, see 463. Graduate-level requirements include extensive reading and an in-depth paper. May be convened with 463.

564. Topics in Greek and Roman Archaeology (3) Research papers and oral presentations on different aspects of Greek and Roman archaeology; preparation in writing scholarly articles for refereed journals. P: 340a or 340b.

565. Topics in Greek and Roman Architecture and Urbanism (3) Research papers on an aspect of ancient architecture which involves not only monuments themselves but attempts to consider a building in its physical and cultural setting. P: 340a or 340b.

581. Greek Pottery 1200-400 B.C. (3) For a description of course topics, see 481. Graduate-level requirements include extensive reading and an in-depth paper. (Identical with Anth. 581) May be convened with 481.

584. Roman Art and Architecture (3) For a description of course topics, see 484. Graduate-level requirements include extensive reading and an in-depth paper. P: Art 117, 118, or 6 units of ancient history. (Identical with Ar.H. 584) May be convened with 484.

589. Topography and Monuments of Athens (3) II 1992-93 For a description of course topics, see 489. Graduate-level requirements include an oral presentation and extended term paper. P: 340a or 340b; consult department before enrolling. May be convened with 489.

596. Seminar a. Aegean, Roman and Mediterranean Provincial Archaeology (3) [Rpt./30 units]

Clinical Engineering
(See College of Engineering and Mines)

Cognitive Science
Psychology Building, Room 312
(602) 621-2065

Committee on Cognitive Science (Graduate)

Professors Merrill Garrett, Chair (Linguistics, Psychology, Speech and Hearing Sciences), Carol Barnes (Psychology, Neuropsychology), Robert Cummins (Philosophy), Richard Demers (Linguistics), Kenneth Forster (Psychology), Alvin Goldman (Philosophy), Michael Harnish (Psychology), Alfed Kaszniak (Psychology, Psychiatry), John Khinston (Psychology), Terence Langendoen (Linguistics), Adrienie Lehrer (Linguistics), Bruce McNaughton (Psychology, Physiology), Lynn Nadel (Psychology), John Pollock (Psychology), Alan Rubens (Neurology), Susan Steele (Linguistics)

Associate Professors Diana Anghelou (Linguistics), Kathryn Bayles (Speech and Hearing Sciences), John C. Maloney (Philosophy), Richard Oehrle (Linguistics), Linda Swisher (Speech and Hearing Sciences), Joseph Toliver (Philosophy)

Assistant Professors Andrew Barsis (Linguistics), Felice Bedford (Psychology, Paul Blaisdell (Psychology), Denise Cummins (Psychology), Molly Diesing (Linguistics), Betty Gisky (Psychology), Kerry Green (Psychology), Michael Hammond (Linguistics), Laura Mccloskey (Psychology), Mary Peterson (Psychology), Cyma Van Petten (Psychology), Margaret Wynn (Psychology)

Cognitive science is the interdisciplinary study of the workings of the mind. It seeks to link theories of human mental capacities to experimental and computational approaches to cognition, and to discover the ways in which the brain carries out high-level mental functions. The committee offers a Doctor of Philosophy
The Department of Communication offers courses to promote understanding of the functions of communication at all levels of society, from interpersonal communication to the social effects of mass media. Because communication is the most basic social behavior and the means by which the individual functions in society, the study of communication is relevant to all academic and career interests.

The degrees offered by the department are the Bachelor of Arts, the Master of Arts, including an interdisciplinary option in organizational communication; and the Doctor of Philosophy, all with a major in communication. Students should consult the College of Arts and Sciences section of this catalog for the undergraduate program requirements for the Bachelor of Arts degree. For graduate admission and degree requirements, students should consult the Graduate Catalog.

The major requires 36 units in communication, 20 of which must be upper-division course work, excluding all "University-Wide House Numbered Courses" (see "Course Listing Information" under Departments and Courses of Instruction section) except 396, 496, and 4931. All majors must meet the following course requirements: (1) 7 units from basic communication competency courses, including 100, and 6 additional units selected from 102, 103, 104, 105, and 106; (2) 9 units in analysis courses: 200, 225, 280, (3) 20 units of upper-division courses, including 300 and at least one theory and one research course from the following list: Theories (3) I II S Analysis of the structure and function of communication in complex organizations. Interpersonal, group, and public communication experiences are provided.

The teaching major requires the following 36 units: 100, 102, 103, 104, 105, 200, 225, 280, 300, 309, 318, 403, 417 and 493. The teaching minor requires 24 units: 100, 201, 102, 103, 104, 105, 200, 225, 280, 300 and 493. The department participates in the Honors Program.

The teaching minor requires the following 36 units: 100, 102, 103, 104, 105, 200, 225, 280, 300, 309, 318, 403, 417 and 493. The teaching minor requires 24 units: 100, 201, 102, 103, 104, 105, 200, 225, 280, 300 and 493. The department participates in the Honors Program.

00. Fundamentals of Communication (1) I S Introduces beginning students to the scope of the discipline of communication. CR, 102, 03, 104, 105, or 106.

02. Public Speaking (2) I II S Beginning course in the practice of public speaking, with emphasis on organization, effective thinking, and delivery. P or CR, 100.

103. Communication in Small Groups (2) I II S Introduction to small group communication with practice and exemplification of principles in small group discussion. P or CR, 100.

104. Interpersonal Communication (2) I II S Study and application of basic communication concepts to the description and analysis of interpersonal communication transactions. P or CR, 100.

105. Introduction to Nonverbal Communication (2) I II S Study and application of basic communication concepts to the description and analysis of nonverbal cues. P or CR, 100.

106. Communication of Literature (2) I II S Introduction to the performance of literature, with emphasis on the sound and gesture and the emotional and intellectual meanings of the texts of prose, poetry, and drama. P or CR, 100.

111. Critical Thinking in Communication (3) I II Argument identification and evaluation in a variety of communication contexts. Argument preparation and presentation in written and oral situations.

112. Introduction to Organizational Communication (3) I II S Analysis of the structure and function of communication in complex organizations. Interpersonal, group, and public communication experiences are provided.

125a. Communication Activities in Debate and Forensics (1) [Rpt.] I S Student participation in intercollegiate debate and forensics. Open only to members of the university forensics team. Approval of the instructor is required prior to admission to this offering. No more than 3 units of 125 credit (a or b taken in any combination) may count toward graduation.

125b. Communication Activities in Interpreters' Theatre (1) [Rpt.] I S Student participation in Interpreters' Theatre. Open only to students cast in departmental shows. Approval of the instructor is required prior to admission to this offering. No more than 3 units of 125 credit (a or b) may count toward graduation.

200. Fundamentals of Analysis of Communication Behavior (3) I II S Study and application of principles of analysis to communication functions operating to structure social groups and social systems.

225. Argumentation (3) I II S Study of the philosophy, theory and practice of argumentation; analysis and comparison of classical and contemporary models of advocacy and evidence; examination of argument in public policy, legal, and debate settings.

280. The Nature of Inquiry in Communication (3) I II S Introduction to communication research methods to enable students to become more qualified consumers of communication literature.

300. Introduction to Communication Theory (3) I II S Origin and development of basic concepts in communication theory and research; survey and analysis of theories and models in research. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).


312. Small Group Decision Making (3) I II S A practical and theoretical study of decision making, conflict management, and communication interaction in task-oriented work groups.

318. Persuasion (3) I II S Theories of audience analysis and the motivation of human conduct: the study of rhetorical devices.

399H. Honors Proseminar (3) I II

403. Theories of Small Group Communication (3) I II S Theory and research on social control and deviance in groups from the perspective of communication behavior. May be convened with 503.


409. Theories of Mass Communication (3) I II An in-depth analysis of theories of the social effects of various mass media sources on society. May be convened with 509.

410. Struggle for the Presidency (3) I S Examination of the campaign strategies and tactics of those seeking the nation's most powerful office from 1960 to the present. (Identical with Pol. 410) May be convened with 510.

411. Communication and Conflict Management (3) I II S Consideration of theory and research pertaining to the handling of conflict across diverse contexts. May be convened with 511.

412. Organizational Communication (3) I II S Analysis of interpersonal and group communication practices affecting goal achievement in business, governmental, and professional organizations.

415. Nonverbal Communication (3) I II S The theory and research on nonverbal communication codes (kinesics, touch, voice, appearance, use of space, time and artifacts) and social functions (impression formation and management, relational communication, emotional expressions, regulation of interaction, social influence). May be convened with 515.

417. Relational Communication (3) I II S The relational communication process and messages people use to define interpersonal relationships, including dominance-submissiveness, affection, involvement and similarity. P, 104. May be convened with 517.

418. Advanced Persuasion Theory (3) I II S Examination of philosophical and theoretical assumptions in persuasion in individual, institutional and societal contexts. P, 318.

420. Communication and the Legal Process (3) I S Presents a number of accomplishments and challenges in the social scientific study of law, with special emphasis on the effects of communication and social structure on the legal processes. (Identical with Soc. 420) May be convened with 520.

421. Political Campaign Communication (3) I S Investigation and analysis of communication principles and practices in contemporary campaigns for elective office. May be convened with 521.
422. Presidential Leadership and Communication (3) II Examination of presidential leadership and communication strategies of the modern presidents from Kennedy to the present. P, upper-division standing. May be convened with 522.

423. Topics in Rhetorical Theory and Criticism (3) [Rpt./1] Intensive reading and analysis of the works of major rhetorical theorists. Each semester will focus on a specific era or perspective. May be convened with 523.

428. Communication Research Methods (3) II Theories of communication and their research backgrounds; research methodology in communication behavior studies. May be convened with 528.

445. Communication of Poetry (3) I Typology of poetry analyzed, with emphasis on their differences for oral presentation and delivery. P, 106.

446. Communication of Fiction (3) II Analysis of short stories and selected short novels, with emphasis on point of view, tone, and characterization in preparation for performance. P, 106.

447. Projects in the Performance of Literature (3) I Study in forms, styles, and aesthetics of Readers Theatre, Chamber Theatre, and the documentary; examination of essay, biography, short fiction, novel, and dramatic literature for group reading. P, 3 units in communication, drama, or English.


452. Communication and Human Relationships (3) S An advanced course enabling students to inventory, evaluate, and develop oral communication skills in the interpersonal, group, and organizational dimensions of their lives. P, senior standing. May be convened with 562.


503. Theories of Small Group Communication (3) I II For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper on a single aspect of macro-communication patterns in groups. May be convened with 403.

509. Theories of Mass Communication (3) II For a description of course topics, see 409. Graduate-level requirements include an in-depth theoretical paper on social effects of the mass media. May be convened with 409.

510. Struggle for the Presidency (3) I I For a description of course topics, see 410. Graduate-level requirements include an in-depth research project. (Identical with Pol. 510) May be convened with 410.

511. Communication and Conflict Management (3) III I For a description of course topics, see 411. Graduate-level requirements include an in-depth research paper on communication in some conflict situation. May be convened with 411.

515. Nonverbal Communication (3) I II For a description of course topics, see 415. Graduate-level requirements include an in-depth research project on nonverbal communication. May be convened with 415.

517. Relational Communication (3) I I For a description of course topics, see 417. Graduate-level requirements include an in-depth research project or theoretical paper on some issue in the management of interpersonal relationships. May be convened with 417.

520. Communication and the Legal Process (3) I I For a description of course topics, see 420. Graduate-level requirements include an in-depth research project on a single aspect of communication methods and legal context. (Identical with Soc. 520) May be convened with 420.

521. Political Campaign Communication (3) I I For a description of course topics, see 421. Graduate-level requirements include an in-depth research project or theoretical paper on some issue in a recent campaign. May be convened with 421.

522. Presidential Leadership and Communication (3) II For a description of course topics, see 422. Graduate-level requirements include an in-depth research paper or project. May be convened with 422.

523. Topics in Rhetorical Theory and Criticism (3) [Rpt./1] For a description of course topics, see 423. Graduate-level requirements include an in-depth research project or rhetorical criticism of a selected speaker or issue. May be convened with 423.

528. Communication Research Methods (3) II For a description of course topics, see 428. Graduate-level requirements include an in-depth research project demonstrating ability to design and conduct research and to analyze data. May be convened with 428.

550. Communication and Cognition (3) I II For a description of course topics, see 450. Graduate-level requirements include an in-depth research project on a single issue in communication and cognition. May be convened with 450.

562. Communication and Human Relationships (3) S For a description of course topics, see 462. Graduate-level requirements include an in-depth research project on some single aspect of communication and human relations and additional examination questions. May be convened with 462.

589. Scholarly Communication (3) II (Identical with LIT. 589)

610. Communication Theory I (3) I An overview of theoretical perspectives on the role of verbal and nonverbal communication in the process of generating and understanding development of interpersonal relationships.

620. Communication Theory II (3) I An overview of historical and theoretical perspectives on communication strategies used in social influences from interpersonal to mass media contexts.

621. Theory Construction in Communication (3) III I Theoretical and meta-theoretical positions in the discipline of communication with an emphasis on approaches to analyzing and developing original theories.

660. Research Methodologies I (3) I An introduction to research methods and designs used in contemporary communication research.

670. Research Methodologies II (3) II Advanced study of research design and statistical analysis in contemporary communication research.


696. Seminar a. Nonverbal Communication (3) [Rpt./3] I II
b. Literature as Communication (3) [Rpt./3] I II
c. Rhetorical Theory and Criticism (3) [Rpt./3] I II
d. Social Influence (3) [Rpt./3] I II
e. Mass Media (3) [Rpt./3] I II
f. Linguistic Investigations and Applications (3) [Rpt./3] I II (Identical with Ling. 696f)
g. Message Analysis (3) [Rpt./3] I II
h. Organizational Communication (3) [Rpt./3] I II
i. Interpersonal Communication (3) [Rpt./3] I II
j. Information Processing and Management (3) [Rpt./3] I II
k. Research Methods (3) [Rpt./3] I II

Comparative Literature and Literary Theory (CPLT)

1249 North Highland Avenue
Building 431c
(602) 626-8693

Committee on Comparative Literature and Literary Theory (Graduate)

Professors J. Douglas Canfield, Chair (English), Susan H. Alten (English), Norman Austen (Classics), Barbara A. Babcock (English), Jonathan Beck (French and Italian), David H. Chisholm (German), William Epstein (English), Lawrence J. Evers (English), Adel Gamal (Near Eastern Studies), John Gardner (Russian and Slavic Languages), Robert M. Gimello (East Asian Studies/Religious Studies), Jerrold E. Hogle (English), Richard P. Kinkade (Spanish and Portuguese), Annette Kolden (English), N. Scott Momaday (English), Suresh Raval (English), Ellina S. Rivero (Spanish and Portuguese), Herbert N. Schneider (English), Charles Tatum (Spanish and Portuguese)

Associate Professors Esther Fuchs (Judaic Studies), Ingeborg Kohn (French and Italian), Steven D. Martinson (German), Ronald C. Mao (East Asian Studies), Judith A. Nantell (Spanish and Portuguese), Charlett Sherry (English), Jon Solomon (Classics), Thomas Spaulding Willard (English), Linda Zwinger (English)

Assistant Professors Marie Chan ( Orientai Studies), Albrecht Classen (German), Irene D'Almeida (French and Italian), Susan Derwin (English), Barbara Kosta (German), Lis Lethabier (French and Italian), Tenney Nathanson (English), Holt Parker (Classics), Susan White (English)
in science and industry, and prepares students for graduate study in computing.

The department offers the following degree programs: Bachelor of Science, Master of Science, and Doctor of Philosophy with a major in computer science. For graduate admission and degree requirements, consult the Graduate Catalog.

Admission to the major: Students must complete a minimum of 12 major units before applying for admission to the major. Students should declare Pre-Computer Science as their major while completing the pre-major requirements. All pre-major units taken serve to fulfill existing major, minor, or general education requirements for the B.S. degree. The 30 units include five required pre-major courses: 115, 227, Math. 124 or 125a, 125b, and 4 units from a department approved laboratory science (as of fall 1990 these include PYS. 106, Phys. 111a, Phys. 110, or Chem. 103a, 104a.) Students typically apply for the computer science major in the early fall of their sophomore year. Admission to the major will be selective and competitive due to limited faculty and laboratory resources. All students who have completed the pre-major may apply but only the most qualified applicants will be admitted. Students who do not have a cumulative GPA of at least 3.0 and grades of "B" or better in all required pre-major courses are not likely to be admitted. To receive a degree in computer science students must be admitted to the program and complete at least 30 units of their program as a fully admitted major.

The major: Students must complete the general education requirements of the College of Arts and Sciences; a specified major, and the minor requirements. The major requirements total 38 units including: 115, 227, 237, 344, 327, 342, 373, 430, nine units of 400-level computer science electives and three units of 400-level senior elective. The major requirements total 21 units including Math. 124 or 125a, 125b, 237, 243, and 3 upper-division units of mathematics electives. The balance of the minor units may be chosen from mathematics (a mathematics minor) or from an approved computing-related discipline (a split minor).

The minor in computer science requires a minimum of 20 units in computer science. The student's major advisor approves the course of study in consultation with the departmental chairperson. The minor requires two options to be completed: 30 units including: 115, 227, 237, Math. 243, 342, and two of the following: 327, 344, 430, 452, or 476. Option two (20 units) includes 115, 227, Math. 243, 344, 342 and one of the following: 373 or 443.

Honors: The department participates in the Honors Program. All honors students in computer science complete 6 units of 498H in lieu of the senior elective requirement and 3 units of the 400-level computer science elective requirement.

115. Computer Science Principles (4) I I I S Algorithms, programs and algorithms; problem analysis and structured program design in a high-level language; machine and systems organization, data representation, program testing and verification. P. Math. 117R/S.

227. Program Design and Development (4) I II Programming using a high-level language such as Pascal. Several medium-sized projects will be required, with emphasis on program design using stepwise development. P. 115, Math. 125a.

237. Machine Organization (3) I II Introduction to digital computers; elementary hardware concepts; machine operations and instruction; assembly language concepts; programming in assembly language. P. 115.

327. Comparative Programming Languages (3) I II Introduction to several major high-level programming languages and their characteristics. Programming projects are required in at least three languages. P. 227 or M.I.S. 301; 237 or M.I.S. 307 or E.C.E. 271b. (Identical with M.I.S. 342)

331. Data Management Systems (3) I I I S (Identical with M.I.S. 331)

342. Data Structures and Algorithms (3) I I I Mathematical preliminaries; fundamental data structures and associated algorithms, implementations and applications: stacks, queues, trees, graphs, sorting, and searching. P. 227 or CR 327; Math. 243 or Math. 362. (Identical with M.I.S. 342)


373. Automata, Grammars and Languages (3) II Finite automata, regular expressions, and their applications; context-free grammars, pushdown automata, and their applications. Turing machines and undecidability; the Chomsky hierarchy. P. 227, 244. (Identical with Math. 373) Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).


421. Simulation Modeling and Analysis (3) I (Identical with M.I.S. 421)

430. Software Design (3) I I Techniques and tools for program design and implementation, especially of large programs with difficulty: software design teams, software design models, development techniques, and application. P. 344, 430. May be convened with 530.

433. Introduction to Interactive Computer Graphics (3) II Theory and practice of computer graphics: 2D and 3D transformations, clipping, and viewing, hierarchical modeling, computer graphics hardware, raster graphics, input models, interaction techniques, and applications. P. 344, 430. May be convened with 533.

443. Theory of Graphs and Networks (3) I I (Identical with Math. 443) May be convened with 543.

445. Algorithms (3) I Mathematical preliminaries; using induction to design algorithms; introduction to analysis of algorithms; algorithms involving sequences and sets; graph algorithms; advanced topics. P. 342, 344.

450. String and List Processing (3) I Data representation, pattern matching, programming

520. Principles of Programming Languages (3) II Important programming language concepts, including types, control and data abstraction, denotational semantics, declarative and object-oriented languages, implementation issues. P. 453.

521a-521b. Advanced Systems Modeling and Simulation (3-3) (Identical with M.I.S. 521a-521b)

522. Principles of Concurrent Programming (3) II Fundamental concepts of concurrent programming; synchronization mechanisms based on shared variables and message passing; systematic development of correct programs; paradigms for distributed programming. P, 373, 452.

525. Principles of Computer Networking (3) II Theory and practice of computer networks, emphasizing the principles underlying the design of network software and the role of the communications system in distributed computing. Topics include data representation, channel semantics, synchronization, resource naming, and resource sharing. P, 452.

530. Software Design (3) II For a description of course topics, see 430. Graduate-level requirements include additional and more challenging programming projects and different examinations. P, 237 or E.C.E. 271b; 342. May be convened with 430.

533. Introduction to Interactive Computer Graphics (3) II For a description of course topics, see 433. Graduate-level requirements include more extensive and challenging programming assignments. P, 344, 430. May be convened with 433.

534. Advanced Operating Systems (3) II Operating system design, implementation and compilation of programming languages; specific topics to be determined by current literature and faculty and student interest.

535. Design and Analysis of Algorithms (3) II Time, space complexity; recurrences; algorithm design techniques; lower bounds; graph, matrix, and set algorithms; sorting; fast Fourier transform; arithmetic complexity; intractable problems. P, 445, Math. 362.


550. String and List Processing (3) II For a description of course topics, see 450. Graduate-level requirements include more extensive problem sets and different examinations. P, 327, 373, 430. May be convened with 450.

552. Advanced Operating Systems (3) III Operating system design, implementation and modeling; deadlock and memory management models; protection mechanisms; operating systems for parallel and distributed systems. P, 452.


570. Artificial Intelligence (3) II For a description of course topics, see 470. Graduate-level requirements include more extensive problem sets and different examinations. P, 327, 373, 430. May be convened with 470.

571a-571b. Digital Systems Design (3-3) (Identical with E.C.E. 571a-571b)

572a-572b. Continuous-System Simulation (3) I (Identical with E.C.E. 572a-572b) May be convened with 472a-472b.

573. Theory of Computation (3) I Chomsky hierarchy, abstract families of languages, undecidability; general recursive functions; recursion theory; computational complexity theory; NP-complete and provably intractable problems. P, 373. (Identical with Math. 573)

574a-574b. Computer-Aided Logic Design (3-3) I (Identical with E.C.E. 574a-574b) May be convened with 474a-474b.

575a-575b. Numerical Analysis (3-3) (Identical with Math. 575a-575b)

576. Computer Architecture (3) I For a description of course topics, see 476. Graduate-level requirements include additional items or tests and homework, and additional readings on advanced architectures. P, 237 or E.C.E. 271b; 342. May be convened with 476.

578. Computational Methods of Algebra (3) II (Identical with Math. 578)


588. Computational Linguistics (3) I (Identical with Ling. 588) May be convened with 488.

590. Advanced Topics in Programming Languages (1-3) [Rpt./12 units] I Design, implementation, and compilation of programming languages; specific topics to be determined by current literature and faculty and student interest.


620. Advanced Topics in Programming Languages (1-3) [Rpt./12 units] II Advanced aspects of computation; specific topics to be determined by current literature and faculty and student interest.

645. Advanced Topics in Algorithm Analysis (1-3) [Rpt./12 units] III Design and analysis of algorithms; specific topics to be determined by current literature and faculty and student interest.

652. Advanced Topics in Operating Systems (1-3) [Rpt./12 units] II Operating system design, development, analysis, and performance; specific topics to be determined by current literature and faculty and student interest.

673. Real-Time Distributed Processing Systems (3) II (Identical with E.C.E. 673)

674. Test Generation for Automata (3) I (Identical with E.C.E. 674)


Consumer Studies
(See Family and Consumer Resources)

Correctional Administration
(See Management and Policy)

Counseling and Guidance
(See Family and Consumer Resources)
The critical languages program, a unit within the Faculty of Humanities, provides tape-intensive instruction in languages not offered by other language departments or committees at The University of Arizona. Criteria for the introduction of new languages are (1) student, university or community need, (2) availability of native language tutors, (3) proper audiolingual instructional materials. Sections vary in size from four to seven students.

Languages recently offered are Hungarian, Indonesian, Kazakh, Korean, Swahili, Swedish, Turkish, Ukrainian, Urdu, and Afghan-Uzbek. Additional languages (African, North and South American, Asian, European) will be offered in response to student, university or community need. For further information, contact the critical languages program.

101. Elementary Language Study (4) [Rpt.*] I II S Introduction to the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly tutorial reviews. 2R, 6L, Fee. P. 101.

102. Elementary Language Study (4) [Rpt.*] I II S Continued introduction to the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly tutorial reviews. 2R, 6L, Fee. P. 101.

201. Intermediate Language Study (4) [Rpt.*] I II S Continuing study of the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 6L, Fee. P. 101.

202. Intermediate Language Study (4) [Rpt.*] I II S Continuing study of the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 6L, Fee. P. 201.

*Courses may be repeated if language is different each time.

Dance (DNC)
Gittings Building, Room 14
(602) 621-4698

Committee on Dance
Professors Isabella Bergson, John M. Wilson
Associate Professors Jory Hancock, Chair,
Nina Janik
Assistant Professors Ellen Bromberg

The Committee on Dance, a unit of the School of Music, Faculty of Fine Arts, provides studies in the art, the teaching, and the analysis of dance. The dance curriculum offers four years of technique in ballet and modern dance, choreography and ample performing experience, leading to the Bachelor of Fine Arts degree with a major in dance.

In cooperation with the Department of Theatre Arts, the Committee on Dance offers programs of advanced study which lead to Master of Arts and Master of Fine Arts degrees in the theatre arts with a dance concentration. Interested students should consult the listings for Dance and Theatre Arts in the Graduate Catalog.

The major: Dance majors must audition for placement in dance technique courses and are required to take two credits per semester in dance. For information regarding the placement session, please contact the Committee on Dance. The following courses must be taken: Dnc. 143, 201, 240a-240b, 241a-241b, 245a-245b, 259, 340a-340b, 341a-341b, 370, 401, 440a-440b or 441a-441b; 343a-343b-343c-343d; 346, 394a-394b, 445a-445b," 451a," 496d; Mus. 107 and 108, or 130a and 130b and one unit of applied music; Phil. 111 or Dnc. 397a; any one of T.Ar. 111, 116, or 220. The B.F.A. degree requires 45 units outside of the major department including the general education requirements (described in the College of Arts and Sciences section of this catalog), and 16 units of combined electives in art, history, theatre arts, music, media arts, and creative writing. All B.F.A. students are required to take at least one 3-unit course focusing on gender, race, ethnicity, or non-Western civilization. Thirty units in dance classes, including 4 units in ballet technique, 4 units in modern technique, Dnc. 343a-343b-343c-343d (for cumulative units) and Dnc. 394a-394b, must be taken in residence. Minimum units required for the degree with the major in dance — 125.

*Required for modern emphasis.
**Required for ballet emphasis.

The minor: Students wishing to minor in dance must complete the core curriculum (15 units) and track curriculum (6 units). The core curriculum consists of the following dance courses: 143, one year of ballet or modern dance techniques in sequence with placement in level by audition (240a-240b or 340a-340b for ballet; 241a-241b or 341a-341b for modern dance), 245a-245b, 259, 346, and 370. The track curriculum, consisting of additional dance courses in areas of special interest and demonstrated talent, is selected by students with the advice and approval of the undergraduate advisor for dance. Areas include ballet performance (selection from and placement in 239a-239b, 297a, four units from 343a-343b-343c-343d, 391, 439a-439b, 440a-440b, 450a-450b), modern dance performance (selection from and placement in 297a, four units from 343a-343b-343c-343d, 391, 441a-441b), jazz dance (placement in 244a-244b-244c-244d, 297a, four units from 343a-343b-343c-343d, 391), composition (six units from 343a-343b-343c-343d, 391, 394a, 394b, 445), introduction to teaching (297a, four units from 343a-343b-343c-343d, 391, 394a, 394b, 399). Minimum units required for the minor in dance — 21.

The Committee on Dance participates in the honors program.

100. Looking at Dance (3) I Origins of dance as human expression in ritual, social, and the-atrical context. Twentieth century developments in ballet, modern dance, movie, and show dancing. Open to nondance majors only.

112. Ballet I II S
a. Beginning Ballet (1)
   c. Intermediate Ballet (2)

143. Improvisation (1) I II

152. Modern Dance
a. Beginning Modern Dance (1) I II S
b. Modern Dance for Beginners with Limited Experience (1) I II S, 2P, 152a.
c. Intermediate Modern Dance (2) I II S

175. Theatre Dance I II S Jazz movement styles for the beginning dancer; basic steps, phrases, and performing techniques for musical comedy and media dance entertainment. (Identical with Mus. 175)

201. Alignment-Floor Barre
a. Beginning Alignment-Floor Barre (1) [Rpt.2 units] I II

207. Western Civilization and the Arts: The Twentieth Century (3) I II (Identical with F.A. 207)

239a-239b. Beginning Ballet Pointe (1-3) [Rpt./1] Strength, stretch, and placement techniques for the beginner student in preparation for ballet pointe; barre and center practice. 2S. P, by audition only. CR, 112 or higher level ballet technique.


241a-241b. Dance Technique I: Performance Foundations (2-2) Foundational studies of human movement as an art form, including rhythmic analysis and perceptual enhancement, mechanisms of balance functions on improvisation, and origins of gesture. Wilson/Bergsohn

244a-244b-244c-244d. Jazz Dance Technique (2-2-2-2)

245a-245b. Basic Choreography (2-2) Study of the elements of time, space, and energy; basic concepts of phrasing and structure leading to the composition. 4S, P, 143, Bergsohn

251. History of Dance (3) I II History of dance as theater art within the western world from 1581 to the present. Bergsohn

291. Preceptorship
a. Dance Production (1-3) [Rpt./3] I II

307. Western Civilization and the Arts: Paleolithic through Renaissance (3) I II (Identical with F.A. 307)
460. Ballet Technique for Men (1) \[Rpt./2 units\] I Emphasis on physical conditioning as well as adagio movement; various pirouette, grand allegro, elevations using battery in combinations focusing on male performance. P. Intermediate Ballet. 2S. May be convened with 560.

495. Colloquium a. Evaluation of Dance and Body Technique (3) \[I P, intermediate level ballet or modern dance techniques. (Identical with T.Ar. 495a) May be convened with 595a. Bergsohn

501. Advanced Floor Barre (1) \[Rpt./4 units\] I II For a description of course topics, see 401. Graduate-level requirements include additional written assignments. 2S. P, 201. May be convened with 401.

593a-593b. Advanced Pointe Technique (1-1) \[Rpt./4 units\] I II For a description of course topics, see 439a-439b. Graduate-level requirements include completion of additional exercises. P, audition. May be convened with 439a-439b.

540a-540b. Ballet Technique III (2-2) Graduate-level requirements include an additional creative and/or research project. P, 340b. May be convened with 440a-440b. Hancock

541a-541b. Modern Dance Technique III (3-3) Graduate-level requirements include an additional creative and/or research project. P, 341b. May be convened with 441a-441b. Bromberg

543. Dance Ensemble (2) \[Rpt./1\] I II Rehearsal methods, repertorial development, and performance of dance with particular emphasis on ensemble. 4S. P, repertory audition; intermediate level in modern and ballet (340a-b, 341a-b).

545a-545b. Advanced Choreography (2-2) For a description of course topics, see 445a-445b. Graduate-level requirements include completion of a full-scale group composition, which will be evaluated by the dance faculty. May be convened with 445a-445b. Bromberg

546. Dance Program Administration (3) II 1992-93 Historical and current factors affecting career development in dance and dance-related fields; practical organization of programs. (Identical with T.Ar. 546) Wilson

550. Literary Resources for Choreography (3) I II 1992-93 Historical and current factors affecting career development in dance and dance-related fields; practical organization of programs. (Identical with T.Ar. 546) Wilson

595. Colloquium a. Evaluation of Dance and Body Technique (2) I P, intermediate level ballet or modern dance techniques. (Identical with T.Ar. 595a) May be convened with 495a. Bergsohn

601. Advanced Floor Barre (1) \[Rpt./4 units\] I II For a description of course topics, see 401. Graduate-level requirements include additional written assignments. 2S. P, 201. May be convened with 401.

697. Workshop (See Theatre Arts)
### EAST ASIAN STUDIES (EAS)

#### 130. Asian Religions (3) I Religions of India and the Far East (Identical with Reli. 130)

#### 270. Modern East Asia: A History (3) II Historical survey of China and Japan during the 19th and 20th centuries, along with the factors that have influenced East Asian countries. (Identical with Hist. 270)

#### 333. Buddhist Meditation Traditions (3) I Major forms of Buddhist meditation from both the South Asian and East Asian traditions, with emphasis on the nature of meditation as a variety of religious experience. (Identical with Reli. 333)

#### 345. Hindu Religious Activities (3) I Practical Hinduism through worship, rituals, and ceremonies based on Vedic, Puranic and folk traditions. (Identical with Reli. 345)

#### 396H. Honors Proseminar (3) I 427a. The Prehistory of East Asia (3) I (Identical with Anth. 427a) May be convened with 527a.

#### 445. Hindu Mysticism (3) II Introduction to the major concepts and practices of Hindu mysticism, including yoga techniques, rites, symbols, and myths. (Identical with Reli. 445) May be convened with 545.

#### 451. The United States and East Asia: 1840 to the Present (3) II 1992-93 (Identical with Hist. 451) May be convened with 551.

#### 452. Hindu Literature (3) I For a description of course topics, see 452. Graduate-level requirements include submission of a research paper or project approved by the instructor. (Identical with Reli. 545) May be convened with 445.

#### 552. Hindu Literature (3) II For a description of course topics, see 452. Graduate-level requirements include submission of a research paper or project approved by the instructor. May be convened with 452.

#### 563. Asian Marxism (3) I For a description of course topics, see 463. Graduate-level requirements include a research paper on a topic concerning Marxist movements in China or Japan. (Identical with Hist. 563) May be convened with 463.

#### 564. International Relations of East Asia (3) II (Identical with Pol. 564) May be convened with 464.

#### 587a-587b. History of East Asian Buddhism (3-3) For a description of course topics, see 487a-487b. Graduate-level requirements include assigned readings in primary Chinese or Japanese sources and in modern Chinese and/or Japanese secondary sources, together with a research paper based on such sources. May be convened with 487a-487b.

#### 589. Women in East Asia (3) I (Identical with Hist. 589) May be convened with 489.

### Chinese Studies (CHN)

#### 101. Elementary Chinese (5) I CDT Introduction to modern spoken and written Chinese (Mandarin).


#### 142. Chinese Humanities (3) II Major trends and traditions in the arts, literatures and languages, religions and philosophies of China. (Identical with Reli. 142)

#### 174. Chinese Civilization (3) I Survey of the key elements of traditional and modern Chinese civilization. Changes in the modern period and contacts with the West are examined. (Identical with Hist. 174).


#### 331. Taoist Traditions of China (3) I Intellectual foundations of Taoism in its two scriptural sources, the Lao Tzu and the Chuang Tzu, and a sampling of some of the varieties of religious practice which developed upon these foundations. (Identical with Reli. 331)

### Other Courses

- **497. Workshop** b. Techniques of Foreign Language Teaching (1) I (Identical with Ger. 497b)

- **503b. Introduction to Comparative Literature and Literary Theory (3) II (Identical with Cp.Lit. 503b)**

- **527a. The Prehistory of East Asia (3) I (Identical with Anth. 527a) May be convened with 427a.

- **545. Hindu Mysticism (3) II For a description of course topics, see 445. Graduate-level requirements include two research papers or reports approved by the instructor. (Identical with Reli. 545) May be convened with 445.

- **551. The United States and East Asia: 1840 to the Present (3) II 1992-93 (Identical with Hist. 551) May be convened with 451.

- **552. Hindu Literature (3) II For a description of course topics, see 452. Graduate-level requirements include submission of a research paper or presentation on a subject approved by the instructor. May be convened with 452.

- **563. Asian Marxism (3) I For a description of course topics, see 463. Graduate-level requirements include a research paper on a topic concerning Marxist movements in China or Japan. (Identical with Hist. 563) May be convened with 463.

- **564. International Relations of East Asia (3) II (Identical with Pol. 564) May be convened with 464.

- **587a-587b. History of East Asian Buddhism (3-3) For a description of course topics, see 487a-487b. Graduate-level requirements include assigned readings in primary Chinese or Japanese sources and in modern Chinese and/or Japanese secondary sources, together with a research paper based on such sources. May be convened with 487a-487b.

- **589. Women in East Asia (3) I (Identical with Hist. 589) May be convened with 489.

- **597. Workshop** b. Techniques of Foreign Language Teaching (1) I (Identical with Ger. 497b)

### Additional Information


- **420. Intermediate Modern Chinese (3) II CDT Grammar, reading, and conversation in the modern (Mandarin) language. P. 401.


- **419. Linguistic Structure of Modern Chinese (3) I Linguistic study of the phonological, morphological, and syntactic systems of modern Chinese, with particular attention to linguistic analysis. (Identical with Ling. 419) May be convened with 519.

- **420. Linguistic Structure of Modern Chinese (3) II Linguistic study of the phonological, morphological, and syntactic systems of modern Chinese, with particular attention to linguistic analysis. P. 419. (Identical with Ling. 420) May be convened with 520.

- **427b. The Archaeology of Pre-Han China (3) II (Identical with Anth. 427b) May be convened with 527b.

- **440. Chinese Calligraphy (2) I Theory, practice, and aesthetics of Chinese brush writing, with emphasis on individual training and development. May be convened with 540.

- **460. Modern Chinese Foreign Relations (3) II (Identical with Pol. 460) May be convened with 560.

- **468. Women in China (3) I Analysis of the role of women in Chinese society with equal emphasis on traditional and modern periods. (Identical with W.S. 468) May be convened with 568. Writing-Emphasis Course for Chinese specialization.**

- **475a-475b-475c-475d-475e. Periods in Chinese History (3-3-3-3-3) In-depth treatment of major premodern eras. 475a: Ancient and classical, to 200 B.C. P. 475b: Early Empire 200 B.C. - 200 A.D. P. 475c: Medieval 200-750 A.D. P. 475d: New Empire, 750-1350 A.D. P. 475e: Late Empire, 1350-1800 A.D. (Identical with Hist. 475a-475b-475c-475d-475e) May be convened with 575a-575b-575c-575d-575e.
476. Modern Chinese History (3) Historical survey of the period since 1911 which examines the revolutionary developments shaping contemporary China. (Identical with Hist. 476) May be convened with 576.

482. Social History of China (3) Formation of ancient Chinese society; organization of families and clans; social stratification, mobility, conflict, and control in traditional China; and transformation from traditional to modern society. (Identical with Hist. 482) May be convened with 582. Writing-Emphasis Course for China specialization.*

495. Colloquium
i. Confucianism: The Classical Period (3) (Identical with Hist. 495i) May be convened with 595i. Writing-Emphasis Course* for China specialization.
ii. Confucianism: The Neo-Confucian Tradition (3) (Identical with Hist. 495j) May be convened with 595j.

519. Linguistic Structure of Modern Chinese (3) For a description of course topics, see 419. Graduate-level requirements include two presentations and one term paper. (Identical with Ling. 519) May be convened with 419.

520. Linguistic Structure of Modern Chinese (3) For a description of course topics, see 420a. Graduate-level requirements include two presentations and one term paper. (Identical with Ling. 520) May be convened with 420.

521. Resources and Methods in Sinology (3) II Introduction to and exercises in the use of standard sinological reference and research resources. P. 523.


523. Literary Chinese (3) II Introduction to pre-20th-century Chinese styles through readings in classical Chinese literature. P. 522.

527b. The Archaeology of Pre-Han China (3) II (Identical with Anth. 527b) May be convened with 427b.

540. Chinese Calligraphy (2) [Rpt.] I For a description of course topics, see 440. Graduate-level requirements include an independent project assignment with instructor. May be convened with 440.

541. Chinese Historical Linguistics (3) I Historical survey of the development of the Chinese language, with particular attention to linguistic changes in phonology, morphology, and syntax. P. 402 and a course in general linguistics.

542. Chinese Historical Linguistics (3) II Historical survey of the development of the Chinese language, with particular attention to linguistic changes in phonology, morphology, and syntax. P. 541.


547. Readings in Classical Chinese Prose (3) [Rpt.] II Readings in selected texts from literary, philosophical, and historical traditions; includes selections from the Five Classics and the great prose masters of the Han-Qing. Variable content. P. 523.

550. Studies in Modern Chinese (3) [Rpt.] S Grammar, conversation, and readings in modern Chinese texts, with emphasis on oral and written comprehension and expression. P. consult department before enrolling.

560. Modern Chinese Foreign Relations (3) II (Identical with Pol. 560) May be convened with 460.

568. Women in China (3) I For a description of course topics, see 468. Graduate-level requirements include a 15-page term paper. May be convened with 468.

575a-575b-575c-575d-575e. Advanced Modern Chinese (5-5-5-5-5) Study of advanced modern (Mandarin) Chinese through (515) readings in social science texts, (516) composition, (517) readings in modern literature, and (518) conversation. Graduate-level requirements include more translations and additional readings. 516 and 518 may be repeated once for credit. P. 402. May be convened with 415, 416, 417, and 418, respectively.

579a. Modern Chinese History Since 1949 (3) II (Identical with Hist. 474a-474b-474c-474d-474e) May be convened with 574a-574b-574c-574d-574e.

579b. Modern Chinese History Since 1949 (3) II Readings in Chinese history since 1949. (Identical with Hist. 474b-474c-474d-474e) May be convened with 574b-574c-574d-574e.

582. Social History of China (3) For a description of course topics, see 482. Graduate-level requirements include an extra term paper. (Identical with Hist. 582) May be convened with 482.

595. Colloquium
a. Readings in Chinese History (3) [Rpt./12 units]
   i. Confucianism: The Classical Period (3) (Identical with Hist. 595i) May be convened with 495i.
   ii. Confucianism: The Neo-Confucian Tradition (3) (Identical with Hist. 595j) May be convened with 495j.
   iii. Chinese History Since 1949 (3) II (Identical with Hist. 595r) May be convened with 495r.

596. Seminar
f. Classical Chinese Literature (3) [Rpt.] I II
   g. Modern Chinese Literature (3) [Rpt.] I II
   h. Premodern Chinese History and Politics (3) [Rpt.] I II
   i. Modern Chinese History and Politics (3) [Rpt.] I II

Japanese Studies (JPN)


272. Japanese Civilization (3) II (Identical with Hist. 272)


415. Advanced Japanese (3) I Reading from modern scholarship, fiction, and essays, with attention to grammatical analysis. May be convened with 515.

416. Advanced Japanese (3) II Reading from modern scholarship, fiction, and essays, with attention to grammatical analysis. P. 415. May be convened with 516.


446. Japanese Literature in English (3) I Survey of Japanese literature, with readings in English translation. 7th century to present.

Ecology and Evolutionary Biology (ECOL)

Biological Sciences West Building, Room 310
(602) 621-1588


The Department of Ecology and Evolutionary Biology provides general and professional education for those intending to pursue graduate study or for those planning a career in fields where training in basic or applied organismic, evolutionary and environmental biology is necessary or desirable. Courses in population, community and physiological ecology, behavior, population theory, biogeography, natural history, genetics, systematics, morphology, and evolution are offered. In addition to excellent instruction in the classroom, the department uses the Marine Biology Station at Puerto Penasco, Sonora, Mexico; the Southwestern Research Station at Portal, Arizona; the Boyce-Thompson Arboretum at Superior, Arizona and the Research Ranch at Egin, Arizona. It also curates excellent regional collections of plants and animals.

The department administers the Bachelor of Arts and Bachelor of Science degrees in majors in ecology and evolutionary biology and the Bachelor of Science degree in general biology. The department also administers advanced degrees, the Master of Science and Doctor of Philosophy in ecology and evolutionary biology, and botany.

The major in general biology for the Bachelor of Science degree provides a broad background covering aspects of molecular, cellular, organismic, physiological, ecological, and evolutionary biology. The requirements are: 181, 182, 302, 304, 320, M.C.B. 410a or Bioc. 460 or 462a and additional upper-division units to a minimum of 35 in the major. These elective units may be selected from the departments of Ecology and Evolutionary Biology, Molecular and Cellular Biology, Microbiology and Immunology, Biochemistry and other departments upon the approval of the major advisor. No more than four of these elective units may be taken as 399 or 499 (independent study).

The required courses for a supporting structure minor in chemistry/physics/mathematics are: Chem. 103a-103b, 104a-104b, 241a-241b, 245a-245b; Phys. 102a-102b, 180a-180b; Math. 125a-125b.

Within the general biology major, emphasis are available in the following areas: botany, environmental biology, physiology, zoology, invertebrate zoology, marine biology, preclinical, premedicine, and other appropriate professional preparation (including secondary education) may be pursued.

The major in ecology and evolutionary biology for the Bachelor of Science degree is designed primarily for students who plan to pursue graduate study in ecology and evolutionary biology or a related science. The requirements for the major are: 181, 182, 302, 304, 320, 435, and at least 12 additional upper-division units must be selected upon consultation with the major advisor for a total of 35. These elective courses may be selected from the departments of Ecology and Evolutionary Biology, Molecular and Cellular Biology, Microbiology and Immunology, Biochemistry and other departments upon the approval of the major advisor.

The required courses for a supporting structure minor in Chemistry/Physics/Mathematics are: Chem. 103a-103b, 104a-104b; Phys. 102a-102b, 180a-180b, or 110, 116, and 121; Math. 125a-125b, 223. At least 6 additional units of mathematics or nonbiological science are also required.

The major in ecology and evolutionary biology for the Bachelor of Arts degree is designed for students with interests in natural history and the biological sciences who may not wish to continue with graduate study. The requirements for the major are: 181, 182, 320 and 302 or 304, and 16 upper-division elective units from the Department of Ecology and Evolutionary Biology or from other appropriate departments with the approval of the major advisor, totaling 102 units in the major.

The required courses for a supporting structure minor in Chemistry/Physics/Mathematics are: Chem. 103a-103b, 104a-104b; Phys. 102a-102b; Math. 117/R/5, 118, and one course from 119, 123, 125a, 263.

The teaching major: The same as the general biology major, administered by the Department of Ecology and Evolutionary Biology.

The teaching minor: 181, 182, 320 and 8 upper-division units to be selected in consultation with an ecology and evolutionary biology advisor.

The department participates in the honors program.

100. Biology Concepts (4) I S Levels of biological organization from biosphere to atoms provide a framework around which are developed concepts of diversity and unity of life forms, genetic continuity and evolutionary change, and the interdependent nature of ecosystem components. Nonscience majors orientation. 3R. P, CR 105R.

105R. Introductory Botany (3) II Structure, function, development, and economic importance of flowering plants; brief overview of plant diversity. 3R. 105R must be taken concurrently with 105L to satisfy general education science requirements.

105L. Introductory Botany Laboratory (1) II Study of botanical materials, involving observation, experimentation and data analysis. Nonmajors orientation. 3L. P, CR 105R.

108. Plants and Society (3) II Lecture-demonstration course on the interactions between plants and man and the independent nature of plants as a source of food, fiber, drugs and other products; plants for esthetic value, survival and energy.

123. Introduction to Evolution (2) II Study of the directional and random forces that lead to adaptation within populations, speciation between populations, and quantum differences between major groups. The origin of life and the products of the evolutionary ages are not covered. P, cursory knowledge of Mendelian genetics recommended.
130. Natural History of the Southwest (3) I Elementary biology of the common plants and animals of the Southwest; identification, distribution, ecology. 2R, 2L. Field trips.

183. Marine Biology (3) I Survey of the marine environment and its biotic communities, with emphasis on the natural history of marine organisms. 2R, 3L. Weekend field trip.

159a-159b. Human Anatomy and Physiology (3-3) Correlated structure and function of the human body. Primarily for majors in nurses and e.x.s.s.; not designed for bio. majors.

160a-160b. Human Anatomy and Physiology Laboratory (1-1) P CR 159a-159b.

181. Introductory Biology I (4) I (Identical with M.C.B. 181)

182. Introductory Biology II (4) II Origin, diversity and evolution of life; physiology of plants, animals and organ systems; processes of micro- and macroevolution; animal behavior and ecology of populations and communities emphasizing biotic interactions and biogeography. Designed for biology majors. 3R, 3L. High school biology recommended. Field trips. (Identical with Bioc. 182, M.C.B. 182, Micr. 182)


260. Elementary Plant Physiology (4) I Functions, nutrition, metabolism, and development of higher plants. 3R, 3L. P, 161 and 162, or PLS. 100; Chem. 101b, 102b.


304. Organismic Biology (4) II Structure, function, development, and economic value of flowering plants; structure, function, and development of animals; brief survey of the plant and animal kingdoms. 3R, 3L. P, 181 and 182, or PL.S. 100b, Chem. 103b-104b. Consult department before enrolling.

320. Genetics (4) I The principles that govern the inheritance of all living organisms including molecular, chromosomal, organismal, population and evolutionary aspects of genetics with laboratory experience and problem solving. 3R, 3L. P, 181 and 182, Chem. 103b, 104b. (Identical with M.C.B. 320)


403R. Biology of Animal Parasites (3) I (Identical with V.Sc. 403R) May be repeated with 503R.

403L. Parasitology Laboratory (1) I (Identical with V.Sc. 403L) May be repeated with 503L.

405. Aquatic Entomology (3) II 1992-93 (Identical with Ento. 405) May be repeated with 505.

410. Research Design and Analysis (3) I Design and analysis for ecology, behavior, and morphology; inference and hypothesis tests; exploratory statistics. May be repeated with 510.

411. Insect Behavior (3) II 1991-92 (Identical with Ento. 411) May be repeated with 511.

412. Plants Useful to Man (2) S Lecture-demonstration course for teachers and others wishing information on the uses of plants: foods and food plants, medicinal plants, plants and industry, plants in textiles and other manufac-

418a-418b. Scientific Illustration -Photography (2 to 4-2 to 4) [Rpt.] Individual basic training in the execution of thesis drawings and graphic art techniques. 418a: Illustration. 418b: Photography. Consult dept. before enrolling. (Identical with Anth. 418a-418b) May be repeated with 518a-518b.

420. Evolutionary Quantitative Genetics (3) II 1990-91 Rigorous coverage of the inheritance and evolution of quantitative characters. Theory, estimation and design issues, and experimental results given equal coverage. P, Calculus. May be repeated with 520.

421. Philosophy of the Biological Sciences (3) I 1991-92 (Identical with Phil. 421) May be repeated with 521.

423. Cytogenetics (3) II Investigation into the structure and function of chromosomes and their role in heredity and evolution. 2R, 3L. P, 320. (Identical with Gene. 423) May be repeated with 523.

428R. Advanced Microbial Genetics (3) II (Identical with M.C.B. 428R) May be repeated with 528R.

428L. Advanced Microbial Genetics Laboratory (2) I (Identical with M.C.B. 428L) May be repeated with 528L.


433. Human Genetics (3) I (Identical with Gene. 433) May be repeated with 533.


435. Evolution (3) I A balanced survey of the present-day concepts of the process and products of evolution, with emphasis on contrasting models and their consequences; recent techniques for the elucidation of phylogenetic pathways. P, 320. 3L. P or CR, 325b. (Identical with Gene. 435) May be repeated with 535.

436. Plant Ecology (4) II Dynamic processes giving rise to ecological patterns in plant populations and communities. 2R, 6L. Field trips. P, some botany and general ecology. May be repeated with 536.


438. Biogeography (3) II The role of historical events and ecological processes in determining the past and present geographic distribution of plants and animals. P, 182 or Geos. 225. (Identical with Geos. 438) May be repeated with 538.

440R. Oceanography (2) I 1992-93 Introduction to the physical, chemical, geological, and biological dimensions of the oceans, with emphasis on their importance as biological environments. May be repeated with 540R.

440L. Oceanography Laboratory (2) I 1992-93 Field and lab. investigations of the Gulf of California, with emphasis on research techniques important to biological oceanography. Weekend field trips. P, 440R or CR. May be repeated with 540L. Writing-Emphasis Course.

441. Limnology (4) I (Identical with W.F.Sc. 441) May be repeated with 541.

442. Marine Ecology (6) S A field introduction to basic concepts in marine ecology with emphasis on the behavior and ecology of invertebrates and fishes and the factors affecting the diversity and community structure of marine communities. The entire course is conducted at selected sites in the Gulf of California. Consult instructor before enrolling. May be repeated with 542.

444. Insect Ecology (3) I (Identical with Ento. 444) May be repeated with 544.

458. Comparative Vertebrate Anatomy (4) I (Identical with V.Sc. 458) May be repeated with 558.

459. Comparative Vertebrate Histology (4) II (Identical with V.Sc. 459) May be repeated with 559.

460. Plant Physiology (4) I (Identical with P.S. 460) May be repeated with 560.

466. Physiology Laboratory (2) I Emphasis on data acquisition, analysis and interpretation. Laboratory techniques and investigation of physiological mechanisms. P, either 437, 468; V.Sc. 400a-400b; or Psio. 480. (Identical with M.C.B. 466, Psio. 466, Tox. 466, V.Sc. 466) May be repeated with 566.

468. Comparative Physiology (3) II The responses of physiological systems to the environment; energy exchanges, respiration, thermal and osmotic regulation, locomotion, behavioral regulation, and integration of responses. P, either 437, V.Sc. 400a-400b, or Psio. 480. (Identical with Psio. 468 and V.Sc. 468) May be repeated with 568.

470. Plant Diversity and Evolution (4) I Survey of the plant kingdom, with emphasis on comparative structure and evolution of major plant divisions. 2R, 6L. Field trips. P, 4 units of biological or plant sciences. May be repeated with 570.

471. Human Embryology (4) II (Identical with Anat. 471) May be repeated with 571.

472. Systematic Botany (4) II Evolutionary relationships of orders and families of spermatophytes; systems of classification; collection and identification of local flora. 2R, 6L. May be repeated with 572.

501. Biological Materials (2) I For a description of course topics, see 401. Graduate-level requirements include the design and presentation of a unique and challenging laboratory experience appropriate for a secondary school biology course. P, 12 units. Biology may be convened with 401.

503R. Biology of Animal Parasites (3) I (Identical with V.Sc. 503R) May be convened with 403R.

503L. Parasitology Laboratory (1) I (Identical with V.Sc. 503L) May be convened with 403L.

505. Aquatic Entomology (2) II 1992-93 (Identical with Ento. 505) May be convened with 405.

510. Research Design and Analysis (3) I For a description of course topics, see 410. Graduate-level requirements include a research project. May be convened with 410.


512. Plants Useful to Man (2) S For a description of course topics, see 412. Graduate-level requirements include a research paper. May be convened with 412.

514. Plants of the Desert (2) S For a description of course topics, see 414. Graduate-level requirements include a research paper on a relevant topic. May be convened with 414.

518a - 518b. Scientific Illustration - Photography (2 to 4—2 to 4) [Rpt.] For a description of course topics, see 418a - 418b. Graduate-level requirements include the production of maps, graphs, drawings, and photographs for the thesis, seminars, and scientific papers. (Identical with Anth. 518a - 518b) May be convened with 418a - 418b.

519. Molecular Evolution and Genome Organization (3) II 1992-93 A rigorous and comprehensive survey of both the molecular and evolutionary details of genome organization. P, 320, year of calculus.

520. Evolutionary Quantitative Genetics (3) II 1992-93 For a description of course topics, see 420. Graduate-level requirements include a research paper. P, Calculus. May be convened with 420.

521. Philosophy of the Biological Sciences (3) 1991-92 (Identical with Phil. 521) May be convened with 421.

523. Cytogenetics (3) II For a description of course topics, see 423. Graduate-level requirements include an in-depth research paper on a current problem in cytogenetics. P, 320. (Identical with Gene. 523) May be convened with 423.

524. Theoretical Population Genetics (3) I Mathematical theory of modern population genetics developed from first principles, with emphasis on evolutionary implications and the historical development of ideas. P, 320, Math. 223. (Identical with Anth. 524 and Gene. 524)


528R. Advanced Microbial Genetics (3) II (Identical with M.C.B. 528R) May be convened with 428R.

528L. Advanced Microbial Genetics Laboratory (2) I (Identical with M.C.B. 528L) May be convened with 428L.

531. Environmental Physiology (2) II 1991-92 For a description of course topics, see 431. Graduate-level requirements include an in-depth analytical or research paper. P, 568. May be convened with 431.

533. Human Genetics (3) I (Identical with Gene. 533) May be convened with 433.

534. Population Interactions (4) [Rpt.] II 1992-93 For a description of course topics, see 434. Graduate-level requirements include independent study of a model or data ecological system to be specified by the professor. P, 302, two semesters of calculus. May be convened with 434.

535. Evolution (3) I For a description of course topics, see 435. Graduate-level requirements include two term papers, the subject to be determined by the professor. P, 302, 320; Math. 125a, P or CR, 125b. (Identical with Gene. 535) May be convened with 435.

536. Plant Ecology (4) II For a description of course topics, see 436. Graduate-level requirements include an in-depth library research paper. P, some botany and general ecology. May be convened with 436.

538. Biogeography (3) I For a description of course topics, see 438. Graduate-level requirements include a research paper. P, 182 or Geos. 225. (Identical with Geos. 538) May be convened with 438.

540R. Oceanography (2) I 1992-93 For a description of course topics, see 440R. Graduate-level requirements include an additional literature paper on a modern aspect of oceanography. May be convened with 440R.

540L. Oceanography Laboratory (2) I 1992-93 For a description of course topics, see 440L. Graduate-level requirements include an in-depth research paper project on a single aspect of the course topic. P, 540R or CR. May be convened with 440L.

541. Limnology (4) I (Identical with W.F.Sc. 541) May be convened with 441.

542. Marine Ecology (6) S For a description of course topics, see 442. Graduate-level requirements include an in-depth research project of a single aspect of the course topic. May be convened with 442.

543. Advanced Studies in Marine Biology (2) [Rpt.] I Analysis and discussion of current research in the marine biological sciences.

544. Insect Ecology (3) I (Identical with Ento. 544) May be convened with 444.

545. Concepts in Genetic Analysis (3) I (Identical with M.C.B. 545)


558. Comparative Vertebrate Anatomy (4) I (Identical with V.Sc. 558) May be convened with 458.
558. Comparative Vertebrate Histology (4) I (Identical with V.Sc. 559) May be convened with 459.

560. Plant Physiology (4) I (Identical with P.S. 560) May be convened with 460.

565. Mammalogy (4) I For a description of course topics, see 485. Graduate-level requirements include an exercise in mammalian taxonomy and a higher level of performance. P, 304. (Identical with W.F.Sc. 485) May be convened with 485.

566. Comparative Physiology (3) II For a description of course topics, see 468. Graduate-level requirements include an additional literature review paper on a modern aspect of comparative physiology. P, 181, 182. May be convened with 468.

567. Human Embryology (4) II (Identical with Anat. 571) May be convened with 471.

568. Comparative Vertebrate Histology (4) I For a description of course topics, see 468. Graduate-level requirements include an additional literature review paper on a modern aspect of comparative physiology. P, 181, 182. May be convened with 468.

570. Plant Diversity and Evolution (4) I For a description of course topics, see 470. Graduate-level requirements include an additional research paper on a relevant topic. Field trips. P. 4 units of biology or plant sciences. May be convened with 470.

571. Human Embryology (4) II (Identical with Anat. 571) May be convened with 471.

572. Systematic Botany (4) II For a description of course topics, see 472. Graduate-level requirements include either an additional research project or literature review paper on a modern aspect of systematic biology. May be convened with 472.

575. Freshwater Algae (4) II 1991-92 For a description of course topics, see 475. Graduate-level requirements include a special topic report on an aspect of freshwater algae. Field trips. P. 4 units of biology or plant sciences. May be convened with 475.

578. Global Change (3) II (Identical with Geos. 578) May be convened with 478.

579. Art of Scientific Discovery (3) [Rpt.] II For a description of course topics, see 479. Graduate-level requirements include use of all techniques in a semester-long research project and final paper. P. consult with department before enrollment. May be convened with 479.

580. Invertebrate Zoology (4) I For a description of course topics, see 480. Graduate-level requirements include an in-depth research project on a modern aspect of invertebrate zoology. P. 182. May be convened with 480.

582. Ichthyology (4) 1991-92 I For a description of course topics, see 482. Graduate-level requirements include an in-depth research project on a single aspect of the course topic. P. 182. (Identical with W.F.Sc. 582) May be convened with 482.

583. Herpetology (4) II For a description of course topics, see 483. Graduate-level requirements include an in-depth paper. P. 304. May be convened with 483.

584. Ornithology (4) II For a description of course topics, see 484. Graduate-level requirements include an oral presentation of the results of an independent research project. Field trips. P. one basic biology course. (Identical with W.F.Sc. 584) May be convened with 484.
semesters. Credit is allowed for this course or 200 or 210, but not for all three.

210. Survey of Economic Theory (3) II Introduction to current economic theory. Not open to students who credit in 210a-210b. Credit is allowed for this course or 200 or 201a-201b, but not for all three. P. 6 units of calculus.

217. Resource and Environmental Economics (3) I (Identical with A.Ec. 217)

225. Economic Inquiry (3) II Surveys the range of social science topics which economists study and discusses the various methodologies employed by economists. P. 200 or 201a-201b or 210.

242. World Food Economy (3) III (Identical with A.Ec. 242)

300. Microeconomic Analysis for Business Decision-Making (3) II Examination of industrial structure; theory of prices under varying market conditions; applications to business problems. For nonmajors. Credit for this course or 361, but not for both. P. 200 or 201a or 210.

303. *History of Economic Thought (3) I The origins and evolution of contemporary economic doctrines; classical, socialist, Keynesian and neoclassical thought in past and present social contexts. P. 200 or 210 or 210b.

305. *Soviet Economic System (3) I Marxist-Leninist foundations of Soviet economic policy; economic management and planning mechanisms; problems of international trade and integration; economic reform and prospects. P. 200 or 201a or 210. (Identical with R.S.S. 305)


308. *Economic History of Europe (3) II Europe's economic origins and development; process of industrialization; economic underpinnings of modern Europe. P. 200, 201b or 210.

313. *Economics of Futures Markets (3) I II (Identical with A.Ec. 313)

330. *Money and Banking (3) I II Nature of money and credit; commercial banking; Federal Reserve System; monetary theories; domestic and international policies. P. 200 or 201b or 210.

332. *Intermediate Macroeconomics (3) I II Analysis of output, employment, interest rates, and the price level; the effects on these of changes in monetary and fiscal policies. P. 330, Math. 123, 124, or 125a.


340. International Economics and Policy (3) I II Normative and positive aspects of international trade and international monetary economics, with attention drawn to government policy as it relates to international commercial relationships. Credit allowed for 340 or 442, but not for both. P. 200 or 201a-201b or 210.

361. *Intermediate Price Theory (3) I II Determination of prices and quantities in product and factor markets. For majors. Credit for this course or 300, but not for both. P. 200, 201b or 210; Math. 123, 124, or 125a.


382. *Labor and Public Policy (3) II Economic and legal analysis of the issues and problems arising out of executive, legislative, and judicial efforts to define the rights, duties, and responsibilities of labor and management in the field of industrial relations. P. 200 or 201b or 210.

383. *Labor Arbitration (3) I The place and function of arbitration in the field of labor-management relations. P. 200 or 201b or 210.

386. *Collective Bargaining (3) II Law of collective bargaining; negotiating and administering the contract; public policy. P. 200 or 201b or 210.

396H. *Honors Proseminar (3) II

405. *Comparative Economic Systems (3) II Analysis of economic policy in market (capitalist) economies and of economic ideology and planning in command (Soviet-type) economies. P. 300 or 361.

406. *Introduction to Experimental Economics (3) II Lab. experimental studies of economic behavior; applications to monopoly, bilateral bargaining, and competitive markets under various exchange rules; speculation, voting processes, public goods. 2R, 3L, P. 210 or 300 or 361.

407. *Studies in Microeconomics (3) II Studies in microeconomics, such as the economics of imperfect information and uncertainty, externalities and public goods, and imperfect competition. P. 361, Math. 125b. May be convened with 507.

409. *Economic Anthropology (3) II (Identical with Anth. 409) May be convened with 509.

411. Microeconomic Theory and Behavior (3) II Microeconomic theory with an emphasis on the use of experimental laboratory and field methods for testing the behavioral implications of the theory. P. 300 or 361, Math. 125b. May be convened with 511.

418. *Introduction to Econometrics (3) II Statistical methods in estimating and testing economic models; single and simultaneous equation estimation, identification, forecasting, and problems caused by violating classical regression model assumptions. P. 339 or M.I.S. 375. May be convened with 518.

421. *Introduction to Mathematical Economics (3) II Comparative statics, stability, classical optimization, the Kuhn-Tucker theory, calculus of variations, linear algebra, game theory, and application of these techniques in economic analysis. P. six upper-division units in economics; Math. 125b. May be convened with 521.

424. Topics in European, Chinese, or Japanese Economic History (3) II I examines the economic history and development of medieval, early modern and modern Europe; the development and economic history of premodern and modern Japan and China. P. 300 or 361. May be convened with 524.

425. Topics in the Economic History of the United States (3) II II examines the economic history and development of the United States, including rules of legal and cultural institutions, changes in output mix, government regulation, income distribution, monetary policy, and demographic factors. P. 300 or 361. May be convened with 525.

435. *Public Sector Economics (3) I II The influence of governmental revenue and expenditure decisions on resource allocation, income distribution, and aggregate economic performance. P. 300 or 361.

436. *Economics of Fiscal Federalism (3) II Study of the economics of intergovernmental fiscal relationships in a federal system inclusive of allocational, distributional, and aggregate economic effects. P. 200 or 201b or 210.

442. *International Economics (3) I Financial aspects of international trade relations and commercial policy. Credit allowed for 340 or 442, but not for both. P. 330.

443. *International Trade Theory (3) II General equilibrium analysis of product and input markets of international trade, tariffs, commercial policy, and growth and the welfare aspects of each. P. 300 or 361.

444. International Macroeconomics (3) I Macroeconomic analysis of exchange rates, the balance of payments, the balance of trade, national income, interest-rate differentials across countries, and inflation. P. 332.

459. *Agricultural Economic Development in Latin America (3) I (Identical with A.Ec. 459) May be convened with 559.

460. *Industrial Organization (3) I Structure, conduct, and performance of American industry; governmental institutions and policies affecting business. P. 300 or 361; 339. May be convened with 560.

461. *Economics of Regulated Industries (3) I Economic analysis of the regulated sector of the American economy, including communications, transportation and energy industries; impact of existing and alternative public policies. P. 300 or 361. May be convened with 561.

475. *Economics of Land and Water in the American West (3) II (Identical with A.Ec. 475) May be convened with 575.

476. *Natural Resource Economics (3) II (Identical with A.Ec. 476)

480. *New Venture Market and Industry Analysis (4) I (Identical with Mktg. 480)

481. *Economics of Wage Determination (3) I Applications of economic theory and empirical methods to labor supply and demand, investment in human capital, minimum wages, union effects on relative wages, and labor market discrimination. P. 339, 361.

482. *Labor and the Economy (3) II Macro aspects of labor economics: unemployment—causes and cures; unemployment and inflation; distribution of income. P. 300 or 361.

483. *Urban Economics (3) II Problems of metropolitan areas; evaluation of alternative solutions. P. 200 or 201b or 210. (Identical with A.A.S. 483)

484. *Regional Economics (3) I Location theory, regional growth, techniques of regional analysis. P. 300 or 361.

487. *Health Economics (3) II A study of pricing, allocation, and distribution in the healthcare industry, with particular emphasis on the economic effects of current governmental policies. P. 200 or 201b or 210.

*Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.
500. Managerial Economics (3) I S Microeconomic theory and applications. P, M.I.S. 400 or Math. 119 or 123. Advanced degree credit available for nonmajors only. Open only to students admitted to a BPA graduate program.


504. Production Economics (3) I (Identical with A.Ec. 504)


507. Studies in Microeconomics (3) II For a description of course topics, see 407. Graduate-level requirements include a research paper or additional problem sets, depending on exact content. Advanced degree credit available for nonmajors only. P. 361, Math. 125b. May be convened with 407.

509. Economic Anthropology (3) II (Identical with Anth. 509) May be convened with 409.


511. Microeconomic Theory andBehavior (3) II For a description of course topics, see 411. Graduate-level requirements include a research paper or additional problem sets, depending on exact content. P, 521. May be convened with 411.

512. International Agricultural Economic Development (3) II (Identical with A.Ec. 512)

513. Consumption Economics and Price Analysis (3) II (Identical with A.Ec. 513)

514. Cost-Benefit Analysis (3) II (Identical with A.Ec. 514)


516. Introduction to Econometrics (3) I II For a description of course topics, see 418. Graduate-level requirements include a research project that involves applications of econometric methods to the estimating and testing of behavioral models or simulation studies of the statistical properties of an econometric estimation technique. Advanced degree credit available for nonmajors only. P, 339 or M.I.S. 375 or M.I.S. 552. May be convened with 418.

519. Mathematical Economics (3) I Introduction to the theory and methods of mathematical economics and its applications. Designed primarily for entering graduate students majoring in economics. P, CR, 520; consult with department before enrolling.

520. Theory of Quantitative Methods in Economics (3) I Introduction to the basic concepts of statistics and their application to the analysis of economic data. Designed primarily for entering graduate students majoring in economics. P, CR, 521; consult with department before enrolling.

521. Introduction to Mathematical Economics (3) II For a description of course topics, see 421. Graduate-level requirements include a research paper or additional problem sets, depending on exact content. May be convened with 421.


524. Topics in European, Chinese, or Japanese Economic History (3) I II For a description of course topics, see 424. Graduate-level requirements include a research paper or additional problem sets, depending on exact course content. May be convened with 424.

525. Topics in the Economic History of the United States (3) I II For a description of course topics, see 425. Graduate-level requirements include a research paper or additional problem sets, depending on exact course content. May be convened with 425.

530. Macroeconomic Aspects of Finance (3) II The effects of changing economic conditions upon a firm's operation, including capital decisions as well as production decisions. P. 500.

534. Public Finance (3) I II The study of public fiscal economics, with emphasis on relevant topics for public administration and urban planning. Graduate students: public goods, tax and non-tax revenues, intergovernmental issues, benefit-cost analysis. P. 500.

536. Innovation and Economic Growth (3) I (Identical with Mktg. 536)


553. Business and Economic Forecasting (3) I Forecasting techniques used in business and government, assembly, interpretation and use of economic data; analysis of business conditions; examination of related environmental factors; construction of actual sales or revenue forecasts. P, 500; M.I.S. 552.

559. Agricultural Economic Development in Latin America (3) II (Identical with A.Ec. 559) May be convened with 459.

560. Economic Organization and Governmental Policy (3) I For a description of course topics, see 460. Graduate-level requirements include an applied research project that examines the impact of policy on industry performance. Advanced degree credit available for nonmajors only. P, 300 or 361 or 500; 339 or M.I.S. 552. May be convened with 460.

561. Economics of Regulated Industries (3) II For a description of course topics, see 461. Graduate-level requirements include a case of regulation/deregulation or other approved research project in regulatory theory or policy. Advanced degree credit available for nonmajors only. P, 300 or 361 or 500. May be convened with 461.


568. Environmental Scanning (3) I (Identical with M.A.P. 568 and Mkgt. 568)


575. Economics of Land and Water in the American West (3) II (Identical with A.Ec. 575) May be convened with 475.

576. Advanced Natural Resource Economics (3) I (Identical with A.Ec. 576)

577. Natural Resource Economics and Public Policy (3) II (Identical with A.Ec. 577)

b. Computational Methods in Laborator y Economics (1-3) [Rpt./3 units] I II F Math. 125a-125b; consult department before enrolling.
c. Economic Issues for Teachers (3) S Consult instructor before enrolling.
d. Summer Institute on the American Economy (3) S Consult instructor before enrolling.
e. Economics Education Workshop (2) S Consult instructor before enrolling.
f. Economic Development for Educators (2) S Open to nonmajors only. Consult with department before enrolling.


b. Economic Analysis of Organizations (3) I P, 696c, 696d.

c. Econometric Modeling (3) I P, 696e, 696f.

d. Labor Economics (3) I P, 696h, 696i.

e. Policy Analysis (3) I P, 696j, 696k.

f. International Economics (3) I P, 696l, 696m.

g. Advanced Macroeconomic Theory (3) I P, 696n, 696o.


i. Advanced Microeconomic Theory (3) I P, 696r, 696s.

j. Labor Economics (3) I P, 696t, 696u.

k. Econometric Modeling (3) I P, 696v, 696w.


m. Policy Analysis (3) I P, 696z, 696aa.


o. Advanced Macroeconomic Theory (3) I P, 696ad, 696ae.


q. Advanced Microeconomic Theory (3) I P, 696ah, 696ai.

r. Labor Economics (3) I P, 696aj, 696ak.

s. Econometric Modeling (3) I P, 696al, 696am.

ECONOMICS—EDUCATION (Educational Foundations and Administration) 147

Education (EDUC/EDA/EDP/HED/LRC/SER/TTE)

Education Building, Room 201
(602) 621-1461

The College of Education offers certain courses that are not directly affiliated with any of the academic divisions in the college. In many cases, these courses are college-wide requirements for degree programs.

Education (EDUC)

501. Foundations of Education (3) I I S Nature and functions of schools in society; school reform proposals; moral dimensions of schooling; quality of educational opportunity; alternatives to schooling; nature of teaching profession.

502. Disciplined Inquiry in Education (3) I I S Introduction to research methods in education: analysis of research; writing of research papers; applying research results in educational settings.

503. Variations in Learners (3) I I S Nature and extent of differences among learners, both among and within groups; causes and factors relating to variations in learners; implications for educational placement, curricular planning and program development.


505. Qualitative Methods in Education (3) I I S Introduction to theory and methods of conducting research through extended participant observation in school or community settings; field work, ethnography, case study, qualitative methods. P, 500.

506. Research Design and Techniques in Education (3) I I S In-depth explorations of various research paradigms in educational inquiry and their research designs; critical analysis of structure and logic of various designs and techniques; preparation of research proposals. P, 600, 601.

507. Leadership for Educational Change (3) I I S Investigations of the characteristics of leadership as they apply to changing basic educational organizational structures and processes.

605. Evaluation of Educational Programs and Personnul (3) I I S Models, purposes served, contextual influences and procedures employed in evaluating educational programs and personnel. P, 500.

606. Policy Analysis in Education (3) I I S Understanding of and necessary skills to provide leadership in the area of educational policy development and analysis.

611. Comparative Education (3) I I S Emphasis on comparative education methodology; analysis of selected national education systems, with a focus on sociocultural foundations; curriculum and instruction; administration; teacher education; contemporary trends and issues; implications for education in the United States.

612. Philosophy of Education (3) I I S Analysis of values and conflicts in American culture as these direct educational policy; critical examination of contending philosophies in the light of democratic ideals.

613. History of Western Education (3) I I S The historical development of western educational thought from its origins to the present.

614. History of Education in the United States (3) I I S The development of American educational thought from its colonial origin to the present.

615. Educational Sociology (3) I I S The school as a social institution; social functions of the school; social processes, socialization, and stratification in education; informal and formal systems and the bureaucratic structure of the school.

Educational Foundations and Administration (EDA/EDP/HED)


Associate Professors Harlon D. Christiansen (Emeritus), Sharon C. Connely, Sarah M. Dinners, Macario Saldate, IV, T. Frank Saunders, Sheila Slaughter, Marsden B. Stokes (Emeritus)

Assistant Professors Paul E. Heckman, Valerie R. Reyna

The division houses three programs: educational administration, educational psychology, and higher education. Educational administration is concerned with preparing administrators for a variety of positions in the elementary and secondary schools. Educational psychology prepares students for assuming leadership roles in research, teaching, and professional educational psychology with concentrations in teaching, learning, and development; school psychology; and measurement and methodology. Higher education focuses on the development and dissemination of knowledge about secondary education, including universities and colleges, regional and state agencies, the federal government, and various policy-making organizations.

The division offers programs leading to the Master of Arts degree with majors in educational psychology and higher education. The Educational Specialist degree is offered with majors in educational administration and educational psychology. The Doctor of Education degree is offered with a major in educational administration. The Doctor of Philosophy degree is offered with majors in educational psychology and higher education. At the time of catalog production, the Master of Arts and Doctor of Philosophy degree programs with a major in foundations of education were under review. Prospective students should consult the Office of Student Services within the College of Education for information regarding the status of these programs.

For information on concentrations, graduate admission, and graduate degree requirements, please consult the Graduate Catalog.

Educational Administration (EDA)

Education Building, Room 635
(602) 621-3327

660. Administration and the Educational Environment (3) I I S Introduction to educational administration; overview of administration within school contexts and larger societal environment; organizational and leadership theories.

661. Administration of Bilingual Education Programs (3) I I S Dynamics of the administration of educational programs for the bilingual learner including socio-political realities, mandated federal and state funded educational programs, and effective community participation.

662. Educational Law: Policy and Practice (3) I I S Evolution of modern educational law and the effects of law on educational policy formation and administrative practice.

663. Computer Applications in School Administration (3) I I S Techniques for using computers to make school administration more efficient; using computers to enhance the management of information. P, 660 or CR.


667. Educational Governance and Collective Bargaining (3) I I S Theory and practice of collective bargaining; history of negotiations in the educational sector; impact of statutes and governing authority. P, 660, 662 or CR.

668. Managing Curriculum Change (3) I I S Techniques for administrators to use in analyzing the quality of the curriculum in schools as
well as the appropriateness of instructional techniques used to support the curriculum. P, 660 or CR.

671. School Finance (3) I Historical background of the financing of education in the United States; economics and principles; sources and distribution of funds for education; budgeting, accounting, and reports. P, 660, 661 or CR.

672. School Business Management (3) I The general management of school business; administration and accounting of school funds; administration of equipment and supplies; other business operations. P, 660 or CR.

674. Law and Administrative Practice (3) II Routine and continuous effects of law in public schools; tort liabilities, collective bargaining, influence of federal and state regulations, teacher dismissal; Arizona statutory and case law emphasized. P, 660, 661, 662.

675. Theory and Practice in Human Service Organizations (3) I, II Perspectives on the nature of the individual in the school organization; development of individual-organizational relationships. P, 660.

681. The Principalship (3) I, II Functions and activities of building-level administrators, with emphasis on instruction, staff development, student services evaluation, and operational services. P, 693a and 15 units of educational administration, CR 693b.

682. The Superintendency (3) II S Functions and responsibilities of the chief school executive and central office staff, with emphasis on external and internal system relationships in policy formation and decision-making. P, 693a, 693b or CR.

693. Internship a. Educational Administration (2-3) [Rpt./3] I II P, 660, 661, 662 or CR. b. Advanced Educational Administration (3-4) [Rpt./3] I II P, 693a and 15 units of educational administration. CR, 681 or 682.

694. Practicum a. Educational Administration (1-3) [Rpt./2] I II


Educational Psychology (EDP) Education Building, Room 602 (602) 621-7825

300. Development Throughout Life (3) I II Life span development within the context of physical, intellectual, social, emotional, and moral development, emphasis on the dynamics of personal growth.

301. Child Development (3) I II Human growth and development from conception through early adolescence, integration of behavioral principles into the elementary school setting.

310. Learning in the Schools (3) I II Psychological principles applied to learning and instructional design in the educational setting, emphasizing learning and instructional variables and their applications.

340. Statistics and Measurement for Research in Education (3) I II Basic concepts essential to the comprehension of research in education, including measurement principles and descriptive statistics.

358. Psychological Measurement in Education (3) I II Psychometric methods as applied to the assessment of achievement, mental ability, and attitudes.

402. Early Adolescent Development (3) S Major cognitive, psychosocial, physical and anthropological developmental theory of early adolescence (ages 10-14 years old). Also, the implications of theory into practice regarding early adolescents and schooling. May be convened with 502.

500. Life Span Development (3) II Dynamics of development, social integration and roles across the life span. Special emphasis on cognitive, emotional, and personality development with concentration on the antecedent events to adult life experiences. (Identical with F.S. 500)

501. Advanced Child Development (3) I II Aspects of growth and development which influence behavior of the school-age child; emphasis on current research findings. P, 301.

502. Early Adolescent Development (3) II S For a description of course topics, see 402. Graduate-level requirements include an in-depth research paper or other research project. May be convened with 402.

503. Advanced Adolescent Development (3) II Major developmental issues within the adolescent years; emphasis on the importance and design of adolescent research. (Identical with F.S. 503).

510. Learning Theory in Education (3) II Major theories of learning and motivation; emphasis on relationships between theory and practice in the schools.

517. Classroom Application of Behavior Modification Techniques (3) I II Application of behavior principles and techniques to promote learning and social development of school-related behavior. 2R, 3L. P, 510 or CR.

530. School Psychology (3) II Roles of the school psychologist; implementing programs in the public schools; legal and ethical issues in school psychology. 2R, 3L.

541. Statistical Methods in Education (3) I II Descriptive, correlational, and inferential procedures for presenting and analyzing school and research data. For students in all fields.

557. Design of Questionnaires and Scales (3) I II Emphasis on theoretical and methodological issues related to the development of survey and rating scales, sampling procedures, and response bias.

558. Educational Tests and Measurements (3) I II Theoretical and practical application of psychometric techniques to test construction, analysis, and interpretation of test results. P, 541.

559. Testing of Minorities (3) I II Current theoretical, social, and practical issues in the use of norm-referenced tests with individuals from minority cultures.

600. Theories of Human Development (3) I History and analysis of psychological theories of human development and a comprehensive overview of major theoretical systems. P, 500 or 501.

613. Psychological Theory in Educational Practice (3) I II Major theories of psychological thought; strategies for utilizing such theories in educationally relevant research. P, 510.

615a-615b. Cognitive Development (3-3) I II Cognitive theory and research as they bear upon developmental and educational processes. P, 500 or 501.

619. Design of Instruction (3) I II Historical and theoretical bases for developing instructional design; emphasis on relationship between learning theory and instructional design. P, 510.

638. Behavioral Consultation in Educational Settings (3) I II Principles and techniques of conducting behavioral consultation in educational settings to promote learning and development of children and youth. 2R, 3L. P, 517.

640. Advanced Statistical Methods in Education (3) I II Inferential procedures for analyzing educational data; includes nonparametric methods and introduction to multivariate causal procedures. P, 541.

646. Multidimensional Methods in Educational Research (3) II Provides an understanding of and facility with research application of multivariate correlational techniques, such as multiple regression, discriminant function, canonical correlation, and factor analysis. P, 640.


658. Theory of Measurement (3) I II Advanced topics in theoretical and practical issues in psychometrics. P, 558; 640 or CR.

673. Theories of Intellectual Assessment (3) I II Various theories and models of human ability and their implications for intellectual assessment. P, 558 or CR.

674a-674b. Field Experience in Intellectual Assessment in Education (3-3) Supervised field experience in the administration, scoring and interpretation of various intellectual assessment devices. 674a: Wechsler Adult Intelligence Scale. 674b: Intellectural assessment techniques. 2R, 3L. Open to majors and minors only. Credit allowed for 674a or 674b, but not for both. P, 673 or CR.

677. Individual Assessment in the Schools (3) I II Techniques for assessing personality and social behavior; practice in implementing programs derived from assessment techniques. 2R, 3L. Open to majors and minors only. P, 674b.

679. Psychoeducational Assessment in the Schools (3) I Psychoeducational assessment techniques; practice in prescribing remedial programs. 2R, 3L. Open to majors and minors only. P, 673, 674b.

682. Educational Program Evaluation Principles and Techniques (1-3) [Rpt./1] Development and current viewpoints, political context.
EDUCATION (Educational Psychology—Higher Education—Language, Reading and Culture) 149

Illustrative cases, technical skills for determining merit or making decisions about educational and social programs. P. 541, 558.

565. Child Behavior Disorders and Adjustment (3) I II The diagnostic and assessment practices, theories, and research related to child behavior disorders. P. 530.


569. Internship b. School Psychology (1-4) [Rpt./12 units] I I I

569. Colloquium Issues in Educational Psychology (1-3) [Rpt./12 units] I I I

569. Seminar Issues in Educational Psychology (1-3) [Rpt./12 units] I I I

Higher Education (HED)

Education Building, Room 327

561. The Community College (3) I The scope, objectives, and educational functions of the community college, patterns of community college programs.

560. Higher Education in the United States (3) I The scope of higher education in the United States: brief survey of historical developments and philosophic bases, public policy issues at the state and federal level; types of institutions and their purposes; characteristics of faculty, students and curricula.

568. The College Student (3) I History and characteristics of the college student; interactions with campus environmental influences; developmental and normative trends; major research findings.

569. Organization and Administration in Higher Education (3) I Organizational theory, structures, systems, and administrative procedures in varied higher education institutions; patterns of governance and policy development.

571. Student Personnel Services in Higher Education (3) I Student personnel services, purposes, procedures, representative programs, current trends.


564. Institutional Research and Planning (3) I Development of institutional research programs for short-term and long-term planning; input and output measures.

565. Higher Education Finance (3) I Historical patterns of financing private and public higher education; current sources and types of financial support; alternative methods of financing; social benefits and consumer theories. Field trips.

566. Higher Education Business Management (3) I II Budget planning and execution; systems of resource allocation; personnel management; physical plant planning and construction; information systems and use in management.

567. Higher Education and the Law (3) I Critical court decisions, past and present, affecting higher education; increasing role of the courts in decision making and policy development. Field trips. P. 601, 609, 621 or 650.

568. Internship c. Higher Education (1-3) [Rpt./12 units] I I I

569. Colloquium c. Issues in Higher Education (1-3) [Rpt./12 units] I I I

569. Seminar c. Topics in Higher Education (1-3) [Rpt./12 units] I I I

Language, Reading and Culture (LRC)

Education Building, Room 517

(602) 621-1311

Professors Patricia L. Anders, Kenneth G. Goodman, Yetta M. Goodman, Amelia Melnik (Emerita), Kenneth J. Smith, William J. Valmont

Associate Professors Judy N. Mitchell, Division Coordinator, Adele A. Allen, John M. Bradley, Margaret B. Fleming, Luis C. Moll, James R. Rankin, Richard Ruiz

Assistant Professors Armina Fuentevilla, Teresa McCarty, Kathleen Short

The division is concerned with research, scholarship and teaching related to the use of language and society. The faculty is specifically concerned with reading, language arts education, and bilingual/multicultural education.

The division offers programs leading to the Master of Arts degree with majors in bilingual/multicultural education and in language, reading, and culture. The division also offers programs leading to the Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees with a major in language, reading, and culture. At the time of catalog production, the Master of Education degree program with a major in reading was under review. Prospective students should consult the Office of Student Services within the College of Education for information regarding the status of this program. For information on graduate admission and graduate degree requirements, please consult the Graduate Catalog.

304. Decoding Skills in the Elementary School (2) I I Basic decoding skills needed in reading; methods and materials used in teaching reading.

325. Foundations of Bilingual Education (3) I I Introduction to the theory and practice of bilingual education. (Identical with M.A.S. 325)

406. Foundations of Reading Instruction in Spanish (3) I I Introduction to the theoretical and practical aspects of the reading process, with attention to essential decoding and comprehension skills; special approach for teaching Spanish-speaking children to read. Taught in Spanish. P. Spanish fluency. (Identical with M.A.S. 406)

402. Educating the Culturally Diverse (3) I I Issues faced in education associated with ethnic and linguistic pluralism in the United States; analysis of the interaction of school, community, cultural and family factors in the education of diverse populations. May be convened with 520.

424. Methods and Materials in Bilingual Education (3) I I Analysis and evaluation of methods and materials used in bilingual education programs; effective strategies in first and second languages; concurrent and separate language approaches and cooperative models. P. 504. May be convened with 524.

427. Bilingual Curriculum Development (3) I I Theory and application of curriculum development to bilingual instructional programs: designs, organizational patterns, materials and media, change strategies, and evaluation.

430. Computer Application for Teachers (3) I Microcomputer operation; computer-assisted instructions; software evaluation; use of author systems and word processors in the classroom; computer managed instruction; organization for computer use; communications networking; computer networking. May be convened with 530.

435. Secondary School Reading in the Classroom (3) I I Provisions and procedures for evaluating and developing reading skills needed in content areas. May be convened with 535.

436. Classroom Communications and Interaction (3) I The teacher's role in promoting effective communication and interaction in the classrooms; analysis of both verbal and nonverbal uses of language. May be convened with 536.

480. Children's Literature in the Classroom (3) I I S Analysis and discussion of classic and contemporary children's literature of all genres, and its relationship to language, reading and culture. May be convened with 580.

504. Language and Culture in Education (3) I Introduction to aspects of language and culture that affect education, particularly in reading, writing and the language arts; discussion of social and political concerns.

505. Essentials of Reading and Writing (3) I I Survey of reading and writing relationships: development, instruction, and evaluation.

507. Teaching of Reading: Decoding and Comprehension (3) I I Linguistic, psychological and cultural bases of decoding and comprehension; theories that influence practice; materials and practices that facilitate learning to read.

508. Bilingual Reading and Writing (3) I Analysis of reading and writing situations encountered by bilingual students; phonological, semantic and syntactic aspects of instruction; methods and materials. P. 505 or CR.

520. Educating the Culturally Diverse (3) I I For description of course topics, see 420. Graduate-level requirements include an in-depth research paper or other project on an aspect related to the course. May be convened with 420.

524. Methods and Materials in Bilingual Education (3) I I For a description of course topics, see 424. Graduate-level requirements include an in-depth research paper or other
project on an aspect related to the course. P. 504. May be convened with 424.

525. Educating the Bilingual Learner (3) I II Socio-cultural factors, language practices and education; analysis of theories and practices affecting bilingual learners; historical, social, and cultural influences; relationship of theory to the characteristics and needs of the bilingual learner.

527. Developing Language Arts Curriculum (3) I II Curriculum theory and models; staff development for implementing change; scopes and sequences; planning effective learning experiences. P. 504 and 505.

530. Computer Application for Teachers (3) I II For a description of course topics, see 430. Graduate-level requirements include an in-depth research paper or other project. May be convened with 430.

532. Pre-Reading and Beginning Reading Development (3) I II An examination of various aspects involved in pre-reading and beginning reading development, including psychological, sociological, physiological, linguistic and educational considerations.

535. Secondary School Reading in the Classroom (3) I II For description of course topics, see 435. Graduate-level requirements include an in-depth research paper or other project. May be convened with 435.

536. Classroom Communications and Interaction (3) I II For a description of course topics, see 436. Graduate-level requirements include an in-depth research paper or other project on an aspect related to the course. May be convened with 436.

537. Classroom Diagnosis and Instruction (3) I II Procedures for diagnosing and developing reading and writing skills for pupils of below-average achievement level. P. 505, 507 or CR.

538. Reading, Writing and Texts: A Psychosociolinguistic Perspective (3) I II Readers and writers as users of language; reading and writing as language processes; what makes a text a text.

539. Language Acquisition and Development (3) I Study of the development of language in young children; focus on oral language and its relationship to emergent literacy; instructional strategies that build on language development.

544. Applied Linguistics in Education (3) I The application to curriculum, teaching and learning of concepts from linguistics, psycholinguistics and sociolinguistics. P. 551 or CR.

557. Application of Miscue Analysis (3) I II Study of miscue analysis to explore the reading process, reading research, and readability, as well as to evaluate readers; applications to reading strategies and curriculum; focus on comprehension. P. 551 or CR.

570. Language Research Methodology in Education (3) I II Investigation of procedures for conducting literacy research; examples of literacy research paradigms; critical analysis of evidence supporting literacy practices. P. 507 or 551.

578. Field Experience (3) I II Supervised experience in assessment and instruction of literacy-related practices. P. 504, 505 or CR.

580. Children's Literature in the Classroom (3) I II For a description of course topics, see 480. Graduate-level requirements include an in-depth research paper or other project. May be convened with 480.

581. Multietnic Literature and Literacy (3) I Analyzes the use of multietnic literature that fosters self-concept, acceptance, and a sense of identity to develop literacy. Includes readings from the major categories of multietnic literature about Black, Native, Hispanic, and Asian Americans.

595. Colloquium a. Issues in Language, Reading and Culture (3) I II P. 504, 505. b. Language, Learning, and Reading Disabilities (3) I II (Identical with S.R.E. 595b, which is home) c. Issues in Educating Mexican American Children (3) I II P. 504, 505. d. Applications of Language and Literacy (3) I II [Rpt./9 units]

597. Workshop a. Southern Arizona Writing Project (3-9) [Rpt./12 units] I II P. 504, 505. b. Miscue Analysis in Teacher Education (2-3) I II Teaching of English (3) I II S (Identical with Eng. 597, which is home).

612. Grammatical Analysis (3) I II (Identical with Eng. 612).

613. Second Language Acquisition in Formal Contexts (3) I II (Identical with Eng. 613).

627. Curriculum Development and Supervision in Language Arts (3) I II Organizational patterns of language arts curricula; approaches to improvement of language arts instruction; personnel relations. Designed for the language arts supervisor and school administrator. P. 527.

634. Reading Comprehension: Theories, Research and Methods (3) I II Factors affecting cognitive development; methods of influencing growth in reading comprehension; examination and analysis of instructional materials; research related to comprehension and cognitive development. P. 507.

635. Reading and Writing in Content Areas (3) I II Methodology appropriate for reading and writing to learn content; compatible organizational models; program implementation. P. 504, 505, 507 or 551 or CR.

638. Reading Diagnostic Laboratory (3-6) [Rpt./6 units] I II Supervised practice in reading assessment; identification of factors influencing reading achievement, evaluation, construction, and administration of assessment procedures; development of interview techniques. P. 507, 537.

639. Reading Instructional Laboratory (3-6) [Rpt./6 units] I II Supervised practice in teaching reading and writing; preparing, analyzing and critiquing special instructional programs for students. Open to majors only. P. 507, 537.

653. Written Language Development (3) I II Study of latest research in the written and reading development of preschool and school-aged children; relationships between reading and writing development explored through student research; applications to instruction. P. 505, 553.

694. Practicum a. Bilingual Education (3) [Rpt./2] P. 15 graduate units including 508 and 525.

696. Seminar a. Language, Reading and Culture (1-3) [Rpt./6] P. 15 graduate units including 504, 505.

795. Colloquium a. Theory and Research in Language, Reading and Culture (1-3) [Rpt./15 units] I II P. 570.

796. Seminar a. Research and Evaluation in Language, Reading and Culture (1-3) [Rpt./15 units] I II P. 570.

Special Education and Rehabilitation (SER)

Education Building, Room 412 (602) 621-7822

Professors William C. Healey, Division Coordinator, Sidney W. Bjou, James C. Chaffart, Bob G. Johnson (Emeritus), Jeanne McAfee McCarthy, Amos P. Salle, Inez Tucker (Emeritus)

Associate Professors Shirin D. Antia, Candace S. Bos, Daniel Head, Marilyn Jensen, C. June Maker, S. Rae Smith, John Umbert

Assistant Professors Nancy Eldredge, James Organist, Samuel Supalla, Anthony K. Van Reusen

Lecturers Thomas J. Fisher, Aldine S. von Isser

The division offers comprehensive studies, including preparation for state certification, in every area of handicapped and special ability—physical, emotional and intellectual, infant to adults. The division offers a program leading to the Bachelor of Science in Education with a major in rehabilitation. The division also offers programs leading to the Master of Arts, Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees with a major in special education and rehabilitation. Non-teaching minors in special education or rehabilitation are offered at the baccalaureate level.

For graduate admission and degree requirements, consult the Graduate Catalog.
040. Introduction to Learning Disabilities (3) I II Theories and history of programs for the learning-disabled; definition of education in special education and the interface of the two fields. May be convened with 504.

045. Introduction to Mental Retardation and Severe Disabilities (3) I II History and philosophy of educational programs for persons with mental retardation and other developmental disabilities; etiology, classification, and characteristics; basic premises of bilingual special education and the interface of the two fields. May be convened with 504.

011a-411b. Survey of Human Disabilities (3-3) I II Critical study of rehabilitation processes and services for handicapped individuals and groups. P, CR, 400.

15. Managing Physical Handicaps (3) [Rpt/1] I Physical and multiple impairments, etiology, intervention practices, adaptations needed, transferring and handling skills, and integration into typical environments. Field trips. May be convened with 515.

121. Introduction to Visual Impairments and Deaf-Blindness (3) I An overview of educational services for the student with visual impairments and multiple sensory impairments. An emphasis is placed on the psychosocial effects of visual impairments on the individual and means of compensating for those effects. May be convened with 521.


425. Strategies of Vocational Development and Supported Employment (3) I II Systematic study of the strategies used to place and retain individuals with disabilities in paid, community employment. Topics to include job development, consumer assessment, job placement, job-site training, and follow-up. P, 400. May be convened with 525.

430. Education and Rehabilitation of Hearing Impaired Individuals (3) I II Current and historical perspectives; educational and rehabilitative services; etiology; impact on families, pre-school children, cognitive and intellectual development and functioning of hearing impaired individuals. May be convened with 530.

431a-431b. American Sign Language (4-4) I II Designed to develop intermediate ASL conversational skills in a variety of settings, topics, and functions. P, 370b or division permission. May be convened with 531a-531b.

432. Interpreting for Deaf People (6) I S Introduction to theories, principles, and special settings of interpreting. Covers ethics, definitions and related topics of interpreting. Role playing and simulated interpreting experiences will be included in the course. Principles, methods, and techniques of interpreting for deaf people in rehabilitation and other settings. P, 431b or division permission.

433. Interpreting in Special Settings (3) [Rpt/12 units] I II Classes will be offered on a rotating basis and cover various topics related to the interpreting field and to situations in which interpreting occurs (e.g., educational, interactive, formal and informal). P, 432 or division permission. May be convened with 533.

439. History of Deafness (3) I II Study of history and culture of deaf people, history of sign language, the evolution of various sign systems, fingerspelling and non-verbal communication aspects of sign language. P, 431b or permission of division. May be convened with 539.

440. Education of Gifted Children (3) I I Issues in education of the gifted; discussion of definitions, characteristics, development, screening, identification, curriculum, teaching strategies, and program development. P, 400. May be convened with 540.


455. Rehabilitation of the Aged (3) I II Emphasis on aging from the viewpoint of the aging person and those working with the aged. May be convened with 555.

460. Introduction to Early Childhood Education for the Handicapped (3) I I Focused on the handicapping conditions impacting on pre-school handicapped children available to serve them and critical issues in this rapidly evolving field. P, 400. May be convened with 560.

478. Prevention of Addictions (3) I Analysis of addictive behaviors (e.g., drug addictions, eating disorders, compulsive gambling) from a psychosocial and biological perspective and the implications of this analysis for primary, secondary, and tertiary prevention of addictions. May be convened with 578.


483. Supervised Casework in Rehabilitation (3) I II Application of fundamental professional rehabilitation theories and skills in field settings. P, 400, 411b; 481 or CR.

484. Problems of Drug Abuse (3) [Rpt/1] I Survey course for teachers, counselors, and agency workers concerned with drug abuse; examination of community, cultural, and educational approaches to drug use and abuse. May be convened with 584.

485. Rehabilitation of the Public Offender (3) I II Components in service delivery to the public offender, how the offender enters the criminal justice system, and treatment and rehabilitation services available.

494. Practicum I a. Teaching Exceptional Children (1-10) I S, P, 400, methods courses in area of emphasis.

495. Colloquium I a. Substance Abuse Education (1) I S May be convened with 595a.

500. Foundations of Special Education and Rehabilitation (3) I II For a description of course topics, see 400. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 400.

501. Diagnosis and Remediation of Learning Problems (3) I II For a description of course topics, see 401. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 401.

502. Behavior Principles for the Handicapped (3) I II For a description of course topics, see 402. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 402.

503. The Special Services in the Schools (3) I I For a description of course topics, see 403. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 403.

504. Cultural and Linguistic Diversity in Exceptional Learners (3) I For a description of course topics, see 404. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 404.

505. Introduction to Learning Disabilities (3) I II For a description of course topics, see 405. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 405.

506. Issues in Learning Disabilities (3) I II For a description of course topics, see 406. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 406.


508. Teaching Learning Disabled Elementary Students (3) I Remediation of academic areas and cognitive processes involving per-
ception, integration, and expression, with emphasis on strategies for planning and implementing instructional programs at the elementary level. P, 405/505, 507a/507b and permission of division; CR, 595, 594.

510. Introduction to Mental Retardation and Severe Disabilities (3) I For a description of course topics, see 410. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 410.


513. Educating Students with Mental Retardation and Severe Disabilities (3) II Methods of developing age-appropriate and functional programming, integration, community-based instruction, and integrative source delivery for students who have moderate to profound retardation and other physical, sensory and behavior disorders.

515. Managing Physical Handicaps (3) I [Rpt/1] I For a description of course topics, see 415. Graduate-level requirements include additional research. Field trips. May be convened with 415.

518. Nonoral Communication (3) [Rpt/3] II Techniques for assessment and intervention of alternative communication skills other than speech for students with severe disabilities. Preverbal communication skills development for all ages; social interaction skills; augmentative communication.

520. Low Vision and Visual Functioning (3) I Anatomy and physiology of the eye; implications of visual disorders including visual field losses; introduction to optics; use of optical and nonoptical aids in classroom settings; clinical and functional low vision assessments, including assessing children with multiple impairments; and report writing.

521. Introduction to Visual Impairments and Deaf-Blindness (3) I For a description of course topics, see 421. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 421.

522. Orientation and Mobility of the Visually Handicapped (3) II Methods of teaching orientation and mobility skills to visually impaired and blind students. Emphasis on the school-aged child, with particular attention to concept development, orientation skills, pre-cane skills, personal safety, and independent ambulation, including an introduction to long-cane techniques.

523a-523b. Tactile Communication (3-3) For a description of course topics, see 423a-423b. Graduate-level requirements include in-depth paper(s) on aspects of current issues and class presentations. May be convened with 423a-423b.

524. Methods of Teaching the Visually Handicapped (3) II Curriculum development and adaptation in various educational programs; adaptation of classroom materials and procedures for use with blind and partially sighted children and youth; emphasis on methods of teaching academic and non-academic skills and on educating students with nonhandicapped peers. P, 521; CR, 593.

525. Strategies of Vocational Development and Supported Employment (3) II For a description of course topics, see 425. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. P, 400/500. May be convened with 425.

530. Education and Rehabilitation of Hearing Impaired Individuals (3) I For a description of course topics, see 430. Graduate-level requirements include an in-depth paper and a class presentation. May be convened with 430.

531a-531b. American Sign Language (4-4) I For a description of course topics, see 431a-431b. Graduate-level requirements include a research paper and an oral presentation on an approved aspect of the linguistics of American Sign Language. May be convened with 431a-431b.


533. Interpreting in Special Settings (3) [Rpt/12 units] II For a description of course topics, see 433. Graduate-level requirements include 10-hours practicum per semester. P, 432 or division permission. May be convened with 433.

534. Language Development for the Exceptional Child (3) II Pragmatic, semantic and syntactic aspects of language development in exceptional children and youth; cognitive and social bases for intervention.

535. Assessment of Bilingual Exceptional Learners (2) II Educational and psychological assessment of bilingual students with emphasis on informal and formal evaluation methods and procedures for purposes of identification and educational planning. P, 507.

536. Teaching Bilingual Exceptional Learners (2) II Instructional interventions and program development for exceptional students from culturally and linguistically diverse backgrounds. Emphasis on current intervention methods and practices. P, 508.

537. Language and Reading Intervention for Hearing Impaired (3) II Receptive and expressive language assessment; techniques of teaching language intervention and remediation for hearing impaired children and youth. P, 534; CR, 594b.


539. History of Deafness (3) II For a description of course topics, see 439. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. P, 436b/536b or division permission. May be convened with 439.

540. Education of Gifted Children (3) I For a description of course topics, see 440. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 440.

541. Teaching the Gifted: Questioning Strategies (3) II Mastery of skills involved in developing abstract thinking abilities in gifted children by using the Hilda Taba Teaching Strategies. Emphasis on using these sequent question methods in all content areas and at all grade levels. P, 440/540.

542. Teaching the Gifted: Productive Thinking Models (3) I Mastery of skills involved in developing productive thinking abilities in gifted children by using teaching-learning models developed by Parnes, Williams, Taylor, Guilford, Renzulli and Trefienger at all grade levels and in all-content areas. P, 440/540.

543. Teaching the Gifted: Hierarchical Models (3) I 1990-91 Introduction to general principles involved in providing a curriculum for the gifted. Overview of ten teaching-learning models commonly used with the gifted. Mastery of skills involved in using the hierarchical models with gifted students. P, 440/540.

550. Introduction to Behavior Disorders (3) I For a description of course topics, see 450. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 450.

551. Teaching Children with Behavioral Disorders (3) I Assessment techniques, academic and behavioral intervention strategies, and classroom management with behavior disorders children and youth.

555. Rehabilitation of the Aged (3) II For a description of course topics, see 455. Graduate-level requirements include an in-depth research paper and a class presentation on a topic related to course content. May be convened with 455.

560. Introduction to Early Childhood Education for the Handicapped (3) I For a description of course topics, see 460. Graduate level requirements include an in-depth paper on a single aspect of current issues in the field. May be convened with 460.

561. Methods of Teaching Preschool Handicapped Children (3) I Norm-referenced and criterion-referenced instruments for screening, diagnosis and assessment of preschool children will be reviewed. Emphasis will be placed on teacher involvement in the assessment process. P, 460/560, 562, 575.

562. Methods of Assessment for Preschool Handicapped Children (3) I Norm-referenced and criterion-referenced instruments for screening, diagnosis and assessment of preschool children will be reviewed. Emphasis will be placed on teacher involvement in the assessment process. P, 460/500.


565. Principles of Rehabilitation (3) I Principles underlying rehabilitation programs and interdisciplinary relationships of agencies engaged in rehabilitation services.

570. Administration of Special Education Programs (3) I Practical aspects of organization and development of special education programs, problems of public relations, personnel, case finding, evaluation, placement, and records. P, consult division before enrolling.
The division offers programs directed toward the preservice preparation of elementary and secondary school teachers, the continuing inservice education of certified members of the teaching profession, and advanced graduate training of professional educators.

At the undergraduate level, the division offers programs leading to the Bachelor of Arts in Education with majors in early childhood education and elementary education. At the time of catalog editing, the major in early childhood education was under review. Prospective students should consult the Office of Student Services within the College of Education. In the area of secondary education, both the Bachelor of Arts in Education and the Bachelor of Science in Education degrees are available. Students interested in teaching at the secondary school level will select a subject area teaching major and earn the degree appropriate to the chosen major. For more information on selecting teaching majors, see the College of Education section of this catalog.

Admission requirements for undergraduate students and restrictions on enrollment in education courses are explained in the College of Education section of this catalog.

At the graduate level, the division offers a major in teaching and teacher education for the Master of Arts, Doctor of Education, and Doctor of Philosophy degrees. At the time of catalog editing, the Master of Education and the Master of Teaching degree with majors in elementary and secondary education were under review. For information on admission and degree requirements at the graduate level, consult the Graduate Catalog.

For information regarding the professional education course sequence, please consult an advisor in the Office of Student Services or in the division. Requirements for teaching majors and minors are listed under the appropriate academic department in the Departments and Courses of Instruction section of this catalog.

The division participates in the honors program.

225. Introduction to Teaching (3) I I S Teaching as a profession: examination of current issues and trends, personal career development, and exploration of the social foundations of American education. Observation in elementary and secondary schools. 2R, 3L.

300. Classroom Processes and Instruction (4) I I S Classroom observation, management, instruction, and planning processes. Attention to microcomputers, culture/language differences, special students and substance abuse. 3R, 3L. Open to majors enrolled in the College of Education. 301a-301b. Mainstreaming (2-2) GRD (Identical with S.E.R. 301a-301b)
322. Teaching Language Arts and Communication in Elementary School (3) I I S The teaching of language and communication arts in the elementary school, with special emphasis on current approaches and organization of methods and materials. P. Ed.P. 301, Educ. 350, T.T.E. 300.

323. Teaching Reading and Decoding in Elementary School (2) I I S The teaching of reading and decoding in the elementary school, with special emphasis on current approaches and organization of methods and materials. P. Ed.P. 301, Educ. 350, L.R.C. 481, T.T.E. 300.


338. The Teaching of Secondary School Subjects Specific methods, objectives, organization of subject matter, and evaluation in the various subjects.


b. Business (3) I


h. Science (3) I I

i. Bilingual (3) I I


377. Early Childhood Education (3) I I S Curriculum practices in the primary grades. P. Ed.P. 301, or CR.

383. Introduction to Business Communications (3) I I I Introduction to writing clear and concise sentences and paragraphs in basic office communications.

384. Records/Information Management (3) I I I Systems of information management: creation, distribution, storage, transfer and disposition of office records; management aspects of establishing information systems and evaluating their efficiency.

389. Foundations of Business Education (3) I I I Curriculum construction and implementation in business and distributive education; objectives, history, and philosophy of training for vocational office and distributive education; development and administration of vocational student organizations.


405. Mathematics in the Secondary School (3) I I I Study and analysis of curriculum changes in school mathematics, with emphasis on the design and content of experimental programs such as SSMCIS. P. CR, 305, 330, 362. (Identical with Math. 405)

406. English as a Second Language in Bilingual Education (3) I I I (Identical with English 408)


410. Teaching English Composition (3) I I (Identical with Engl. 410)

411. Teaching of Literature (3) I I (Identical with Engl. 411)

412. The Teaching of English Language (3) I I (Identical with Engl. 412)

414. Teaching of Modern Languages (3) I I I Specific methods, objectives, organization of subject matter and evaluation in modern languages. (Identical with Fr. 414, Ita. 414, Span. 414, Port. 414) May be convened with 514.

472. Office Administration (3) I I I Analysis of functions of office departments; their organization and administration; development and use of office manuals; selection, training, and promotion of office employees, quality and quantity of office production.

482. Teaching Vocational Office and Distributive Education (3) I Development of vocational and career education, the organization and methods of teaching office and distributive education programs.

485. Cooperative Vocational Education Programs (3) I I I The role of the teacher-coordinator and the coordination, teaching, guidance, public relations, and administration of work experience programs.

493. Internship a. Student Teaching in Elementary School (3-12 I I I P. 322, 323, 324, 326, 327, Ed.P. 301.

b. Student Teaching in Secondary School (6-12 I I I P. 300, Ed.P. 310, L.R.C. 435, 493, passing score on a basic skills proficiency examination, 338 or CR. Students must meet all other College of Education requirements and have satisfactory grades in major subject and professional courses. Application should be made several months in advance.

provement, and evaluation at the middle-school level. P, 542.
696. Seminar
b. Research on Teaching (3) I II S P, 539, 545 and Educ. 500.

Educational Administration
(See Education)

Educational Foundations and Administration
(See Education)

Educational Psychology
(See Education)

Electrical and Computer Engineering (ECE)
ECE Building, Room 230 (602) 621-2434

Professors Kenneth F. Galloway, Head (Optical Sciences), John R. Brews, Robert N. Carlile (Emeritus), Thomas C. Cetas (Radiation Oncology), Donald G. Dudley, Walter H. Evans (Emeritus), Walter J. Fahey (Emeritus), Jack Gaskill (Optical Sciences), Douglas J. Hamilton (Emeritus), Charles R. Hauser (Emeritus), Robert A. Hessemer, Jr. (Emeritus), Fredrick J. Hill, Stuart A. Hoening (Emeritus), Lawrence P. Hueltsman (Emeritus), Bobby R. Hunt, Roger C. Jones (Emeritus), William J. Kerwin (Emeritus), Granino A. Korn (Emeritus), H. Angus Macleod (Optical Sciences), Roy H. Mattson (Emeritus), Pitu Mirchandani (Systems and Industrial Engineering), Kenneth C. Mylrea, Olgierd A. Palusinski, John L. Prince, John A. Reagan, Harry E. Stewart (Emeritus), Matur K. Sundaresan, Miklos Szilagyi, James R. Wait (Geosciences), John V. Wilt, James C. Wyatt (Optical Sciences), Bernard Zeigler

The Department of Electrical and Computer Engineering in the College of Engineering and Mines offers the degrees of Bachelor of Science in Electrical Engineering, in Computer Engineering, and in Optical Engineering, and Master of Science and Doctor of Philosophy with a major in electrical engineering.

All three of the undergraduate curricula have the goal of educating immediately productive engineers who are also qualified to pursue further education as necessary to keep pace with these rapidly changing areas. The electrical engineering program prepares students for careers in such areas as electronics, microelectronics, communications, controls, electromagnetics, and signal processing. The computer engineering program prepares students for computer-related careers including microcomputer-based design, computer-aided VLSI design, computer networks, and artificial intelligence applications. The optical engineering program, offered in cooperation with the Optical Sciences Center, supports careers in areas involving optical design, optical fabrication and testing, lasers, optical detectors, optical instrumentation, optical fiber communications, etc. (See the College of Engineering and Mines section of this catalog for specific undergraduate program requirements.) The department participates in the honors program. For graduate admission and degree requirements, consult the Graduate Catalog.

207. Elements of Electrical Engineering (3) I II S CDT Introductory survey of electrical engineering, with emphasis on electric power. 3ES. P, Math. 125a, Phys. 116.

208. Elements of Electronics (3) I II S CDT Introductory survey of electronic principles and instrumentation. 3ES. P, 207.

210. Geometrical Optics (3) I (Identical with Opt. 210)

220a-220b. Basic Circuits and Electronics (3-3) I II S CDT 220a: Analysis of elementary linear and non-linear circuits, characteristics of common electronic devices. 2ES. P, 207a, 207b. 220b. 220a and 220b are offered each semester. Credit will be allowed for only one of the following sequences: 220a-220b or 207a and 207b.

221L. Basic Electronics Laboratory I (1) I II Basic laboratory techniques, experiments illustrating circuits and electronics topics from 220a. 1ES. P. CR, 220a.

222L. Basic Electronics Laboratory II (1) I II Basic laboratory techniques, experiments illustrating circuits and electronics topics from 220b. 1ES. P. CR, 220b.

226. Physical Optics (3) I (Identical with Opt. 226)

271a-271b. Digital Systems and Microprocessors (3-3) I II S CDT 271a: Number systems and coding, logic design, sequential systems, computer organization. 2ES, 1ED. P. CR, Phys. 116. 271b: Microprocessor programming,
assembly language, input/output, stacks and interrupts. 2ES, 1ED. Both 271a and 271b will be offered each semester.

301. Electrical Engineering Laboratory (3) II CDT Emphasis on measurement techniques, lab procedures, and operating principles of instruments. Experiments deal primarily with basic circuit and electronic concepts and basic design techniques. 3ES. P. CR, 320, 351.

302. Electrical Engineering Design Laboratory (3) II S CDT Design-oriented lab. Exercises in circuits, electronics and fields. 3ED. P, 301.

320. Circuit Theory (3) II S CDT Electric circuits in the frequency domain, using sinusoidal steady-state, Laplace and Fourier methods, and including single-phase and three-phase power; time domain methods and convolution; transformed networks; natural frequencies; poles and zeros; two-port network parameters; and Fourier series analysis. 2ES, 1ED. P, 220b.

340. Engineering Systems Analysis (3) II S CDT Basic concepts in the modeling and analysis of engineering systems and fundamental topics in communications, controls, and signal processing. Includes classification of systems, signal characterization in frequency domain, Fourier and Laplace transforms; representation of continuous-time systems by I/O models; system diagrams; state variable models; stability analysis and Bode plots; feedback system characteristics; discrete-time systems; and digital signal processing. 2ES, 1ED. P, 320.

350. Radiometry, Sources, and Detectors (3) I (Identical with Opti. 350)

351. Electronic Circuits (3) II S CDT Transistor amplifiers, bipolar and MOS; operational amplifiers; frequency response; feedback; tuned and broad-band amplifiers; filters and oscillators; logic circuit families. 1.5ES, 1.5ED. P, 351.

352. Device Electronics (3) II S CDT Electronic properties of semiconductors; carrier transport phenomena; P-N junctions; bipolar, unipolar, microwave and photonic devices. 1.5ES, 1.5ED. P, 351.

370. Lasers and Electro-Optical Devices (3) II (Identical with Opti. 370)

371. Engineering Software Design (3) II S Machine structure, system development tools, programming languages, data structures, single-task monitors, input/output routines, process scheduling. 2R, 3L. 1.5ES, 1.5ED. P, 271b, C-SC. 227.

372. Computer System Hardware (3) II S Computer components and circuits, random and sequential memory devices, peripherals and interface design, case studies of computer systems. 2R, 3L, 1.5ES, 1.5ED. P, 371.

381. Introductory Electromagnetics (3) II S Electrostatic and magnetostatic fields; Maxwell's equations; introduction to plane waves. 2ES, 1ED. P, Math. 322.

411. Electronic Instrumentation (3) III Individualized instructional units in specific areas: light, sound, acoustics, oscilloscope, reference electrodes, gas analysis, basic electric circuits, signal processing. 1.5ES, 1.5ED. P, college physics.

412. Optical Instrumentation (3) I (Identical with Opti. 412)

415. Instrumentation and Measurement (3) I Basic concepts of instrumentation and measurement; principles of transducers, operational amplifiers and instrument systems, with emphasis on biomedical applications; lab, experiments with transducers, amplifiers, computers, and medical equipment. 2R, 3L, 1ES, 2ED. P, senior standing in engineering. May be convened with 515.

416. Optical Design, Fabrication and Testing (3) II (Identical with Opti. 416)

417. Clinical Engineering (3) II Activities and responsibilities of clinical engineers; hospital facilities, medical equipment specifications and control, safety, management and health care. 2ES, 1ED. P, 208 or 351. (Identical with A.M.E. 417) May be convened with 517.

418. Physiology for Engineers (4) I (Identical with Psc. 418)

419. Physiology Laboratory (2) I (Identical with Psc. 419)

422. Active and Passive Filter Design (3) I Approximation; methods for realizing Butterworth, Chebyshev, Thomson and Elliptic filters; vector and realizations. 1.5ES, 2ED. P, 320. May be convened with 522.

423. Engineering Computations with Personal Computers (3) II Introduction to the use of personal computers in engineering and scientific computations and design. Open only to students having a personal computer or having received permission of the instructor. 0.5ES, 2.5ED. P, 340.

425. Image Science and Engineering (3) II Properties of optical images and image forming systems; acquisition and manipulation of digital images; two-dimensional Fourier representation; image quality criteria; introduction to image processing. 2ES, 1ED. P, 340. May be convened with 525.

426. Modern Filtering and Signal-Processing Techniques (3) II Operational amplifier circuits, nonideal amplifier limitations, active RC filter design, nonlinear wave shaping, switching, A/D and D/A components; interfacing. 1ES, 2ED. P, 320. May be convened with 526.

429. Digital Signal Processing (3) I Discrete-time signals and systems, z-transforms, discrete Fourier transform, fast Fourier transform, digital filter design. 1.5ES, 1.5ED. P, 340, Math. 322. May be convened with 529.

430. Optical Communication Systems (3) II Physics of optical communication components and applications to communication systems. Topics include fiber attenuation and dispersion, laser modulation, photo detection and noise, receiver design, bit error rate calculations, and coherent communications. 1ES, 2ED. P, Stat. 361, E.E.C. 340, 352, 381; CR, 431. May be convened with 530.

431. Principles of Communication Systems (3) I SI Special analysis techniques associated with modulation and demodulation in systems such as AM, FM, and PCM, with special emphasis on digital communication. 1.5ES, 1.5ED. P, 340, 351.

432. Electrical and Optical Properties of Semiconducting Materials (3) I (Identical with M.S.E. 434) May be convened with 534.


436. Introduction to Coding Techniques (3) Error-correcting codes used in modern digital communications systems, with emphasis on hardware implementations and performance on real channels. 2ES, 1ED. P, 271a and Stat. 361. May be convened with 536.

441. Automatic Control (3) I II Linear control system representation in time and frequency domains, feedback control system characteristics, performance analysis and stability, design of control. 1.5ES, 1.5ED. P, 340.

442. Digital Control Systems (3) II Modeling, analysis, and design of digital control systems; A/D and D/A conversions, Z-transforms, time and frequency domain representations, stability, microprocessor-based designs. 1.5ES, 1.5ED. P, 441. May be convened with 542.

447. Direct Energy Conversion (3) II (Identical with N.E.E. 447) May be convened with 547


453. Active Linear Circuit Design (3) I Discrete and integrated analog solid-state circuits, DC, wide-band, power transconductance, and operational amplifiers; computer simulations; applications. 1.5ES, 1.5ED. P, 351, 352. May be convened with 553.

455. Elementary Digital Circuit Design (3) II Emphasis on first-order analysis and design, integrated bipolar and MOS digital circuits. 0.5ES, 2.5ED. P, 351.

456. Optoelectronics (3) I Properties and applications of optoelectronic devices and systems. Topics include radiation sources, detectors and detector circuits, fiber optics, and electro-optical components. 1.5ES, 1.5ED. P, 352, 381; CR, 482. May be convened with 556.

458. Solid-State Circuits (3) I MOS technology; basic circuit and design techniques. Subsystem design and layout, MOS scaling. Practical realities, layout, and ground rules. Aspects of total system design, CAD concepts. 1ES, 2ED. P, 352.

459. Laser Principles and Devices (3) I Introduction to the characteristics of laser radiation including Gaussian beam propagation, ABCD Law, beam guiding, and resonators. Material requirements for stimulated emission, light amplification and threshold. Also covers basic types of laser systems with an emphasis on semiconductor lasers. 1.5ES, 1.5ED. P, 352, 381; CR, 482. May be convened with 559.

461. Energy Conversion (3) I Principles and operating characteristics of rotating machinery and electromagnetic transducers, single-phase and polyphase transformer operation, laboratory demonstrations and tests of transformers and rotating machinery. 2ES, 1ED. P, 320, 381.

462. Symmetrical Components (3) I Three-phase circuit analysis; analysis of fault conditions in power systems. Field trip. 1.5ES, 1.5ED. P, 320.
463. Electric Power Systems (3) Study of a balanced utility power network; load flow and economic dispatch solutions by interactive computer systems. 1.5ES, 1.5ED, P, 320.

464. Operating System Concepts (3) Fundamental issues in the design, implementation and evaluation of operating systems. Topics include process models, concurrency control algorithms, resource management and an introduction to distributed system concepts. 1.5ES, 1.5ED, P, 371, 372. May be convened with 564.


466. Power Plant Electrical Design (3) Basic elements of power plant electrical design for both the generating system and the plant auxiliary system, including selection and sizing of major electrical equipment. 1ES, 2ED. P, 461 or 462.

468. Photovoltaic Systems Engineering (3) May be convened with N.E.E. 468. May be convened with 568.

469. Computer Architecture and Organization (3) Fundamentals of computer architecture and organization, computer design methodologies, processor organization and design, control design, microprogramming, memory organization and design, virtual memory concept, inter- and intra-system communication, bus structure, input/output, operating system role, parallelism in computer architecture. 1.5ES, 1.5ED, P, 371. May be convened with 569.

470a-470b. Optics Laboratory (3-3) (Identical with Opt. 470a-470b)


473. Software Engineering Concepts (3) In-depth consideration of each of the phases of the software project life cycle. Object-oriented design and programming. Includes a large-scale software development project involving groups of students. 2R, 3L. 1ES, 2ED, P, 371. May be convened with 573.

474a-474b. Computer-Aided Logic Design (3-3) 474a: Tabular minimization of single and multiple output Boolean functions, NMOS and CMOS realizations, synthesis of sequential circuits, RTL description, laboratory exercises. 1.5ES, 1.5ED, P, 271a, 474b: Standard cell layout, gate and switch level simulation, level mode sequential circuits. VLSI testing, CAD tools, laboratory projects. 1ES, 2ED. (Identical with C.Sc. 474a-474b) May be convened with 574a-574b.

475. Microcomputer-Based Design (3) Design of microprocessor-based real-time test and control systems, use of development systems and emulators. 2R, 3L. 0.5ES, 2.5ED, P, 372.


479. Principles of Artificial Intelligence (3) Provides an introduction to problems and techniques of Artificial Intelligence (AI). Problem solving; basic problem solving methods and techniques; search and game strategies; knowledge representation using predicate logic; structured representations of knowledge; semantic nets, system entity structures, frames and scripts; planning; learning, expert systems; implementing AI systems. 1.5ES, 1.5ED, P, 371, 473.

481. Microwave Measurements (3) Measurement techniques and the application of hardware and test equipment in the modern microwave laboratory. 2R, 3L. 1.5ES, 1.5ED, CR, 482 or consult department before enrolling.

482. Electromagnetics (3) II Plane waves, transmission lines, waveguides, cavity resonators, and antennas. 1.5ES, 1.5ED. P, 381 or Phys. 415a.


485. Radio Waves (3) II 1992-93 Geometrical ray tracing, diffraction and scattering, ground waves propagation, magneto-ionic theory, random media effects, topographic influences, satellite communications, and fiber optic transmission. 1.5ES, 1.5ED, P, 482. May be convened with 565.

486. Microwave Engineering (3) II Waveguides; cavities; S-parameter representation of microwave components and networks; transistor and MESFET amplifiers; IMPATT diode and Gunn oscillators; microwave integrated circuits. 1.5ES, 1.5ED. P, 482.

487. Fiber Optics Laboratory (3) May be convened with 587.


494. Practicum a. Senior Practicum in Design (3) II 0.5ES, 2.5ED, P, 302. Writing-Emphasis Course.


501. Linear Systems Theory (3) I Mathematical descriptions of linear systems, state-variable models, analysis methods-stability, controllability and observability, state feedback techniques, design of feedback controllers and observers.


515. Instrumentation and Measurement (3) I For a description of course topics, see 415. Graduate-level requirements include additional homework and a term project. May be convened with 415.

517. Clinical Engineering (3) II For a description of course topics, see 422. Graduate-level requirements include additional homework and a term project. May be convened with 422.

522. Active and Passive Filter Design (3) I For a description of course topics, see 426. Graduate-level requirements include additional homework and a term project. May be convened with 426.


524. Active RF Filters (3) II Modern techniques for realizing active RF filters using passivity preserving amplifiers, gain blocks; determination of sensitivity; effects of gain-bandwidth.

525. Image Science and Engineering (3) II For a description of course topics, see 425. Graduate-level requirements include additional homework and a term project. P, 340. May be convened with 425.

526. Modern Filtering and Signal-Processing Techniques (3) II For a description of course topics, see 426. Graduate-level requirements include additional homework and a term project. May be convened with 426.

527. Holography (3) II 1992-93 (Identical with Opt. 527)


529. Digital Signal Processing (3) I II For a description of course topics, see 429. Graduate-level requirements include additional homework and a term project. May be convened with 429.


531. Image Processing Laboratory for Remote Sensing (3) I Techniques and applications of digital image processing in remote sensing, multispectral image enhancement and analysis, classification, feature extraction for cartography, rule-based systems for mapping from imagery. 3R, 1L. (Identical with Opt. 531)

533. Digital Image Processing (3) I Image statistics, models, transforms; enhancement and restoration; coding; tomography. P. 425/525, 503. (Identical with Opt. 533)

534. Electrical and Optical Properties of Semiconducting Materials (3) I (Identical with M.S.E. 534) May be convened with 434.

535. Noise in Communications Systems (3) I II For a description of course topics, see 435. Graduate-level requirements include additional homework and a term project. Credit is allowed for this course or for 536 but not for both. P. 431, Stat. 361. May be convened with 435.

536. Introduction to Coding Techniques (3) I For a description of course topics, see 436. Graduate-level requirements include additional homework and a term project. P. 271a, Stat. 361. May be convened with 436.


538. Digital Communications Systems (3) II Digital modulation techniques for the Gaussian white noise channel, emphasizing optimal demodulation methods, analysis of error rates, and signaling techniques over finite bandwidth channels. Credit is allowed for this course or for 535 but not for both. P. 503.

539. Algebraic Coding Theory (3) II 1991-92 (Identical with Math. 539)


542. Digital Control Systems (3) II For a description of course topics, see 442. Graduate-level requirements include additional homework and a term project. May be convened with 442.


545. Decentralized Control and Large-Scale Systems (3) II 1991-92 Introduction to large-scale systems, definitions and special problems, modeling/model reduction, structural properties, decentralization of control and information, hierarchical and multi-level controllers. P. 501.

546. Direct Energy Conversion (3) II (Identical with N.E.E. 547) May be convened with 447.


552. Solid-State Devices (3) II Basic semiconductor physics and materials, PN junctions, metal semiconductor junctions/contacts. BJTs and MOSFETs, device operation, terminal behavior and frequency response, device models. P. 352, 451.

553. Active Linear Circuit Design (3) I For a description of course topics, see 453. Graduate-level requirements include additional homework and a term project. May be convened with 453.

554. Electronic Packaging Principles (3) I Introduction to problems encountered at all levels of packaging thermal, mechanical, electrical, reliability, materials and system integration. Future trends in packaging. (Identical with M.S.E. 554)

555. VLSI Chip Engineering (3) I Layout methods and tools for MOSFET and bipolar IC, statistical circuit design techniques, circuit models for SPICE simulation, ESD and latch-up protection, exercises and term project in design of a chip, including SPICE simulation on mainframe computer and chip layout using modern CAD system on work station. P. 458.

556. Optoelectronics (3) I For a description of course topics, see 456. Graduate-level requirements include additional homework and a term project. May be convened with 456.


558. Vacuum System Engineering (3) II 1991-92 Rarefied gas dynamics, pumping, gauging and systems as they apply to microelectronic device and thin-film fabrication. Materials and techniques for ultrahigh and ultrahigh vacuum processes. P. 557b or consult department before enrolling.

559. Laser Principles and Devices (3) I For a description of course topics, see 459. Graduate-level requirements include additional homework and a term project. May be convened with 459.

560. Aerosol Science and Engineering (3) I 1991-92 (Identical with Ch. 560)

561. Power Electronics (3) II Design and analysis of switching converters: topologies, state-space averaging, feedback, power bipolar transistor and MOSFET characteristics, magnetic modeling and design. P. 320, 340.

562. Plasma Processing (3) II Practical methodology of plasma etching, sputtering, and plasma enhanced CVD. Plasma physics and plasma chemistry. RF and DC discharges. P. 557 or consult department before enrolling.

564. Operating System Concepts (3) I For a description of course topics, see 464. Graduate-level requirements include additional homework and a term project. P. 371, 372. May be convened with 464.


566. Computer Network Design (3) I Fundamental issues in the design, implementation and evaluation of distributed computer programs. Focus on understanding, using, and designing upper-level network protocols and interfaces. Topics include OSI, TCP/IP and SNA protocols, and the TL1 and socket interfaces. P. 564, 578.

568. Photovoltaic Systems Engineering (3) I (Identical with N.E.E. 568) May be convened with 468.

569. Computer Architecture and Organization (3) I For a description of course topics, see 469. Graduate-level requirements include additional homework and a term project. P. 371. May be convened with 469.


571a-571b. Digital Systems Design (3-3) I 571a: Computer organization and architecture control unit design, microprogramming, input/output. P. 571b: Advanced I/O, bus arbitration, interface design, fault tolerance, associative, cache, and virtual memory, RISC architectures. (Identical with C.Sc. 571a-571b)

572a-572b. Continuous-System Simulation (3-3) I For a description of course topics, see 472a-472b. Graduate-level requirements include more difficult homework and separate grade normalization. (Identical with C.Sc. 572a-572b) May be convened with 472a-472b.

573. Software Engineering Concepts (3) I For a description of course topics, see 473. Graduate-level requirements include additional homework and a term project. May be convened with 473.

574a-574b. Computer-Aided Logic Design (3-3) I II For a description of course topics, see 474a-474b. Graduate-level requirements include additional homework and term projects. (Identical with C.Sc. 574a-574b) May be convened with 474a-474b.


576. Knowledge-Based System Design (3) I Provides a framework for systematic design of systems and for constructing computer-aided environments to support engineering design activities. Characterization of design methodologies; introduction to knowledge-based design; system design and simulation modeling.
knowledge-based model of design, representing designs and design knowledge, design model synthesis, concepts for design evaluation, learning and creativity in design systems. A large-scale term project is central to the course. P, 479, 473.


578. Fundamentals of Computer Networks (3) I For a description of course topics, see 478. Graduate-level requirements include additional homework and assignments. May be convened with 478.

579. Artificial Intelligence and Simulation (3) I Incorporating expert systems concepts and artificial intelligence into simulation modeling and systems design environments. Provides a framework for applying simulation methodology and AI concepts in a unified manner. P, 575.

580-581b. Electromagnetic Field Theory (3-3) 581a: II Time-harmonic fields; fundamental theorems and concepts; rectangular and circular waveguides and resonators; apertures in ground planes, cylinders, and wedges; scattering by cylinders and wedges. P, 502 or Math. 220, 482 or Phys. 415b. 581b: I Spherical geometries; interface problems; perturbation techniques; integral equations; asymptotic techniques; introduction to transient fields, finite elements, and finite differences.

183. Remote Sensing Instrumentation and Techniques (3) II Development of instrumentation, measurement and signal processing techniques required for electromagnetic remote sensing applications with emphasis on atmospheric remote sensing. P, 482. (Identical with Atmo. 583)

584. Advanced Antenna Theory and Design (3) II 1992-93 Electromagnetic radiation and diffraction; dipoles, slots, open wave guides, and horns; apertures, reflectors, and arrays; mechanical and electronic scanning; applications to practical radar and communications problems. P, 584.

585. Radio Waves (3) II 1992-93 For a description of course topics, see 485. Graduate-level requirements include a research report on a topic selected by the instructor from the course material. P, 482. May be convened with 485.

587. Fiber Optics Laboratory (3) II (Identical with Opt. 587) May be convened with 487.

589. Atmospheric Electricity (3) II 1991-92 (Identical with Atmo. 589)

596. Information Theory (3) II 1992-93 Definition of a measure of information and study of its properties; introduction to channel capacity and error-free communications over noisy channels; rate distortion theory; error detecting and correcting codes. P, 503. (Identical with Math. 636)


650. Advanced Analog Circuits (3) II Advanced topics in bipolar and CMOS analog integrated circuits including both switching and nonswitching applications. Voltage references, DAC and ADC systems, instrumentation amplifiers, sample-hold circuits, switched-mode power supply regulators. P, 550.

651. Advanced Topics in Semiconductor Devices (3) II Preparation of approximately three research reports and presentation on semiconductor topics of current interest. P, consult department before enrolling.

652. Advanced Solid-State Devices (3) I Analysis and design of devices including BJTs, MOSFETs, MESFETs, MODFETs, microwave devices, and photonic devices. P, 552.


659. Advanced Topics in Microelectronics and Solid-State Devices (3) [Rpt./9 units] Specialized topics, as announced, such as submicron MOSFETs, radiation effects on devices, yield analysis, advanced semiconductor processing technologies, and contamination control. P, consult department before enrolling.

671. Parallel Processing: Architectures and Algorithms (3) II Parallel computer architectures; architectural classification schemes, techniques for parallel processing, pipeline computers, vector processing, multiprocessor structures and applications (SIMD and MIMD machines), study of parallel algorithms, parallel process applications, neural networks, and data flow computing. P, 569, knowledge of computer architecture and digital systems.

672. Computer-Aided Design Algorithms and Techniques for VLSI (3) I Introduction to VLSI design, combinational and sequential logic synthesis, layout generation and optimization, logic and timing simulation, design styles. P, 474/574.


678. Integrated Telecommunication Networks (3) I Analysis and design of integrated voice, data, and image networks for integrated telecommunications applications. Protocols for LANs, ISDNs, WANs, MANs and interoperable networks. ISO-based network software design for applications. P, 566, 673.

679. Advances in Knowledge-Based Systems (3) I Forum for discussion of advanced topics in the forefront of research. Lectures and student presentations. P, 575 or 576 or 579.


Elementary Education
(See Education)

Engineering and Mines (ENGR)

Geology Building, Room 134
(602) 621-6032

Listed below are courses which are common to all degrees offered by the College of Engineering and Mines, and others that are available to all university students.


102. Problem Solving and Engineering Design (3) II I S Introduction to the engineering design process, basic engineering principles, problem-solving techniques, and software tools. Culminates in an engineering design project. 1ES, 1ED, P, 101.

109. Technology and Society: An Historical Perspective (3) I (Identical with N.E.E. 109)

120. Mineral Resources, Geotechnology and the Environment (3) I (Identical with E.M. 120)

196. Honors Proseminar
a. Survey of Engineering Professions (1) I
b. Engineering Design Proposal (1) II

255. Materials Science in Modern Society (3) I (Identical with M.S.E. 255)

256. Laboratory for Materials Science (1) I (Identical with M.S.E. 256)

257. Materials Science of Art and Archaeological Objects (3) II (Identical with M.S.E. 257)

258. Materials Science of Art and Archaeological Objects Laboratory (1) II (Identical with M.S.E. 258)

265. Engineering Economic Analysis (3) I II S (Identical with E.M. 435)
The Graduate Catalog.

Extended English, Master of Arts with majors in English, Master of Fine Arts with a major in language and literature, leading to the following degrees.

The Department of English offers instruction in a number of topics and concentrations: British literature, American literature, literature and composition. British concentrators must take one core course in American literature and one in literature before 1800. Literature concentrators must take three 496 seminars and one course (405, 406, or 421), one British language course (405, 406, or 421), one applied rhetoric course (301, 401, 402, 414, or 419a or 419b), a course in writing about literature (380 or another 496), and a literature elective at the 300 or 400 level. Majors are also required to take six units each of English as a Second Language (ESL) (which may also be used in partial fulfillment of the general education requirement in Western Civilization).

All majors are required to fill out a plan of study with the department's Director of Undergraduate Studies or an Associate Advisor in English. The supporting minor for majors in English: Recommended subjects are classics, drama, philosophy, modern languages, history and theory of art or of music, journalism, communication, anthropology, government, economics, history, linguistics, psychology, sociology; other subjects as may be individually justified.

The major in creative writing: 36 units, including 209, 210, 370a-370b; 3 units from 261, 267a-267b, 380; 6 units from 301, 304, 309; 6 units from 401, 404, 409, 413, T.A.R. 460a-460b; 9 units of upper-division (300 level or above) literature courses in the English Department, to include 3 units of course work in modern or contemporary literature.

The minor in creative writing: 21 units, including 209, 210, 3 units from 301, 304, 309; 3 units from 401, 404, 409, 413, T.A.R. 460a-460b; 3 units from 261, 265, 267a-267b, 370a-370b, 380; 3 units at the 400 level in modern or contemporary literature. The teaching major in English (for students who are candidates for a B.A. in Education with secondary teaching certification): 36 units, including 306, 370a-370b, 380, 405, 406, 410, 411, 412, 496, one course in Shakespeare, and one course in American literature. Engl. 107 and 108 may not be used to satisfy the freshmen composition requirement.

The teaching minor in English (for students majoring in subjects other than English who are candidates for a B.A. or B.S. in Education): 21 units, including 306, 370a or 370b, 380, 405, 406, 410, 411, and one course in American literature. Engl. 107 and 108 may not be used to satisfy the freshmen composition requirement.

The teaching major in extended English: in place of one of the minor fields listed under English (ENGL). Modern Languages Building, Room 445 (602) 621-1836

305. Advanced Composition (3) I II Study of rhetorical theory; practice in writing exposition and argument. Writing-Emphasis Course for English education majors.*
308. Technical Writing (3) I II Analysis and presentation of scientific and technical information.
309. Poetry Writing (3) I II Practice in poetry writing. P. 209.
310. The Novel (3) II S The origin and evolution of the novel as a literary form. P. Freshman Composition.
313. Lyric Poetry (3) I II A close reading of poetry. P. Freshman Composition.
320a-320b. Literature of the Bible (3-3) II S Old Testament: legendary and historical narratives, prophetic literature, and poetry.
331. Shakespeare's Major Plays (3) I II A close reading of six to eight plays, including a comedy, a history, a tragedy, and a tragi-comedy.
350. Oral Tradition (3) I II A study of oral tradition, with emphasis on American Indian myth, legend, and lore. P. Freshman Composition. (Identical with A.In.S. 350)
370a-370b. English Literature (3-3) A survey, with emphasis on major writers in their literary and historical contexts. 370a: From Old English to Renaissance literature. 370b: From Restoration to modern literature. 370a is not prerequisite to 370b. Both 370a and 370b are offered each semester.
371a-371b. American Literature (3-3) A survey with emphasis on writers in their literary and historical contexts. 371a: From the Revolutionary Period to 1865. 371b: From 1865 to the present.
401. Advanced Creative Nonfiction Writing (1-4) [Rpt./2] II P. 301 or 306, and consult department before enrolling. Writing-Emphasis Course for creative writing majors.*
404. Advanced Fiction Writing (1-4) [Rpt./2] II P. 304. Writing-Emphasis Course for creative writing majors.*
405. History of the English Language (3) I II The evolution of English sounds, inflections, and vocabulary from earliest times to the present, with attention to historical conditions. (Identical with Ger. 405) May be convened with 505.
406. Modern Grammar and Usage (3) I II Introduction to the nature of grammar, and approaches to its description. Scope also includes the social and historical factors which influence the form and use of English in various contexts, both in speaking and writing. May be convened with 506.
408. English as a Second Language in Bilingual Education (3) I II Methodology for the teaching of English as a component of bilingual education; grammar, phonology, and syntax as they apply to the teaching of language skills. (Identical with T.T.E. 408) May be convened with 508.
409. Advanced Poetry Writing (1-4) [Rpt./2] II P. 309. Writing-Emphasis Course for creative writing majors.*
413. Poetry in Forms (1 to 4) [Rpt.] II Explores prosody through discussing and writing of forms and types, research paper. P. 309. May be convened with 513.
414. Advanced Scientific Writing (3) I II Preparation of professional literature for publication. May be convened with 514.
415. The Nature of Literature (3) I II What literature is and does, as exposed in theories of writing and in self-conscious literary works.
417. Women Authors (3) I Analysis of selected works by women in the context of the authors' lives and social milieus. (Identical with W.S. 417)
418. Women in Literature (3) I II Analysis of works by women in the context of the authors' lives and social milieus. (Identical with W.S. 418)
419a-419b. Non-fiction Prose (3-3) 419a: The essay in English. 419b: Other prose forms.
465. Victorian Literature (3) I Major poetry and nonfictional prose.

466. Themes in Victorian Literature (3) II The impact of science, the sexual revolution, art and ecology, and the Romantic heritage.

470. Literature and Major Philosophers (3) II Selected works of literature in connection with particular philosophical statements or problems. An honors section is available. P, Freshman Composition; upper-division standing.

472. Modern Fiction (3) I American, British, and Continental fiction, with particular attention to the development of characteristically modern techniques.

473a-473b. Modern British Literature (3-3) 473a: Development of British fiction from the late 19th century to the present. 473b: Development of British poetry from the turn of the century to the present.

475. Modern Fiction (3) I The development of dramatic literature from Shakespeare to the present; Ibsen, Chekhov, Strindberg, Brecht, Pirandello, Giraudoux, Anouilh, Beckett, Ionesco, and other playwrights.

476. American Romanticism (3) II Prose and poetry by Hawthorne, Poe, Emerson, Whitman, Thoreau, and Melville.

481. Literature of the Early Republic (3) I Satire, drama, essays, novels, and poetry of the Revolutionary and post-Revolutionary periods; Franklin, Frenau, Crevecoeur, the Connecticut Wits. C.B. Brown, Irving, Cooper. P, upper-division standing.

482. American Romanticism (3) II The development of realism and naturalism in American literature; Twain, James, Crane, Dreiser, and other writers.

483a-483b. American Realism (3-3) 483a: The nineteenth century—Hawthorne, Melville, Twain, and others. 483b: The twentieth century—James, Fitzgerald, Faulkner, and others.

484a-484b. The American Novel (3-3) 484a: The nineteenth century—Hawthorne, Melville, Twain, and others. 484b: The twentieth century—James, Fitzgerald, Faulkner, and others.

485. Modern British and American Drama (3) II The development of drama in English from 1900 to the present. Shaw, O’Casey, Beckett, Osborne, Pinter, O’Neill, Wilder, Miller, Williams, Albee, and other playwrights.

486. Themes in American Literature (3) I II Analysis of such literary themes as the frontier, the American Adam, American humor, self and society.

487. Major American Author (3) I II A consideration of the major works of one author, including such authors as Hawthorne, Melville, James, and Faulkner.


490. Colloquium a. Honors for Juniors (3) II
b. Honors for Seniors (3) II

496. Seminar a. Studies in a Literary Period (3) [Rpt./9 units] II
b. Literary Themes (3) [Rpt./9 units] II
c. Literary Genres (3) [Rpt./9 units] II
d. Major Authors (3) [Rpt./9 units] II

497. History and Literature (3) [Rpt./9 units] I S

498. American Indians (3) I S

Note: Seminars serve as writing-emphasis courses for literature majors.
202. Applied Entomology (3) [Rpt./1] I Survey of insect pests of crops and domestic animals, in the forest and urban environments, and as vectors of plant and animal diseases. Control of insects using pesticides and biological methods and the public debate over insect control will be discussed. 2R, 3L. Field trips. Terry

403R. Biology of Animal Parasites (3) I (Identical with V.Sc. 403R) May be convened with 503R.

403L. Parasitology Laboratory (1) I (Identical with V.Sc. 403L) May be convened with 503L.

404. Insect Morphology (4) I 1992-93 External and internal anatomy as related to identification, function and phylogeny of insects and other arthropods; modifications in development and habits peculiar to the insects. 2R, 6L. P, 201R or invertebrate zoology. May be convened with 504. Wheeler.


407R. Insect Physiology (3) II 1992-93 Introduction to the diverse and unique ways insects solve physiological problems. A whole-animal approach will be used centered around various aspects of an insect's life (i.e., growing, flying, reproducing). P, 201; CR, 407L; biochemistry recommended. May be convened with 507R. Hagedorn/Chapman.


408. Insecticide Toxicology (3) II 1991-92 Insecticides and related chemicals; their modes of action, detoxification, resistance in arthropods, and environmental distribution and effects. P, 3 units of organic chemistry or biochemistry. (Identical with Tox. 408) May be convened with 508. Feyerisen.


452. Medical-Veterinary Entomology (4) [Rpt./3] I 1992-93 Survey of arthropods of public health and veterinary importance, with emphasis on transmission dynamics of pathogens, biometrics of vector populations, and current control concepts. 3R, 3L. P, 201; parasitology recommended. (Identical with V.Sc. 452) May be convened with 552. Cupp.

468. Insect Pest Management (3) I Principles underlying the management of arthropods in agricultural systems. P, 201R. May be convened with 568.

470. Biological Control (3) II Principles of the biological control of arthropod pests and weeds, emphasizing their application to agricultural and rangeland entomology. P, 444 and 468. May be convened with 570. Watson.


503R. Biology of Animal Parasites (3) I (Identical with V.Sc. 503R) May be convened with 403R.

503L. Parasitology Laboratory (1) I (Identical with V.Sc. 503L) May be convened with 403L.

504. Insect Morphology (4) I 1992-93 For a description of course topics, see 404. Graduate-level requirements include a written literature review and oral presentation of a selected topic. P, 201R or invertebrate zoology. May be convened with 404. Wheeler.

505. Aquatic Entomology (3) II 1992-93 For a description of course topics, see 405. Graduate-level requirements include an original research or review paper on some aspect of aquatic entomology agreed upon by the student and the professor. Field trips. P, Ecol. 182. (Identical with W.F.Sc. 505 and Ecol 505) May be convened with 405. Smith.

507R. Insect Physiology (3) II 1992-93 For a description of course topics, see 407R. Graduate-level requirements include written literature reviews. P, 201; biochemistry recommended. 507L is not required for 507R. May be convened with 407R. Hagedorn/Chapman.

507L. Insect Physiology Laboratory (1) II 1992-93 For a description of course topics, see 407L. Graduate-level requirements include helping to develop a laboratory. P, 201; biochemistry recommended. 507L is not required for 507R. May be convened with 407L. Hagedorn/Chapman.

508. Insecticide Toxicology (3) II 1991-92 For a description of course topics, see 408. Graduate-level requirements include a written literature review and oral presentation of a selected topic. P, 3 units of organic chemistry or biochemistry. (Identical with Tox. 508) May be convened with 408. Feyerisen.

511. Insect Behavior (3) II 1991-92 For a description of course topics, see 411. Graduate-level requirements include a research paper on some aspect of bee biology or pollination, terminating with an oral presentation. Field trips. P, one course in biology. May be convened with 414. Erickson.

514. Bee Biology and Pollination (2) II 1992-93 For a description of course topics, see 416. Graduate-level requirements include a written literature review and oral presentation of a selected topic. 3R, 3L. Field trips. May be convened with 416. Smith.

516. Insect Systematics (4) I 1991-92 For a description of course topics, see 416. Graduate-level requirements include a written literature review and oral presentation of a selected topic. 3R, 3L. Field trips. May be convened with 416. Smith.

542. Medical-Veterinary Entomology (4) [Rpt./3] I 1992-93 Survey of arthropods of public health and veterinary importance, with emphasis on transmission dynamics of pathogens, biometrics of vector populations, and current control concepts. 3R, 3L. P, 201; parasitology recommended. (Identical with V.Sc. 452) May be convened with 552. Cupp.

544. Insect Ecology (3) I 1992-93 For a description of course topics, see 444. Graduate-level requirements include an independent research project and a literature review paper. Field trips. P, 201R. (Identical with Ecol. 544) May be convened with 444. Moran.

552. Medical-Veterinary Entomology (4) [Rpt./3] I 1992-93 For a description of course topics, see 452. Graduate-level requirements include taking the lead in class discussion and completion of a term paper. P, M.C.B. 181, Ecol. 182. May be convened with 443. Tobin.

554. Insect Ecology (3) I 1992-93 For a description of course topics, see 444. Graduate-level requirements include an independent research project and a literature review paper. (Identical with Ecol. 554) May be convened with 444. Moran.

555. Insect Neurobiology (3) II 1991-92 For a description of course topics, see 416. Graduate-level requirements include an independent research project and a literature review paper. (Identical with Ecol. 555) May be convened with 416.

556. Insect Pest Management (3) I For a description of course topics, see 468. Graduate-level requirements include an additional report. P, 201R. May be convened with 468.

570. Biological Control (3) II For a description of course topics, see 470. Graduate-level requirements include a research paper on some major area of biological control, terminating with an oral presentation. P, 444 and 468. May be convened with 470. Watson.

576. Environmental Toxicology (3) I (Identical with Tox. 576).


696. Seminar a. Entomology (1) [Rpt./6] I II Entrepreneurship (See College of Business and Public Administration)
Environment and Behavior (ENV)

Psychology Building, Room 517
(602) 621-7430

Committee on Environment and Behavior (Graduate)

Professors Robert Bechtel, Chair (Psychology), Charles Albanese (Architecture), Terry Daniel (Psychology), Donald Davis (Hydrology), William Havens (Renewable Natural Resources), Robert Hershberger (Architecture), William Ittelson (Psychology), David King (Renewable Natural Resources), William Rathje (Anthropology), Thomas F. Saarinen (Geography), Lee Sechrest (Psychology), Ervin H. Zube (Renewable Natural Resources)

Associate Professors Curtis W. Bryant (Civil Engineering) Dennis Doxtater (Architecture), William Shaw (Renewable Natural Resources)

Assistant Professors Robert Itami (Renewable Natural Resources), Chet Ross (Family and Consumer Resources)

The Committee on Environment and Behavior functions to coordinate and further develop study of the relationship between physical settings and human activities. This multidisciplinary group of teachers and researchers will assist students interested in combining an environment and behavior emphasis into majors such as psychology, architecture, landscape architecture, interior design, geography, renewable natural resources, political science, and water resources administration. Students should consult their department advisors and appropriate members of the Committee on Environment and Behavior. While no graduate major is offered, the committee does offer a doctoral minor. A minimum of 15 units from environment and behavior courses approved by the committee is required.

The graduate interdisciplinary program in epidemiology offers the opportunity for study in the scientific discipline concerned with the causes and prevention of disease in human populations. Advances in clinical medicine, laboratory science, environmental health, nutrition, statistics, computer data processing and the basic understanding of the pathogenesis of disease enable epidemiology researchers to better examine causes of disease and to evaluate more effective strategies for disease prevention and control. Multidisciplinary collaborations between committee faculty and members of university departments and state and national health institutions provide classroom and community training opportunities. To accomplish this goal, faculty committee members with overlapping expertise from several health science departments have been selected to direct courses and research.

Degrees

The Graduate Committee on Epidemiology offers a major in epidemiology for the Master of Science and Doctor of Philosophy degrees.

Admission Requirements

In addition to an undergraduate degree, applicants should provide scores of the Graduate Record Examination. Three letters of recommendation are required. For additional information, contact Dr. T.E. Moon.

Courses

See the Department of Family and Community Medicine under Medicine for listing of most epidemiology courses.

Ethnic Studies

(See African American Studies, American Indian Studies, and Mexican American Studies)

Exercise and Sport Sciences

(See Health-Related Professions)

Family and Consumer Resources (FCR/MCS/ID/HEE/COU/FS)

FCR Building, Room 205
(602) 621-1075

Professors Jereilyn B. Schultz, Director, Oscar C. Christensen (Emeritus), Victor A. Christopherson (Emeritus), Roger J. Daldup (Emeritus), Kathryn L. Hatch, James R. Hine (Adjunct), Theodore Jacob, Jean Ryley Kears (Emerita), Amy Jean Knorr (Emerita), Doris E. Manning (Emerita), Shirley O’Brien (Adjunct), Naomi A. Richter, Robert R. Rice, Carl A. Ridley, George B. Sproles, Mary Adele Wood (Emerita)

Associate Professors Richard L. Erickson, Ellen Goldsberry, Donna R. Iams, Maureen E. Kelly, Roger M. Kramer, Philip J. Lauver, Jessica Lazarus (Adjunct), Mary H. Marion, Betty J. Newlon, David C. Rowe, Sooyon Shim, Elizabeth K. Sproles, Mari S. Wilhelm

Assistant Professors Oscar Blazquez, Brenda M. Brandt, Donna H. Christensen, James E. Deal, Daniel J. Flannery, Wendy Gamble, Molly Longstreth, Susan B. Silverberg

Extenstion Specialists Sherry L. Betts, Norma J. Redeker, Corinne I. Stinson (Emerita), Lawrence M. Sullivan, Shirley Jo Taylor, Frank R. Williams

Lecturer Chet J. Ross

The School of Family and Consumer Resources provides instructional, research extension and outreach programs that enable families, individual family members and consumers to achieve an optimum quality of life throughout the lifespan. Instructional programs prepare professionals for careers serving families and consumers in a culturally diverse and rapidly changing society.

The undergraduate program has as its major objectives: (1) specialization in various aspects of Family and Consumer Resources, in preparation for professional positions, and (2) courses to enrich the professional preparation of students in other colleges.

The school is organized into three divisions: Family Studies; Educational and Professional Studies; Merchandising, Consumer Studies and Design.

The school offers the Bachelor of Science in Family and Consumer Resources with majors in family studies (emphasizing human development, interpersonal relations, and family financial counseling); general home economics; home economics education (secondary education and family life education tracks); interior design; and merchandising and consumer studies.

Graduate degree programs offered by the School of Family and Consumer Resources include the Master of Arts with a major in counseling and guidance; the Master of Science with a major in family and consumer resources or home economics education; the Master of Education with a major in family and consumer resources; and the Master of Home Economics Education with a major in home economics education. For the Master of Science degree with a major in family and consumer resources, con-
concentrations are available in family studies; interior design; consumer studies; merchandising; home economics education; and family economics. The school also offers the Doctor of Philosophy with a major in family and consumer resources. Emphases are available in consumer studies; human development; interpersonal relationships and family resource management. For further information, consult the Graduate Catalog.

Students enrolled in majors in Family and Consumer Resources may elect to choose a minor subject area with the approval of the students advisor.

Family and Consumer Resources (FCR)

129. Professional Development (2) I Knowledge and attitudes generally needed by professionals in family and consumer resources or related fields; exploration of careers and cross specialization concepts.

297. Workshop
a. Self and the World of Work (1) I II
b. Student Executive Training in Higher Education (2) II
c. Student Assistant in College Residence Halls (1) I

397. Workshop
d. Writing for Applied Sciences (2) I II (Identical with A.Ed. 397d)

465. Women in International Development (3) II (Identical with Anth. 465) May be convened with 565.

565. Women in International Development (3) II (Identical with Anth. 565) May be convened with 465.

696. Seminar

z. Family and Consumer Resources (1-3) [Rpt. 1] I II

Division of Merchandising, Consumer Studies and Design

N. Reich, Chairperson

The division offers two majors: merchandising and consumer studies, and interior design. Majors in merchandising and consumer studies acquire expertise in coordinating complex economic, aesthetic, technological, and sociological factors in dress as they prepare for professional careers.

Merchandising and Consumer Studies (MCS)

Students are required to meet the advanced standing requirements in merchandising and consumer studies, which includes a cumulative grade-point average of 2.6 or better, to establish eligibility for the upper-division level courses in the major.

The College of Business and Public Administration's advanced standing requirement, which includes cumulative grade-point average of 2.75 or better, is required to establish eligibility for the upper-division level business courses. The major in merchandising and consumer studies requires a number of upper-division level business courses as part of the program. A student who does not complete the required business courses, as well as the merchandising and consumer studies requirements, will not be able to graduate under the major. Students must establish advanced standing in the program before attempting to register for junior and senior years of study.

The purpose of the undergraduate curriculum in the MCS major is to provide a broad education to prepare the student for imaginative and responsible citizenship and leadership roles in business or society. The bulk of the professional course work is concentrated in the upper-division portion of the degree program following a basic foundation of general education. This foundation includes course work in communications, mathematics, physical and environmental sciences, the language of commerce, the social and behavioral sciences, and world civilizations.

Any course work that might be applicable to the upper-division professional core or major requirements taken while enrolled in other colleges or at other universities is subject to acceptance by the School of Family and Consumer Resources for degree certification purposes.

The major in merchandising and consumer studies majors must complete five general education study areas, as described in the College of Agriculture section of this catalog (see school advising sheets for specific requirements for study areas); as well as completing Engl. 101 or 103H; 102 or 104H; Comm. 112; Engl. 307; Math. 117F/S; M.S. 111 or approved course. Major requirements include: F.C.R. 129; I.D. 115; M.C.S. 114, 238, 304, 325, 393b, 440, 434 or 540, 304; Economics 114, 116, 304. 434 or 540; 6 units from M.C.S. 386, 434, 444, 445, 454, 493b, F.S. 337, 416, 416; Psy. 101; Acct. 200; Mktg. 361, 364, 458; 366 or 372 or 450 or 452 or 456 (first three Mktg. courses are required; students can choose from second group); and 9 units from Acct., M.A.P. 305, 320, 330, Mktg., M.I.S., M.C.S. 493b (3 units maximum); Ex.S.S. (2 units); 3 unit F.C.R. upper-division course outside the major.

114. Introduction to Merchandising (3) I II The processes involved in moving apparel and related consumer products from development through the wholesale and retail system.

284. Textile Science (4) I II Scientific theory concerning fibers, yarn, fabric construction and finishes; use of scientific data related to selection, use and care. P. Chem. 101a, 102a, or Phys. 102a, 180a.

304. Merchandising Analysis (3) I II Development of merchandising policies and procedures used in retailing with emphasis on retail mathematics. P. 284, Acct. 200.

325. Historical Analysis of Dress and Fashion (3) I Western dress and the development of the fashion system from an historical perspective from ancient to modern periods; special emphasis on twentieth century dress. P. Hist. 101, 102; or 6 units of Hist. 250a-250b-250c or 6 units of Ar.H. 117, 118, or T.A. 144a-144b.

376. Consumer Problems (3) I The buyer-seller relationship, with emphasis on consumer problems, the consumer movement, and business and consumer rights and responsibilities.

386. Consumer Protection (3) I II Study and application of principles of consumer protection among consumers, businesses, and government agencies.

393. Internship
b. Merchandising and Consumer Studies (1) I II Open to majors only.

411. Consumer Fraud in Nutrition (3) S (Identical with N.F.S. 411)

434. The Fashion Industry (3) II Operations of the wholesale to retail channel, and development of retail strategy by different types of retail outlets. P. 304, Mktg. 361. May be convened with 534.


444. Dimensions of Clothing Behavior (3) I Analysis of psychological, social, cultural, historical, economic and aesthetic dimensions of clothing reported in literature. P. 325, Soc. 101, Psyc. 101, Econ. 201a. May be convened with 544.

445. Clothing for Special Needs (3) S Clothing and accessories for special needs; based upon research. P. 9 units of Individuals, Societies and Institutions courses. (Identical with Gero. 445) May be convened with 545.

446. Consumer Economics (3) I I Study and application of consumer economics under existing market conditions. P. Econ. 201a. (Identical with A.Ec. 446) May be convened with 546.


493. Internship
b. Merchandising and Consumer Studies (1 to 12) [Rpt. 1] I II Open to majors only.

495. Colloquium
b. Senior Report (1) I II P. Engl. 307 Writing-Emphasis Course* *Writing-Emphasis Courses. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

534. The Fashion Industry (3) I For a description of course topics, see 434. Graduate-level requirements include testing on additional references on appropriate topics and completion of three projects. P. 304, Mktg. 361. May be convened with 434.

540. Consumer Concepts and Theory (3) I For a description of course topics, see 440. Graduate-level requirements include reading and developing weekly briefs of research articles on consumer behavior for presentations in class, tests on supplementary readings, and a term paper 10 pages longer and including 20 additional academic references than those required of undergraduates. May be convened with 440.

544. Dimensions of Clothing Behavior (3) II For a description of course topics, see 444. Graduate-level requirements include an expanded research paper of journal review length and format. P. 325, Soc. 101, Psyc. 101, Econ. 201a. May be convened with 444.

545. Clothing for Special Needs (3) S For a description of course topics, see 445.
335. Interior Furnishings Industry (3) I Patterns of production and distribution in the interior furnishings industry, the market area, and in merchandising techniques. P, 275, Art 101.

345. Interior Perspective (3) S Application of various one-point perspectives in interior design. Use of techniques such as pencil, ink, color pencils and markers applied to interior perspective for presentation as well as use of sketches and furniture perspectives. P, 265 or drafting course. P, 285.

355. History of Design (3) I Period styles in interiors and furniture, ancient to the 20th century. P, 6 units of art history. Hist. 101, 102 or 8 units of Hum. 250a-250b-250c. Writing Emphasis Course*

365. Housing (3) II Human needs in housing; housing structure; and construction practices. Field trips. P, junior standing.

375. Private Space Design (4) II Design of residential environments for individual or family use applying knowledge of interior materials, furnishings, and human factors. P, 335, 355.

385. Computer Aided Drafting (3) II Introduction to the basic concepts of computer graphics and the basic set-up and operation of a computer graphics system. Assignments, design problems, and final interior design project included. 1R. 45. For majors only. P, 265, M.S. 111.

405. Barrier Free Design (3) II Current research in architecture, interior design, product design, physical therapy, behavioral science, and rehabilitation reviewed, and applied in design problem-solving. P, 9 units of Individuals, Societies and Institutions courses. May be convened with 505.

455. Visual Merchandising and Display (3) S All aspects of displaying merchandise, including window display, interior display, color and lighting techniques, line and composition, three-dimensional presentation, fixtures and systems, planning and layout, scheduling and promotion. P, 115 or Art 101. May be convened with 555.

475. Public Space Design (4) I Studio project with specific focus on interior environments designated for public usage. Includes programming, design development, project documentation and organization, working drawings and presentation techniques. P, 375, 385. May be convened with 575.

485. Ethics and Practice for Interior Design (3) I For a description of course topics, see 485. Graduate-level requirements include an in-depth research study of local dealerships and designers’ studies relative to major products available, discount structure offered, and design fees. An evaluation of three manufacturers’ similar products is also required. P, 375. May be convened with 485.

588. Advanced Public Space Design (4) II For a description of course topics, see 488. Graduate-level requirements include applications of current researched information to an actual design project and client. P, 575. May be convened with 488.

Division of Educational and Professional Studies

B. Newlon, Division Chairperson

The Division of Educational and Professional Studies provides undergraduate instructional programs for home economics education, including secondary education and family life education. Graduate instructional programs are provided in counseling and guidance and home economics education.

Home Economics Education (HEE)

The program area of home economics education provides instructional programs for home economics education, including secondary education and family life education tracks; and general home economics. Opportunities for field experiences are provided in all programs.

The major in home economics education prepares students to develop and implement educational programs in home economics and leads to certification for teaching in public schools. Candidates for admission to undergraduate programs in education, family life education track, and home economics education must present evidence of having completed 58 units of work applicable to the Bachelor of Science in Family and Consumer Resources degree. All majors must pass the writing proficiency exam or complete remedial work prior to enrolling in 300- and 400-level Home Economics Education and College of Education courses.

With a major in home economics education: Majors must have a minimum grade-point average of 2.5, pass the PPST, and complete five general education study areas, as described in the College of Agriculture section of this cata-
log (see school advising sheets for specific requirements for study areas); as well as completing Eng. 101 or 103H; 102 or 104H; H.E.E. 428, plus 3 additional communications units; Math. 117/1S; 3 units of computer skills from an approved list. Major requirements include: F.C.R. 125; Ed. P. 310; Educ. 350; L.R.C. 435; H.E.E. 288, 338g; 609, 489; F.S. 116, 117, 119, 123, 237, 337, 347, 356, 357, 416; F.S. 377 or Ed.p. 402; M.C.S. 114, 284; I.D. 115 or 388, 365; S.E.R. elective, and N.F.S. 101.

The major in home economics education (family life education track) prepares students for work in schools, communities, businesses, and other health or social service agencies as family life or parent educators. Students in the program acquire knowledge from the basic social sciences, child development, family social science, home economics education and related areas which are particularly relevant to family life and parent education. Using the NCFR Family Life Education Certification guidelines, this track will meet the criteria necessary for certification once a student has completed two years of work experience following graduation. The students are responsible for applying for this certification.

The major in home economics education (family life education track): Majors must complete five general education study areas, as described in the College of Agriculture section of this catalog (see school advising sheets for specific requirements for study areas); as well as completing Eng. 101 or 103H; 102 or 104H; 6 units of communications from an approved list; Math. 117/1S; and a computer skills course from the approved course list. Major requirements include: F.C.R. 125; F.S. 116, 117, 223; H.E.E. 288; Ed.P. 300; F.S. 137, 337, 357, 377; H.E.E. 408, 428, 493, 499; F.S. 416, 436; Coun. 403; H.E.E. 338g; Soc. 321; Hihh. 330, 434; M.A.P. 348, 463.

The major in general home economics was under review at the time of catalog production. Prospective students should consult the School of Family and Consumer Resources for information regarding the status of this degree program.

288. Observation/Participation in Home Economics and Family Life Education (2) I 1992-93 Functions of home economics educators in school- and community-based programs; characteristics of home economics programs; structuring learning settings to meet student/client needs. 1R, 3L.

338g. Teaching Home Economics (4) I (Identical with T.T.E. 338g) Writing-Emphasis Course* 

*Writing-Emphasis Courses. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).


428. Professional Presentations and Techniques (3) I Theory and practice of educational techniques in non-formal settings in positions in business, government and human services. 3L. May be convened with 528.

439. Non-Formal Education (3) II (Identical with A.Ed. 439) May be convened with 539.

489. Supervised Teaching in Home Economics (1 to 8) II Teaching vocational home economics under supervision in approved programs in secondary schools in Arizona. Pre-registration first semester of the junior year. P. T.T.E. 338g; CR, H.E.E. 408.

493. Internship e. Supervised Work Experience in Home Economics (1 to 6) [Rpt./2] II Open to home economics education majors only.

509. Occupational Home Economics Programs (3) I 1991-92 For a description of course topics, see 409. Graduate-level requirements include developing two evaluation instruments (one affective and one psychomotor) and developing two sets of teaching materials, e.g., job training manual. P, CR, T.T.E. 338g. May be convened with 409.

528. Professional Presentations and Techniques (3) I For a description of course topics, see 428. Graduate-level requirements include a paper and a 30- to 45-minute presentation on a topic from the outline. In addition, graduate students must design an educational program tailored to their interest. May be convened with 428.

538. Extension Education (3) I (Identical with A.Ed. 538)

539. Non-Formal Education (3) II (Identical with A.Ed. 539) May be convened with 439.

597. Workshop c. Extension Credibility and Accountability (1-2) [Rpt./2] (Identical with A.Ed. 597g, which is home)

d. Administration, Management, and Supervision of Cooperative Extension (1-2) [Rpt./2] (Identical with A.Ed. 597d, which is home)

g. Microcomputers-Extension (1-2) [Rpt./2] (Identical with A.Ed. 597g, which is home)

h. Family Development through Home Economics Programs (1-2)

i. Video Communications and Methods (1-2) [Rpt./2] (Identical with A.Ed. 597f, which is home)

m. Personal Effectiveness: The Human Factor (1-2) II (Identical with A.Ed. 597m, which is home)

n. Public Policy Issues (1-2) II (Identical with A.Ed. 597n, which is home)

r. Public Relations in Extension (1-2) [Rpt./2] (Identical with A.Ed. 597r, which is home)

e. Local Government and Extension: A Working Partnership (1-2) II (Identical with A.Ed. 597l, which is home)

l. Professional Improvement in Extension (1-3) [Rpt./3] II (Identical with A.Ed. 597l, which is home)

u. Evaluation in Extension Education (1-3) I (Identical with A.Ed. 597u, which is home)

v. Volunteer Staff Development in Extension (1-2) I (Identical with A.Ed. 597v)

w. Administration of Extension Programs (1-3) I (Identical with A.Ed. 597w, which is home)

*Offered only through the Cooperative Extension Service Winter School.

607. Topics in Home Economics Education (1-3) [Rpt./12 units] II S Philosophy, content, and resources for understanding, teaching, and working in home economics education.


610. Investigation and Studies in Home Economics (3) I Study and analysis of research literature, methods, techniques, and procedures for conducting investigations, selecting and developing plans for research problems.

618. Evaluation in Home Economics Education (3) II 1992-93 Application of theory to the selection and construction of evaluation instruments, their use and interpretation in home economics programs.


Counseling and Guidance (COUN)

The program area of counseling and guidance offers professional preparation in community and mental health counseling. The Master of Arts degree with a major in counseling and guidance is available through the program area. For admission and degree requirements, please see the Graduate Catalog.

401. Basic Skills in Counseling (3) S Selected counseling skills and their applications to noncounseling settings. Designed for nonmajors needing basic skills in counseling as an adjunct to other primary occupational functions. P. 6 units of social science.

403. Principles of Adlerian Psychology (3) S Techniques for the study of human behavior: implications for improving adult-child relationships, with emphasis on Adlerian principles. P. 6 units of social science. May be convened with 503.

421. Techniques of Interviewing (3) I II S Types and functions, process, and application of the interview in various settings. P. 6 units of social science.

503. Principles of Adlerian Psychology (3) I S For a description of course topics, see 403. Graduate-level requirements include an additional research paper dealing with a theoretical aspect of Adlerian psychology. May be convened with 403.

550. Counseling and Human Sexuality S Sexual function, dysfunction, and disorders in context of individual and couple; interview techniques and intervention strategies. P. 6 units of counseling or related area.
555. Addictions Counseling (3) S An analysis of issues in addictions counseling ranging from various theoretical positions, information regarding diagnosis of addictive personality, treatment programs, and research. P. 6 units of counseling or related area.

557. Methods in Marital Therapy (3) I (Identical with F.S. 557)

570. Counseling the Adult (3) I Adult crisis, midlife changes and developmental patterns; counseling techniques and intervention strategies. P. 6 units of counseling or related area.

571. Counseling Women (3) II Examination of the counseling needs of contemporary women and current types of intervention designed to meet these needs. P. 6 units of counseling or related area. (Identical with W.S. 571)

597. Workshop
   c. Self-Management Techniques (3) S P. 6 units of counseling or related area.
   j. Anger, Depression and Guilt (3) S P. 6 units of counseling or related area.
   k. Family Systems and Psychodrama (3) S P. 6 units of counseling or related area.

601. Foundations of Counseling (3) I Relationship and contributions of various fields to the work of the counselor at all levels, in current counseling techniques and intervention strategies; midlife changes and developmental patterns; counseling the adult.

645. Theories of Counseling (3) I Introduction to theories of counseling; collation and interpretation of counseling data; the counseling process; study of cases. P. 601, 622.

646. Counseling Process (3) II Introduction to theories of counseling; collation and interpretation of counseling data; the counseling process; study of cases. P. 601, 622.

647. Career Counseling (3) I Theories of vocational development; types, sources, and use of occupational and educational information in counseling and decision making. P. 601 or CR.

648. The Counseling Process (3) II Introduction to theories of counseling; collation and interpretation of counseling data; the counseling process; study of cases. P. 601, 622.

649. Theories of Counseling (3) II Rational, development, and research underlying major counseling theories. P. 631, 644.

657. Premarriage and Marriage Counseling (3) I Contemporary issues, concepts, and procedures in premarriage and marriage counseling. P. 622.

658. Procedures in Family Counseling (1 to 3) II Theory and process in family counseling; problem solving techniques applied to parent-child conflict; lab. experience. P. 403.


672. Cross-Cultural Counseling (3) II Issues, research and procedures involved in counseling with culturally different persons. Open to majors only. P. 601, 622.

683. Group Counseling (3) I Theory and process in group counseling; applications in community and mental health settings; lab. experience. P. 644.

696. Seminar
e. Ethics and Professional Practice (3) I Open to majors only. P. 601, 622, 644.
   r. Issues in Counseling Research (3) I Open to majors only. P. 601, 622, and 623 or 631.

Division of Family Studies (FS)

T. Jacob, Division Chairperson

The program area of family studies focuses on generation and dissemination of basic and applied knowledge concerned with human development and family relations throughout the life span. Students may elect courses in consultation with faculty members to reflect an emphasis in one of the following areas: human development, interpersonal relations, and family financial counseling.

The major in family studies: Majors must complete five general education study areas as described in the College of Agriculture section of the catalog (see school advising sheets for specific requirements for study areas); as well as completing Engl. 101 or 102, 104 or 104H; Engl. 308; Comm. 100 and 102 or 104; Math. 117R/S; M.I.S. 111. All majors must satisfy a common set of core courses: F.S. 116, 117, 116a, 357, 357 or 407 or 413; Psys. 225 and 255; in addition to the required core, the student must complete specific courses required of each concentration: human development: F.S. 223, 377, 407, 447, 457; N.F.S. 101; Psys. 214, 216, 265, 415; interpersonal relations: F.S. 416a, 427, 457, 487; F.S. 416b or 436 or 466; Comm. 104 and 107; Soc. 321; Psys. 300; Anth. 200 or 308 or 312 or 402 or 403 or 419; family financial counseling: F.S. 356, 416a-416b, 436, 466, 476, 495a, Fin. 221 and 225, M.A.P. 348, Coun. 401. A minimum of 12 upper-division units should be chosen from the following areas: anthropology, education, family studies, counseling and guidance, family and consumer resources, psychology, management and policy (M.A.P. 360, 365, 411, 426, 457), sociology, and finance.

116. Family Resource Management (3) I Principles of management as applied to families and individuals with special emphasis on management of money and time.

117. Human Development and Relations (3) I II Behavioral science approach to human development through the life span.

118. Interpersonal Relations in Marriage and the Family (3) I II Behavioral science approach to family development through the life span.

122. Child Development (3) I II Development, socialization and the child within the family setting, from conception to the middle school years; observations of infants and preschoolers. P. Psys. 101.

243. Sociology of Adult Life (3) I (Identical with Soc. 243)

247. Family Relations (3) I II The modern family and its relationships with emphasis on marriage and interpersonal relationships. P. 137.

347. Child Development in Group Settings (3) I Laboratory experience with young children. Supervised experience with 3-5-year-old children in a group setting; interactions, observations, discussions. P. CR, 223.


377. Adolescence (3) I Growth, development and socialization of the child from the middle school years through adolescence. P. 117, Psys. 101.


413. Issues in Aging (3) I 1992-93 Introduction to gerontology, with emphasis upon contemporary issues. May be convened with 513.


422. Problems in Marriage and the Family (3) I II Identification and analysis of major problem areas in marriage and the family, including economic, sexual, role conflict, emotional disorders, and childrearing. P. 137.

436. Economics of Aging (3) I II Economic issues as they affect the aging individual, family and society; economic demographics, consumer problems, and retirement financial planning. (Identical with Soc. 456) May be convened with 536.

447. Advanced Child Development (3) I In-depth examination of various dimensions of human growth and development P. 223; 6 units of psych. May be convened with 547. Writing-Emphasis Course.

457. Bio-Social Determinants of Socialization (3) II Bio-social factors, including genetic influences, related to human development, socialization, and cross-cultural patterns of behavior. P. 223; 6 units of child dev. or soc. or psych. (Identical with Soc. 457) Writing-Emphasis Course.

466. Family Economics (3) I Analysis of the family as an economic-decision-making unit within the larger economic system. P. Econ. 201b. May be convened with 566.

476. Family Financial Counseling (3) I 1992-93 Counseling techniques used when assisting families with financial management and over-indebtedness are addressed. Open to majors only. P. 416a, Coun. 401.

477. Genetic Basis of Normal and Deviant Traits (3) II Explores methods of studying genetic influences on human traits and summarizes research findings on normal traits, such as sociability and IQ, and on deviant traits such as criminality. Implications for the fields of family studies, sociology, and psychology are considered. May be convened with 577.

487. Advanced Family Relations (3) II Critical analysis of selected studies and current research in family relations. P. 337, or Soc. 321. May be convened with 587.
507a-507b. Research Methods in Family Studies (3-3) 507a: I Design issues of general relevance to behavioral research. 507b: I Design issues of particular relevance to family and developmental research. Both 507a and 507b are offered in the fall semester only.

513. Issues in Aging (3) II 1992-93 For a description of course topics, see 413. Graduate-level requirements include additional readings and a written research proposal. (Identical with Gero. 513) May be convened with 413.

536. Economics of Aging (3) II For a description of course topics, see 436. Graduate-level requirements include an in-depth term paper and a working bibliography. (Identical with Gero. 536) May be convened with 436.

537. Analysis of Family Studies (3) I An analysis of major research topics; critical resources relevant to graduate training; and ethical/professional issues related to the conduct of research.

547. Advanced Child Development (3) I For a description of course topics, see 447. Graduate-level requirements include additional assignments. P, 223; 6 units of psyc. May be convened with 447.

557. Methods in Marital Therapy (3) I Theories and principles of counseling for premarital, marital, and group counseling situations. (Identical with Coun. 557)

566. Family Economics (3) I For a description of course topics, see 466. Graduate-level requirements include extra required readings and an in-depth term paper. P, Econ. 201b. May be convened with 466.

567. Theories of Human Development (3) II Analysis of major paradigms and world views influencing the study of human development. Overview of key issues and controversies arising in the field as well as evaluations of specific theories and specific theorists.

573. Theories of the Family (3) II Major theories of the family to include theory construction, historical roots of family theories, and classic and contemporary family theories. P, 9 units of family studies, psychology or sociology.

577. Genetic Basis of Normal and Deviant Traits (3) II For a description of course topics, see 477. Graduate-level requirements include a research proposal or paper. May be convened with 477.

587. Advanced Family Relations (3) II For a description of course topics, see 487. Graduate-level requirements include extra required readings and an in-depth term paper. P, 337, or Soc. 321. May be convened with 487.

607. Topics in Family Studies (1 to 3) [Rpt.] I II Variable content: cognitive development, bi-
484. Development of New Venture Plans (4) [Identical with M.A.P. 484]

"Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.

511. Managerial Finance (3) II Integration of the basic principles and underlying theory of finance, with emphasis on analytical financial management of business firms and other organizations. Students with credit in 412 should take 512. Open only to students admitted to a BPA graduate program. P, Acct. 550.

521. Advanced Corporation Finance (3) II Financial theory applied to corporate structure; investment decisions; corporate valuation; and corporate financial policies. P, 412 or 511.


528. Finance for New Ventures (3) I Value maximization; simulation of value distribution; sources of venture capital; timing of initial public offering; new venture ownership structuring. Open only to students in the entrepreneurship program. P, 511, Econ. 500a-500b, Mktg. 500. (Identical with M.A.P. 537)

539. Planning of New Ventures (3) I (Identical with M.A.P. 539)

559. Information and Financial Decision Support for Investment Planning (3) II (Identical with Acct. 559)


655. Colloquium
a. Research and Finance (1-3) [Rpt.4] I II

696. Seminar
a. Investments (3) [Rpt.1] I II
b. Financial Markets (3) [Rpt.1] I II
c. Corporation Finance (3) [Rpt.1] I II
d. Financial Institutions (3) I II
e. Financial Theory (3) [Rpt.1] I II
f. Research Methods (3) [Rpt.] I II

Fine Arts (FA)

Music Building, Room 111
(602) 621-1301

The following courses in the Faculty of Fine Arts, College of Arts and Sciences, are interdepartmental in subject matter and in instruction. Therefore, they are offered by the Faculty of Fine Arts rather than by a specific department. They are crosslisted in Fine Arts departments, when appropriate. These courses are taught by faculty in the Faculty of Fine Arts.

207. Western Civilization and the Arts: The Twentieth Century (3) I The arts as an interdisciplinary framework of human heritage from which connections are made to contemporary issues in ethics, philosophy, science, law, and politics. (Identical with Ar.H. 307, Dnc. 307, Mus. 307, T.Ar. 307)

208. Western Civilization and the Arts: Baroque Through Nineteenth Century (3) I The arts as an interdisciplinary framework of human heritage from which connections are made to historical issues in ethics, philosophy, science, law, and politics. (Identical with Ar.H. 317, Dnc. 317, Mus. 317, T.Ar. 317)

397. Workshop
a. Writing and the Arts (3) I II (Identical with T.Ar. 397a, which is home)

Food Science
(See Nutrition and Food Science)

Foundations of Education
(See Education)

French and Italian (FRE/ITA)

Modern Languages Building,
Room 549
(602) 621-7349

Professors Jonathan Beck, Head, Guido Capponi (Emeritus), Frank M. Chambers (Emeritus), Jean-Jacques Demorest (Emeritus), Monique Wittig
Associate Professors Robert Artew, Edward G. Brown, Ingeborg M. Kohn, Henri Servin, Gianni Speca, Ronnie H. Terpening
Assistant Professors Irene D'Almeida, Lise Leibacher
Lecturers Gerard Agnieran, John L. Gesell, Jean Goetinck, Annamaria Kelly (Emerita) Instructors Brunella Bigi

The Department of French and Italian offers language instruction at the elementary, inter-mediate, and advanced levels. In addition, courses (taught in their respective languages) are offered in the literature and culture of France and of Italy and in business French. Study abroad options include programs in Florence and in Paris.

Undergraduate majors in French or Italian attain a command of the language and a knowledge of the culture that can prepare them to teach at the secondary level or to undertake postgraduate studies in French or Italian, or to pursue careers in international business or in the foreign service. Departmental majors selecting the latter option may combine language study with a thematic business minor in the College of Business and Public Administration, concentrating in general business, management, or marketing. This option provides a solid foundation of marketable skills for careers in international business and finance, communications and technology, government and administration.

Degree Programs: Bachelor of Arts with a major in French (concentrations in French literature and culture, or in business French); Bachelor of Arts with a major in Italian; Bachelor of Arts in Education with a teaching major in French; Master of Arts with a major in French; Master of Education with a teaching major in French; and Doctor of Philosophy with a major in French. An option at the M.A. level is the program in Francophone studies, focusing on the cultural originality and vitality of French-speaking areas outside of France (Quebec, Belgium, North Africa, Black Africa, West Indies). A doctoral minor is offered in French. A graduate-level area of emphasis is available in Francophone literature. Interdisciplinary doctoral minors are available in conjunction with the programs in comparative literature and literary theory and in second language acquisition and teaching.

Writing-Emphasis Courses: Because writing in all upper-division courses is in the language of instruction (French or Italian), the requirement will be satisfied through completion of at least one 3-unit course designated as a Writing-Emphasis Course within the department (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). Consult an undergraduate advisor.

The department participates in the honors program and offers honors sections of selected courses. Inquire with the departmental honors advisor.

French (FRE)

Unless otherwise indicated, all courses are taught in French. For purposes of appropriate placement, enrollment in all language courses is subject to the consent of the instructor. Under certain circumstances, students majoring in French may substitute 355 (Paris program) for 375a.

Literature major: 36 units past the 201 level, including 350, 375a-375b, three 400-level survey courses, including 401, 402, and 403, and two additional electives from the 400 level, one of which must be a course in literature or creative writing. No fewer than 24 units must be upper-division course work. The minor subject will be chosen in consultation with the major advisor.
Translation. Does not count toward fulfillment of language requirement, or the major or minor in French. Taught in English.

285. Introduction to Humanities Computing (3) S (Identical with Ger. 285)

305a-305b. Composition and Conversation (3-3) Designed for students who wish to write and speak fluently in everyday idiom; material based on practical current topics. P, 202. Both 305a and 305b are offered each semester.


355. Intensive Composition and Conversation (3) S For students at advanced and high intermediate levels. Materials for discussion and writing exercises are derived from current activities in Paris (films, plays, and other cultural events). Offered in Paris program only. P, 202 or two years of college French.


375a-375b. Advanced Composition and Conversation (3-3) Practice in formal writing and formal oral communication. P, 305b. Both 375a and 375b are offered each semester.

396H. Honors Proseminar (3) (Identical with W.S. 396H)

401. French Literature of the 19th and 20th Centuries (3) Survey of French literature of the period with focus on main literary genres and intellectual currents since Romanticism. P, 350.

402. French Literature of the 17th and 18th Centuries (3) Survey of French literature of the period with focus on major authors; textual analysis and discussion of historical, social, and cultural background. P, 350.


414. Teaching of Modern Languages (3) II (Identical with T.T.E. 414) May be convened with 514.


416. Translation (3) II Theory and practice of translation (French/English; English/French). Literary and technical. P, 375b or 370b.

422. Introduction to Romance Philology (3) I 1992-93 (Identical with Span. 422) May be convened with 522.

425. Paris: Capsule/Capital of French Cultural History (3) S The cultural history of France surveyed through selected works of literature, art, and architecture. Readings and discussions, in conjunction with faculty-guided visits to historical sites in Paris. Offered in Paris program only. P, 202 or two years of college French.

430a-430b. French Civilization (3-3) Historical, social, economic, literary, and artistic elements in the development of the French nation. 430a is not prerequisite to 430b. P, 202.


452. French Literature of Quebec (3) II 1992-93 Comprehensive study of the most significant literary expression in Quebec. P, 350 May be convened with 552.


454. Francophone Literature of the Maghreb and Lebanon (3) II 1992-93 Francophone literature of Algeria, Lebanon, Morocco and Tunisia. P, 305b if taught in French. May be convened with 554.

470. Advanced Grammar and Usage (3) II Structural analysis of spoken and written French, with emphasis on structural patterns and attention to contrasts with English. P, 202.

485. Linguistic and Computer-assisted Approaches to Literature (3) I (Rpt.6 units) II (Identical with Ger. 485) May be convened with 585.

500. Intensive Reading Course for Graduate Nonmajors (3 hrs/wk., no credit) I Rapid acquisition of reading proficiency in French. No prior knowledge of the language necessary. Proficiency certification obtained from this course fulfills graduate foreign language requirement in some departments (consult department for information).

510. Introduction to Graduate Study in French Language and Literature (3) I 1991-92 Problems and methods of advanced research in French language and literature. Use of specialized library resources and computerized data bases. Issues in the history, sociology, and politics of the professional practice of language and literature study in American universities.


514. Teaching of Modern Languages (3) II (Identical with T.T.E. 514) May be convened with 514.

515a-515b. Literature of the 20th Century (3-3) 1992-93 515a: Novel. 515b: Poetry and drama. 515a is not prerequisite to 515b.

516a-516b. Literature of the 19th Century (3-3) 1992-93 516a: Poetry and theatre. 516b: Novel and short story; intellectual current. 516a is not prerequisite to 516b.

517a-517b. Literature of the 18th Century (3-3) 1991-92 Study of ideas in the French Enlightenment. 517a: Rationalist currents. 517b: Sensibility. 517a is not prerequisite to 517b.

518a-518b. Literature of the 17th Century (3-3) 1992-93 518a: Literature and culture in the first half of the 17th century. 518b: The Classical ideal. 518a is not prerequisite to 518b.
519a-519b. Literature of the 16th Century (3-3) 1991-92 519a: Early Renaissance, Reformation, Rabelais, the Pleiad. 519b: The Humanists, Montaigne, D'Aubigné, the drama. 519b is not prerequisite to 519a.


522. Introduction to Romance Philology (3) I (Identical with Span. 522) May be convened with 422.

550a-550b. French Literature of Black Africa and the West Indies (3-3) 1991-92 For a description of course topics, see 450a-450b. Graduate-level requirements include more demanding readings and other assignments. May be convened with 450a-450b.

552. French Literature of Quebec (3) II 1992-93 For a description of course topics, see 452. Graduate-level requirements include more demanding readings and assignments. P. 350. May be convened with 452.

553. Culture and Civilization of North Africa (3) I 1992-93 For a description of course topics, see 453. Graduate-level requirements include more demanding readings and other assignments. P. 350b if taught in French. May be convened with 453.

554. Francophone Literature of the Maghreb and Lebanon (3) II 1992-93 For a description of course topics, see 454. Graduate-level requirements include more demanding readings and other assignments. P. 350b if taught in French. May be convened with 454.

579. Problems in Teaching College French (1 to 3) I II Methodology course in lower-division college pedagogy. Discussion of broader issues of language, pedagogy, academia, the history of foreign language education, college teaching as a career.

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt.] II (Identical with Ger. 585) May be convened with 485.

696. Seminar
a. French Linguistics (3) [Rpt.] I II
b. Foreign Language Pedagogy (3) [Rpt.] I II
c. French Literature: General Topics (3) [Rpt.] I II
d. Old French Literature (3) [Rpt.] I II
e. Sixteenth Century (3) [Rpt.] I II
f. Seventeenth Century (3) [Rpt.] I II
g. Eighteenth Century (3) [Rpt.] I II
h. Nineteenth Century (3) [Rpt.] I II
l. Twentieth Century (3) [Rpt.] I II
k. Francophone Literature and Culture (3) [Rpt.]

Note: *May be repeated for credit when content varies. Consult department for current topics.

Italian (ITA)

The major: 30 units (in addition to 101 and 102), including 305a-305b, 400a-400b, and/or 405a-405b, and 6 additional units of literature courses in the 400 series. No fewer than 22 units must be upper-division course work.

The minor: 20 units (in addition to 101 and 102), including 305a-305b or 405a-405b (for students who require additional fluency), and 400a-400b.

Students with teaching minors are required to complete a course in the methodology of foreign-language teaching used in high school and/or junior college.

101. Elementary Italian I (4) I II S CDT Listening, speaking, reading, and writing; and introduction to the basic structures and vocabulary of Italian. (Does not count toward the Italian major or minor) Also see 102z.

102. Elementary Italian II (4) I II CDT Listening, speaking, reading and writing; an introduction to the basic structures and vocabulary of Italian, continuation. P. 101 or placement. (Does not count toward the Italian major or minor). Offered each semester. Also see 102z.

102z. Intensive Elementary Italian (4) I P, language major or demonstrated language proficiency. Corresponds to 101 and 102.

201. Intermediate Italian I (4) I II CDT Continued skill development; reinforcement of basic language skills. P. 102 or placement. Also see 202z.

202. Intermediate Italian II (4) I II CDT Continued skill development; reinforcement of basic language skills. P. 201 or placement. Also see 2022.

222. Intensive Intermediate Italian (4) II P, language major or demonstrated language proficiency. Corresponds to 201 and 202.

283. The Renaissance: Italian Literature in Translation (3) I Detailed study of representative masterpieces of Italian literature of the Middle Ages. Does not count toward fulfillment of language requirement for the major or the minor in Italian. Taught in English.

283. The Renaissance: Italian Literature in Translation (3) II Detailed study of representative masterpieces of Italian literature of the Renaissance. Does not count toward fulfillment of the language requirement for the major or the minor in Italian. Taught in English.

305a-305b. Composition and Conversation (3-3) GRD Emphasis on improving listening, comprehension, speaking, and writing. P. 202 or consult department before enrolling.

400a-400b. Main Currents of Italian Literature (3-3) 400a: The Middle Ages and Renaissance. 400b: The 17th through 20th centuries. P. 202 or consult department before enrolling.


414. Teaching of Modern Languages (3) I (Identical with T.T.E. 414)

420. Italian Civilization (3) S Historical, geographical, social, and artistic aspects of the development of the culture of Italy. Offered only in Florence, Italy. P. 202.

422. Introduction to Romance Philology (3) I 1992-93 (Identical with Span. 422)

450. Renaissance Studies (4) S Taught in English. On-site study of the birth and development of the Italian Renaissance with emphasis on Florence. Offered only in Florence, Italy.

502. Dante (3) I 1991-92 For a description of course topics, see 402. Graduate-level requirements include more demanding readings and other assignments. P. 202. May be convened with 402.

504. The Renaissance (3) II 1992-93 For a description of course topics, see 404. Graduate-level requirements include more demanding readings and other assignments. P. 202. May be convened with 404.

506a-506b. The Novel: Ottocento and Novecento (3-3) 1992-93 For a description of course topics, see 406a-406b. Graduate-level requirements include more demanding readings and other assignments. May be convened with 406a-406b.

696. Seminar
a. Italian Literature (3) [Rpt.] I II

General Literature

(See Ecology and Evolutionary Biology)

General Business Administration

(See College of Business and Public Administration)

Genetics (GENE)

Biosciences West Building, Room 114
(602) 621-1784

Committee on Genetics (Graduate)

Professors Margaret G. Kidwell, Chair, (Ecology and Evolutionary Biology), Harris Bernstein (Microbiology and Immunology), Robert P. Erickson (Pediatrics), William B. Heed (Ecology and Evolutionary Biology), Conrad Istok (Ecology and Evolutionary Biology), Brian A. Larks (Plant Sciences), Robert G. McDaniel (Plant Sciences), Neil H. Mendelsson (Molecular and Cellular Biology), Richard E. Michod (Ecology and Evolutionary Biology), David W. Mount (Molecular and Cellular Biology), David C. Rowe (Family and Consumer Resources), Nobuyoshi Shimizu (Molecular and Cellular Biology), Hans VanEtten (Plant Pathology), Samuel Ward (Molecular and Cellular Biology)

Associate Professors Danny Brower (Molecular and Cellular Biology), Suzanne Cassidy (Pediatrics), Sue K. DeNise (Animal Sciences), Jennifer D. Hall (Molecular and Cellular Biology), Tim Helentjaris (Plant
Geneticists from various departments comprise the interdepartmental Committee on Genetics, which offers programs leading to the Master of Science and Doctor of Philosophy degrees with a major in genetics. For admission and degree requirements, please see the Graduate Catalog.

413. Principles of Animal Breeding (3) II (Identical with An.S. 413)


415. Somatic Cell and Molecular Genetics (3) II (Identical with M.C.B. 415) May be convened with 515.

423. Cytogenetics (3) II (Identical with Ecol. 423) May be convened with 523.

428R. Advanced Microbial Genetics (3) II (Identical with M.C.B. 428R) May be convened with 528R.

433. Human Genetics (3) I (Genetic theory and technique, as applied to man; methods of analysis of genetically determined cytological and biochemical differences in individuals and populations. 3L, P, Ecol. 320 or 321. (Identical with Ecol. 433)) May be convened with 533. Ward

435. Evolution (3) I (Identical with Ecol. 435) May be convened with 535.

473. Recombinant DNA Methods and Applications (4) II (Identical with M.C.B. 473)


515. Somatic Cell and Molecular Genetics (3) II (Identical with M.C.B. 515) May be convened with 515.

520. History of Genetics (1) I 1992-93 Experiments and discoveries which have led to the present state of knowledge in the various areas of genetics. P, Ecol. 320 or 321.

523. Cytogenetics (3) II (Identical with Ecol. 523) May be convened with 423.

524. Theoretical Population Genetics (3) I (Identical with Ecol. 524)

525. Speciation (2) II (Identical with Ecol. 525)

528R. Advanced Microbial Genetics (3) II (Identical with M.C.B. 528R) May be convened with 428R.

533. Human Genetics (3) I For a description of course topics, see 433. Graduate-level requirements include an in-depth research paper on a current problem in human genetics. P, Ecol. 320 or 321. (Identical with Ecol. 533) May be convened with 433. Ward


539. Statistical Methods (4) I II (Identical with A.Ec. 539)

545. Concepts in Genetic Analysis (3) I (Identical with M.C.B. 545)

555. Molecular Mechanisms of Development (3) II 1992-93 (Identical with M.C.B. 555)

568. Nucleic Acids (4) I (Identical with Bioc. 568)

570. Molecular Genetics (3) I 1991-92 (Identical with Micr. 570)

571. Molecular Gene Cloning (3) II 1992-93 (Identical with Micr. 571)

574. Advances in Mammalian Genetics (2) (Rpt./II) 1992-93 (Identical with Bioc. 574)

589. Cancer Genetics and Cytogenetics (3) I 1991-92 (Identical with C.Bio. 589, which is home)

595. Colloquium a. Genetics (1) [Rpt.] I II


627. Advanced Genetics (3) I 1992-93 (Identical with P.S. 627)

635. Advanced Cytogenetics (4) II 1992-93 (Identical with P.S. 635)

638. Genetics of Plant Cell Cultures (2) I 1992-93 (Identical with P.S. 638)

666. Human Microevolution (3) II 1992-93 (Identical with Anth. 666)

670. Recent Advances in Genetics (2) II Recent advances in the field of genetics. (Identical with Ecol. 670)

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### Geography and Regional Development (GEOG)

Harvill Building, Room 454
(602) 621-1652


Curricula in geography and regional development are designed to contribute to general education; to provide a solid, substantive and methodological grounding in geography for those who plan to teach or pursue graduate work in the field; and to provide preparation for those persons desiring professional training and/or careers in such fields as urban and regional planning, land development, resource management, environmental policy-making, for-
110. Regional Land Use (3) I II Problems of regional environments in relation to the use and development of activities on the land. Emphasis on field study of actual land uses and introduction to the analysis and mapping of these using microcomputers. The relation of land use to taxation, zoning, and real estate transfer and development. (Identical with Ping. 110) Mann

151. World Regional Geography (3) I II Geographic concepts and information organized by conventional region and nation. Appropriate for elementary and secondary teaching.

171. Introduction to Meteorology and Climatology (3) I I (Identical with Atmo. 171) Saarinen

275. Metropolitan Tucson (3) I Physical and cultural bases of Tucson's geographic patterns, with emphasis on the city's site, situation, settlement patterns and problems of growth and change. Field trips. Saarinen

301. Introduction to Regional Planning (3) I II Introduction to the principles and techniques used for planning in metropolitan and rural regions. Field trips. Mann

305. Economic Geography (3) I II Analysis and modeling of the spatial structure of primary, secondary, and tertiary economic activities; location theory and regionalization in economic systems. Mulligan Writing-Emphasis Course*


357. Geographical Research Methods (3) I Formulation and solution of geographical problems; models, research design, and methods of gathering, analyzing, and portraying geographic data. 2R, 3L, P, 3 units of geography. Marston Writing-Emphasis Course*

359. Land Use and Growth Regulation (3) I I Land use analysis and fundamentals of zoning. Current planning, legal, and financial methods to regulate the rate of development, sequence of growth, and eventual size of cities, regions, and states. Practical application of methods. Field trips. (Identical with Ping. 359)

360. Environmental Perception (3) I Consideration of patterns in human perception in relation to modification of environment and environmental planning. Saarinen Writing-Emphasis Course*

371. Principles and Practices of Regional Development (3) I Introduction to basic concepts, objectives, practices and techniques of regional and industrial development as a professional activity, with emphasis on development problems and solutions. Field trips. Gibson Writing-Emphasis Course*

373. Political Geography (3) I II Explores links between global economic and political processes, national affairs and local politics. Designed to foster participation; assessment is via essays and assignments. Kirby Writing-Emphasis Course*

379. Urban Growth and Development (3) I II Location patterns in urban areas and processes of growth; historical development of U.S. cities, rent theory, housing markets, commercial and industrial location, the role of transport and planning. Student development teams create a model city using the ACRES real estate simulation game. Plane

381. Cartography (3) I Tools and techniques, properties and construction of projections, design and preparation of maps for publication. 2R, 3L. Altschul

407. The American Landscape (3) I II Origin and character of the visual aspects of places viewed individually and regionally; changes in habitat, vernacular structures and landscapes, townscapes, countrysides and special features. Field trips. (Identical with L.Ar. 407) May be convened with 507. Zube Writing-Emphasis Course*

408. Arizona and the Southwest (3) I The changing character of the land and man's occupation of it, with emphasis on Arizona; historical and problem oriented. Field trip. May be convened with 508. Writing-Emphasis Course*

409. Soviet Union (3) I II Physical, biological, and cultural elements of the contemporary Soviet state and their internal regionalization. Emphasis on human settlement, economy, and resource development. (Identical with R.S.S. 409) Reeves Writing-Emphasis Course*

411. Middle America (3) I II Land, man, and culture in the major natural and cultural regions of Mexico, Central America, and West Indies. (Identical with L.A.S. 411) May be convened with 511. Pederson Writing-Emphasis Course*

412. South America (3) I Physical and cultural bases of South America's geographic patterns, with emphasis on human settlement and problems of resource development. (Identical with L.A.S. 412) May be convened with 512. Pederson Writing-Emphasis Course*

413. Africa (3) I II Physical and human bases of regional contrasts, with emphasis on tropical environmental systems and changing patterns of regional urban development. Field trip. May be convened with 513. Altschul Writing-Emphasis Course*


416. Rural Area Development (3) I (Identical with A.Ec. 416) May be convened with 516.


535. Locational Analysis (3) I Industrial location theory and location factors, consumer travel behavior and market areas, geography of economic impacts, location of public facilities. (Identical with Ping. 453) May be convened with 553. Mulligan Writing-Emphasis Course*

456. The American City (3) I An integrated approach to the built environment with special emphasis on the historical, social, and political aspects of American urban development. (Identical with Ping. 456) Marston Writing-Emphasis Course*

457. Statistical Techniques in Geography, Regional Development and Planning (3) I Methods of gathering and analyzing data for the solution of geographical, urban, and regional planning problems, with emphasis on quantitative and statistical techniques used in spatial analysis and cartography, on the one hand, and program planning, on the other. (Identical with Ping 457) May be convened with 557.

461. Population and Resources (3) I II Estimation of present and potential world population; distribution and methods of conserving important resources. (Identical with H.W.R. 461, L.A.S. 461 and Ping. 461) Writing-Emphasis Course*

464. The Arid and Semiarid Lands (3) I Past, present and future of settlement and resource utilization in the world's arid lands; spatial interrelationships of environmental, demographic, socioeconomic and political systems. May be convened with 564. Bonine Writing-Emphasis Course*

465. Physical Aspects of Arid Lands (3) I The climate, landforms, hydrology, soils and vegetation of deserts, with special emphasis on land use processes and distribution at micro-to-macro scales. May be convened with 565. Altschul Writing-Emphasis Course*

469. Geography of the Middle East (3) I Physical environments and cultural areas of Southwest Asia, with emphasis on man-environment interrelationships, settlement systems, and impact of Islam. (Identical with N.E.S. 469) Bonine Writing-Emphasis Course*

471. Problems in Regional Development (3) I II Analysis of population growth trends, market areas, the role of transportation in development, regional specialization and economic structure, interregional migration, and regional policy issues. (Identical with A.Ec. 471 and Ping. 471) May be convened with 571. Writing-Emphasis Course*

476. Metropolitan Land Development (3) I (Rpt./1) I II A case-oriented approach to site selection, rezoning, financing, architectural design, economic feasibility, and other facets of the land development process. Field trip. Consult with department before repeating course. (Identical with Ping. 476) Mann

481. Computer Cartography (3) I I Introduction to the use of computers for map production, with emphasis on cartographic principles and practical experience with several user-oriented mapping programs. (Identical with Ping. 481) May be convened with 581.

483. Geographic Applications of Remote Sensing (3) I Use of aircraft and satellite imagery for monitoring landforms, soils, vegetation and land use, with the focus on problems of land-use planning, resource management and related topics. 2R, 3L. Field trip. P, two units of remote sensing or equivalent experience. (Identical with Ping. 483) May be convened with 583. Marsh

488. Governing Science and Technology (3) I II Historical, cross-cultural, and geographical assessment of strategies societies have deployed to govern science and technology; effects of particular strategies in terms of impacts (both positive and negative) of science
and technology on people, their lives, and the environment. (Identical with Anth. 488 and Pol. 488) Waterer Writing-Emphasis Course*

497. Workshop
a. Geography for Teachers (3) S May be convened with 597a.

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

500. Current Geographical Research (3) I Major trends and issues in human and physical geography. Kirby

507. The American Landscape (3) II For a description of course topics, see 407. Graduate-level requirements include the completion of an essay and annotated bibliography on the work of a specific scholar, place, or region. Field trips. (Identical with L.A.R. 507) May be convened with 407. Zube

508. Arizona and the Southwest (3) I For a description of course topics, see 408. Graduate-level requirements include the completion of an original research paper on an approved topic. Field trip. May be convened with 408.

510. Development of Regional Planning (3) I Survey of the historical development of the planning profession; the evolution of American planning as a response to urbanization. Open to majors only. Credit allowed for this course or 301, but not for both. (Identical with Ping. 510) Mann

511. Middle America (3) II For a description of course topics, see 411. Graduate-level requirements include three tutorial sessions and a research-review paper. (Identical with L.A.S. 511) May be convened with 411. Pederson

512. South America (3) I For a description of course topics, see 412. Graduate-level requirements include three tutorial sessions and a research-review paper. (Identical with L.A.S. 512) May be convened with 412. Pederson

513. Africa (3) II For a description of course topics, see 513. Graduate-level requirements include the completion and oral presentation of an original research paper on an approved topic. May be convened with 413. Aitchison

515. Introduction to Water Resources Policy (3) II (Identical with H.W.R. 515) May be convened with 415.

516. Rural Area Development (3) I (Identical with A.Ec. 516) May be convened with 416.

517. Introduction to Geographic Information Systems (3) II (Identical with R.N.R. 517) May be convened with 417.

544. Site Planning (2) I (Identical with Arch. 544) May be convened with 444.

550. Metropolitan and Regional Planning (3) I Survey and evaluation of concepts and examples, including metropolitan, economic development, state and national, and environmental plans in the U.S. and abroad. (Identical with Ping. 550) Mann

553. Locational Analysis (3) I For a description of course topics, see 453. Graduate-level requirements include the completion of an original research paper on an approved topic. (Identical with Ping. 553) May be convened with 453. Mulligan

555. Urban Systems Analysis (3) II Theoretical and applied analysis of urban growth models, gradients of urban influence, residential and facility decisions, and urban transportation. (Identical with Ping. 556) Marston

557. Statistical Techniques in Geography, Regional Development and Planning (3) I For a description of course topics, see 457. Graduate-level requirements include the completion of several data-intensive research projects. (Identical with Ping. 557) May be convened with 457.

561. Resource Management (3) I Examination and critical appraisal of social and behavioral science aspects of resource management, with special emphasis on factors affecting decision making. (Identical with Ping. 561) Saarinen

563. Perception of Environment (3) II Examination of interdisciplinary research on environmental perception; consideration of social and behavioral variables at all scales of environmental perception and planning. (Identical with Ping. 563) Saarinen

564. The Arid and Semiarid Lands (3) I For a description of course topics, see 464. Graduate-level requirements include the completion of an original research paper on an approved topic. May be convened with 464. Bonine

565. Physical Aspects of Arid Lands (3) II For a description of course topics, see 465. Graduate-level requirements include the completion of an oral presentation of an original research paper on an approved topic. May be convened with 465. Aitchison

567. Geographical Analysis of Population (3) II Population distribution and change; practical methods of demographic analysis, migration, business and planning applications. (Identical with Ping. 567) Plane

571. Problems in Regional Development (3) II For a description of course topics, see 471. Graduate-level requirements include the completion of an original research paper on an approved topic. (Identical with A.Ec. 571 and Ping. 571) May be convened with 471.

581. Computer Cartography (3) I For a description of course topics, see 481. Graduate-level requirements include the completion of a project report. (Identical with Ping. 581) May be convened with 481.

583. Geographic Applications of Remote Sensing (3) II For a description of course topics, see 483. Graduate-level requirements include the completion of a project report. Field trip. P, two units of remote sensing or equivalent experience. (Identical with Ping. 583) May be convened with 483. Marsh

596. Seminar
k. Risk and Society (3) I (Identical with Anth. 596k, Jour. 596k, H.W.R. 596k)
ui. Interdisciplinary Environment-Behavior-Design (3) II (Identical with Env. 596u, which is home)

597. Workshop
a. Geography for Teachers (3) S May be convened with 497a.

605. Planning Theories and Perspectives (3) I A critical examination of normative and methodological assumptions of alternative planning models, with emphasis on developing a perspective on contemporary planning issues. (Identical with Ping. 605) Mann

609. Policy Problems in Structure and Change (3) II (Identical with M.A.P. 609)

611. Projects in Regional Planning (1 to 5) [Rpt., 5 units] II Lectures, laboratory, and field projects covering various aspects of professional practice. P. 605, 24 units toward a graduate degree in planning. Field trips. (Identical with Ping. 611)

657. Spatial Analysis (3) II Formal analysis and modeling of spatial structures and processes; conceptual evaluation of point patterns, networks, surfaces and interaction. P. 457 or 557. (Identical with Ping. 657) Mulligan

659. Growth Controls (3) II Current legal and planning techniques to regulate the rate of growth, the sequence of growth, and the eventual total size of towns, regions, and states; concentration on case studies. (Identical with Ping. 659)

689. History of Geographic Thought (3) II History of geographic philosophy and methodology. P. 15 units of geography. Pederson

696. Seminar
a. Economic Geography (3) [Rpt./2] I
b. Cultural Geography (3) [Rpt./2] II
c. Physical Geography (3) [Rpt./2] II
d. Historical Geography (3) [Rpt./2] II

e. Area Study (3) [Rpt./3] I
f. Research Methods (3) [Rpt./2] II
g. Urban Geography (3) [Rpt./9] II

697. History of Geographic Thought (3) II History of geographic philosophy and methodology. P. 15 units of geography. Pederson

Geological Engineering
(See Mining and Geological Engineering)

Geology
(See Geosciences)

Geosciences (GEOS)
Gould-Simpson Building, Room 208
(602) 621-6024

424 or 432 or 434 or 469; Math. 124 or 125a, 209, 302, 321, 322, 412, 416, 420, and 419 or courses are required: Geos. 101, 102, 103, 104, the College of Arts and Sciences, the following concentration): In addition to the requirements of the College of Education for their junior and senior years. Courses required include: Astra. 110a or 100-101L, Atmo. 171, Geos. 101, 102, 103, 104, 10-12 additional units of geosciences courses selected from Geos. 225, 415, 450, 453 or 473 or other approved courses; a minor in chemistry or physics; general education requirements, including Math. 117R/S; and College of Education requirements to total 125 units.

A variety of geosciences minor options are available to students in other departments: earth resources, environmental geoscience, geoarchaeology, geochonmistry, geophysics, mineralogy, and paleontology. A split minor is also an option. An advisor in the student's field of interest will assist in selecting courses. The teaching minor requires 20 units of approved earth science courses, including Geos. 101, 102, 103, 104; Astr. 110a-110b, and Atmo. 171.

The department participates in the honors program.

101. Introduction to Geology I (3) Earth's materials; surface and interal costs processes; development of plate tectonics model. CR, 103.


105. Survey of the Solar System (4) II (Identical with Phy.S. 106)

110. Environmental Geology (3) I Introduction to geologic studies and their application to current environmental problems, their causes and possible solutions. Focuses on surface geologic processes and geohazards, natural resources, and global systems. Field trips. Primarily for nonmajors. Kresan/Schreiber

209. Introduction to Crystallography and Mineralogy (4) I GRD Geometric crystallography: internal structure of crystals. Crystal chemistry. Chemical and physical properties of major rock-forming minerals. Mineral paragenesis. Laboratory consists of identification of major minerals in hand specimen and optics. 3R. CR, 101, 103; Chem. 103a-103b, 104a-104b. Snow

225. Introduction to Paleontology (4) I GRD Basic principles and concepts; morphology and classification of fossils; their occurrence, distribution, geologic and evolutionary significance. 3R. 2L. Field trips. P, 102, 104 or Ecol. 101 or 104. Flesas

280. History of Life (2) I II Scenarios and explanations for major events in the history of life from the origin of the Earth to the evolution of humans. Lindsay


315. Introduction to Petrology (4) GRD II Classification, distribution, and genesis of igneous and metamorphic rocks; chemical disequilibrium. 3R, 3L. P, 209. Anovitz

321. Structural Geology (4) II GRD Description and analysis of geological structures of deformational origin; stereographic and experimental work in lab.; structure mapping in the field. 3R. 4L. P, 101, 102. G. Gehrels

322. Introduction to Geophysics (3) I GRD Physical principles applied to problems in earth science including seismology, gravity, magnetics, heat flow, plate tectonics. P. Phys. 116 or 103b and 180b. Butler

330. Introduction to Remote Sensing (3) I (Identical with Geog. 330)

346H. Natural Resources and Society (3) I History of the impact of minerals and metals on development of society and civilization, uniqueness of resources, current situation and problems. P. junior standing. Titley

396H. Honors Proseminar

400. Introduction to Geochemistry (3) I Nuclear systemsatics and thermodynamics with applications to geologic processes. P, 101, 103; Chem. 103b, 104b. May be convened with 500. Ruiz


404. Petrographic Techniques (3) I Introduction to application of modern petrographic techniques. Use of optical theory, optical petrography, electron microscope and image processing to examine and describe minerals and other materials. 2R. 3L. May be convened with 504. Anovitz

407. Photogeology (3) I (Identical with G.En. 407) May be convened with 507.

408. Mammalian Phylogeny and Evolution (3) II 1992-93 A study of the mammalian fossil record, with emphasis on taxonomy and morphology. Evolution of selected mammal orders. 2R. 3L. Field trips. May be convened with 508. Lindsey

409a. Petrology (3) Earth composition; spatial and temporal distribution of rock types.


413. Geology Field Camp II (3) S Field studies in geology, with emphasis on geologic mapping. Fee. P, 412.


417. Sedimentary Basin Analysis (3) I Stratigraphic sedimentation, paleogeographic, and paleoecological evolution of sedimentary basins with attention to facies relations, depositional systems, and structural and plate tectonic framework. P, 302. May be convened with 517. Parrish

418. Advanced Mineralogy (3) I 1992-93 Structure and crystal chemistry of minerals, microstructural development, kinetics and mechanisms of mineral reactions and transformations, with application to determining geologic history of rocks. P, 209 or consult department before enrolling. May be convened with 518. Snow

419. Global Tectonic Processes (3) I Plate tectonics; thermal properties and processes in the Earth; mechanical behavior of lithosphere and mantle; global gravity and geoid. P, Math. 254; Phys. 121. (Identical with Pty.S. 419) May be convened with 519. Richardson/Chase

421. Tectonometamorphism (3) I 1992-93 Introduction to the use of thermodynamics and kinetic theory of transformation subsolidus processes. Application of these results to interpretations of regional tectonics and the thermal evolution of planetary bodies. P, consult with department before enrolling. May be convened with 521. Anovitz

423. Regional Structural Geology (3) [Rpt.] I Geologic mapping in a variety of rock types and structural regimes, with emphasis on the recognition and solution of regionally significant structural problems. Field trips. P, 413. May be convened with 523. Gehrels

424. Paleomagnetism: Principles and Applications (3) I Physical basis for remanent magnetism in rocks, techniques of sample collection, measurements, and statistical treatment; review of polarity time scale, apparent polar wander, plate tectonics. P, Phys. 103b or 116. May be convened with 524. Butter

425. Regional Tectonics (3) I Discussion of the geology, geophysics, petrology, and geochemistry of different types of orogenic systems and their tectonic evolution. Methods of tectonic regionalization and integration based on lithotectonic assemblages and terranes, and regional structural geology. Plate tectonic regimes and kinematics. May be convened with 525. Coney

426. Cordilleran Tectonics (3) I Geologic and tectonic evolution of the North American Cordillera based on analysis of geologic, paleomagnetic, and paleobiogeographic constraints and tectonic models. May be convened with 526. Gehrels

429. Scanning Electron Microscopy (1-2) I Introduction to the principles and methods of Scanning Electron Microscopy/Energy Dispersive Spectroscopy and Image Analysis for geological/paleontological samples. Students will have the opportunity to conduct original research in SEM/EDS/IA as a portion of the laboratory. 1R, 3L. May be convened with 529.

431. Hydrogeology (3) I I (Identical with H.W.R. 431) May be convened with 531.


438. Biogeography (3) I (Identical with Ecol. 438) May be convened with 538.

440. Geodynamics (3) I [Rpt.] Large-scale tectonic problems approached by combined geophysical and geologic analysis in regional context. P, 20 units of geology, including 321, 3 units geophysics, Math. 254; consult with department before enrolling. May be convened with 540. Chase

444. Mining Geology (2) I 1991-92 (Identical with G.En. 444) May be convened with 544.


448. Geophysical Exploration and Engineering (4) I (Identical with G.En. 448) May be convened with 548.


451. Sedimentary Petrology (4) I Hand specimens, detrital grains, and thin section study of terrigenous clastic rocks, including mudrocks; carbonate rocks and associated evaporites; cherts, iron-rich rocks, and phosphorites. 2R, 6L. Field trips. P, 302, 315. May be convened with 551. Schreiber

452. Petroleum Geology (3) I Origin, migration, chemistry, and accumulation of petroleum; reservoir mechanics, types of traps; recovery of petroleum; oil shales and tar sands. 2R, 3L. May be convened with 552. Nagy


457. Low Temperature Geochemistry (3) I Equilibrium and kinetic chemical processes producing natural waters, and chemical sediments. P, 101, 103, 400/500 or Chem. 480a; Chem. 103b, 104b. (Identical with H.W.R. 457) May be convened with 557. Long


464a-464b. Introduction to Dendrochronology (3-3) Survey of dendrochronological theory and methods. Applications to archaeologi- cal, geological, and biological dating problems and paleoenvironmental reconstruction. Emphasis on dating methods, developing tree-ring chronologies, and evaluating tree-ring dates from various contexts. 2R, 3L. Field trips. (Identical with Anth. 464a-464b and Ws.M. 464a-464b) May be convened with 564a-564b. Swetnam


470. Introduction to Paleocology (3) I II Paleontologic approaches to the reconstruction of ancient environments, populations and communities. Evolution of communities through geologic time. 2R, 3L. Field trips. P, 225, 302. May be convened with 570. Flessa

473. Geology and the Urban Environment (3) I II Geologic processes that result in loss of life and/or property damage; emphasis on case studies of urban areas in the Southwest. Applications to archaeology (3 -3) Survey of dendrochronological theory and methods. Applications to archaeologi- cal, geological, and biological dating problems and paleoenvironmental reconstruction. Emphasis on dating methods, developing tree-ring chronologies, and evaluating tree-ring dates from various contexts. 2R, 3L. Field trips. (Identical with Anth. 473) May be convened with 573. McCullough

475. Cenozoic Mammalian Faunas (3) I 1991-92 Study of mammal faunas and deposits yielding those faunas, with emphasis on se- quential ordering of the faunas using biostratigraphic and paleomagnetic methods. 2R, 3L. Field trips. May be convened with 575. Lindsay

478. Global Change (3) I Analysis of the entire Earth system through an examination of how its component parts and their interactions have changed in the past and may be expected to change in the future. P, upper-division standing; introductory course work in biological and physical sciences. (Identical with Ecol. 478, H.W.R. 478 and R.N.R. 478) May be convened with 578. Graumlich

482. Paleoclimatology (3) I 1992-93 Topics in paleoclimatology including prediction of paleo- climatic patterns, proxy paleoclimatic indicators.
and paleoclimatic cycles. May be convened with 582. Parrish.


500. Introduction to Geochemistry (3) I For a description of course topics, see 400. Graduate-level requirements include an independent research report. P, 101, 103; Chem. 103b, 104b. May be convened with 400. Ruiz.


504. Petrographic Techniques (3) I For a description of course topics, see 404. Graduate-level requirements include a paper and class presentation. May be convened with 404. Anovitz.

505. Applied Multispectral Imagery (3) II (Identical with G.En. 505)

507. Photogeology (3) II (Identical with G.En. 507) May be convened with 407.

508. Mammalian Phylogeny and Evolution (3) II 1992-93 For a description of course topics, see 408. Graduate-level requirements include an in-depth research paper on a topic selected by the student and the instructor. Field trips. May be convened with 408. Lindsay.


514. Late Quaternary Geology (3) I Paleoenvironment and geochronology of Late Quaternary alluvium as read from the stratigraphic records and geomorphology at key localities in North America. The interaction of fluvial and aeolian processes in the eastern Sahara will be evaluated using enhanced LANDSAT and Shuttle imaging radar. Domestic field trips. Enrollment limited to 10 students. P, 102, 104. (Identical with Anth. 514) Haynes.

515. Advanced Sedimentary Petrology (3) I Advanced study of sedimentary rocks with an emphasis on the recognition of diageneric features and the application of appropriate techniques to problem solving. Requires a research project in publication format. 1R, 6L. Field trips. P, 451/551. Schreiber.

516. Field Studies in Geophysics (3) II S (Identical with G.En. 516) May be convened with 416.

517. Sedimentary Basin Analysis (3) II For a description of course topics, see 417. Graduate-level requirements include an additional research project. P, 302. May be convened with 417. Parrish.

518. Advanced Mineralogy (3) I 1992-93 For a description of course topics, see 419. Graduate-level requirements include an original research proposal. P, 209 or consult department before enrolling. May be convened with 418. Snow.

519. Global Tectonic Processes (3) II For a description of course topics, see 419. Graduate-level requirements include a term paper in publication format on some aspect of a major course topic. P, Math. 254; Phys. 121. (Identical with Pty.S. 519) May be convened with 419. Richardson/Chase.

520. Meteorites (3) II 1992-93 (Identical with Pty.S. 520)

521. Tectonometamorphism (3) II 1991-92 For a description of course topics, see 421. Graduate-level requirements include a project. P, consult with department before enrolling. May be convened with 421. Anovitz.

522. Well Logging Interpretation (3) II (Identical with G.En. 522)

523. Regional Structural Geology (3) [Rpt.] I For a description of course topics, see 423. Graduate-level requirements include additional reading assignments on structural processes and regional geology. Field trips. P, 413. May be convened with 423. G. Gehrels.

524. Paleomagnetism: Principles and Applications (3) II For a description of course topics, see 424. Graduate-level requirements include an in-depth research paper on a topic selected by the student and the instructor. P, Phys. 103b or 116. May be convened with 424. Butler.

525. Regional Tectonics (3) I For a description of course topics, see 425. Graduate-level requirements include a research paper on topical or regional tectonics. May be convened with 425. Coney.

526. Cordilleran Tectonics (3) II For a description of course topics, see 426. Graduate-level requirements include final report concerning some aspect of the tectonic evolution of western North America. May be convened with 426. Gehrels.

527. Orogenic Systems (3) I An analysis of the geology, geophysics, and geochemistry, and the tectonic evolution of selected world mountain systems ranging from currently active belts in both oceanic and continental settings back through Phanerozoic, Proterozoic, and into Archean time. Coney.


529. Scanning Electron Microscopy (1-2) For a description of course topics, see 429. Graduate-level requirements include a sophisticated research project. 1R, 3L. May be convened with 429.

530. Chemical Evolution of the Earth (3) I Chemical differentiation and evolution of earth's mantle and crust according to major-element, trace-element and isotopic characteristics of neodymium, hafnium, strontium, lead and other isotopes. (Identical with Pty.S. 530) Patchett.

531. Hydrogeology (3) I (Identical with H.W.R. 531) May be convened with 431. A. Davis.

532. Introduction to Seismology (3) I For a description of course topics, see 432. Graduate-level requirements include a term paper. P, Math. 254. May be convened with 432. Wallace.

533. Exploration Geophysics: Seismic methods (3) II For a description of course topics, see 434. Graduate-level requirements include a special research project. P, Math. 254. May be convened with 434. Johnson.

535. Aquifer Mechanics (3) II (Identical with H.W.R. 535)

536. Development of Groundwater Resources (3) II (Identical with H.W.R. 536)

538. Biogeography (3) II (Identical with Ecol. 538) May be convened with 438.


540. Geodynamics (3) [Rpt.] II For a description of course topics, see 440. Graduate-level requirements include a quantitative modelling project in some aspect of tectonics and a publication-format paper. P, 20 units of geology, including 321, 3 units geophysics, Math. 254; consult with department before enrolling. May be convened with 440. Chase.

541. Soil Genesis (3) II (Identical with S.W. 541)


543. Mathematical Theory of Magma-Hydrothermal Systems (3) I Dynamics and chronology of natural systems are reconstructed using mathematical systems and computer models to represent the redistribution of thermal and mechanical energy around magma chambers. Norton.

544. Mining Geology (2) I 1991-92 (Identical with G.En. 544) May be convened with 444.

545. Geochemical Processes in Magma-Hydrothermal Systems (3) II Migration of chemical components in natural fluid-rock systems are analyzed using the geochemical theory that represents irreversible, equilibrium and advection mass transfer. Norton.

546. Economic Mineral Deposits (3) II GRD For a description of course topics, see 446. Graduate-level requirements include an independent study project. P, 209, 321. May be convened with 446. Guibert/Tilety.

547. Industrial Minerals and Rocks (3) I 1992-93 For a description of course topics, see 447. Graduate-level requirements include a term paper. P, 446. May be convened with 447. Guibert.


549. Microwave Exploration (3) I 1991-92 (Identical with G.En. 549) May be convened with 449.
550. Geomorphology (4-I) For a description of course topics, see 450. Graduate-level requirements include panel discussions on environmental diffusion sessions and additional lab exercise questions. 3R, 3L. P, 101, 103. May be convened with 450. Bull

551. Sedimentary Petrology (4-II) For a description of course topics, see 451. Graduate-level requirements include a research paper in publication format on a topic selected by the student and instructor. 2R, 6L. Field trips, P. 302, 315. May be convened with 451. Schreiber

552. Petroleum Geology (3) For a description of course topics, see 452. Graduate-level requirements include a term paper regarding some aspect of a major course topic. 2R, 3L. May be convened with 452. Nagy

553. Glacial and Quaternary Geology (3-II) For a description of course topics, see 453. Graduate-level requirements include an independent research project or a term paper in publication format. P. 102, 104. May be convened with 453. Baker


556. Quantitative Dendrochronology (3) 1992-93 Analysis of tree-ring and other geophysical data series using a wide variety of statistical and time-series techniques. Comparison of tree-ring data series with various climatological and hydrological records for the purpose of the reconstruction of past variations. 2R, 3L. P. 464a-464b or 564a-564b, Stat. 461 (Identical with W.S. 556). Stockton

557. Low Temperature Geochemistry (3-II) For a description of course topics, see 457. Graduate-level requirements include an independent research project or term paper in publication format. P. 101, 103, 400/500 or Chem. 480a; Chem. 403b, 104b. (Identical with H.W.R. 557) May be convened with 457. Long

560. Electrical Exploration Methods (3) I (Identical with G.En. 560)

561. Paleoinland Origins (3) I (Identical with Anth. 561)

562. Introduction to Quaternary Ecology (3) I For a description of course topics, see 462. Graduate-level requirements include a term paper in publication format. Field trips, P. 101. May be convened with 462. O. Davis


564a-564b. Introduction to Dendrochronology (3-3) For a description of course topics, see 464a-464b. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology. 2R, 3L. Field trips. (Identical with Anth. 564a-564b and Ws.M. 564a-564b) May be convened with 464a-464b. Long

565. Isotope Geology (3) II Theory and application of light stable isotopes to petrological, ore deposition, and geothermal problems. Long

566. Botanical Basis of Dendrochronology (3) II 1991-92 Examination of the environmentally modified processes of developmental tree physiology and wood anatomy and their application to tree-ring analysis. Field trip. (Identical with Anth. 566-566b) Richardson


569. Seismic Data Processing (3) I For a description of course topics, see 469. Graduate-level requirements include a special research project. P or CR, 434, Math. 422a. May be convened with 469. Johnson

570. Introduction to Paleoecology (3) II For a description of course topics, see 470. Graduate-level requirements include a research project and an abstract to be submitted for publication. 2R, 3L. Field trips. P. 225, 302. May be convened with 470. McCulloch

575. Cenozoic Mammalian Faunas (3) II 1991-92 For a description of course topics, see 475. Graduate-level requirements include an in-depth research paper on a topic selected by the student and the instructor. 2R, 3L. Field trips. May be convened with 475. Lindsay

578. Global Change (3) II For a description of course topics, see 478. Graduate-level requirements include an in-depth research paper on a topic selected by the student and instructor. P. graduate standing; introductory course work in biological and physical sciences. (Identical with Ecol. 578, H.W.R. 578 and R.N.R. 578) May be convened with 478. Graumlich

579. Introduction to Quaternary Macrossilis Analysis (4) [Rpt./1] II 1992-93 Literature and techniques of identification of plant remains in- cluding leaves, seeds, and wood of gymnosperms and angiosperms. 2R, 6L. Field Trips, P. Ecol. 472 O. Davis


581. Quaternary Palynology (4) I 1991-92 Theory and application of pollen to geology, biology, archaeology, and paleoecology; definition of information pollen sample record; experience in pollen extraction and identification. 3R, 4L. P. Ecol. 472. (Identical with Anth. 581) O. Davis

582. Paleoclimatology (3) I 1992-93 For a description of course topics, see 482. Graduate-level requirements include an additional research project. May be convened with 482. Parrish

583. Thermodynamics in Geosciences (3) I Principles of classical and elementary statistical thermodynamics. Thermo-chemical and -physical properties; equations of state for solids and gases; solutions; phase equilibria; nonideal multicomponent systems with emphasis on geological and planetary problems. P, Math. 125a-125b, or 124, Math. 119 and/or consult with department before enrolling. (Identical with Pty.S. 583)


596. Seminar a. Petrography-Petrology (1-4) [Rpt./6 units] II b. Structural Geology (1-4) [Rpt./6 units] II c. Mineral Deposits (1-4) [Rpt./6 units] II d. Petroleum Geology (1-4) [Rpt./6 units] II e. Tectonics (1-4) [Rpt./6 units] II f. Mineralogy-Crystallography (1-4) [Rpt./6 units] II g. Vertebrate Paleontology (1-4) [Rpt./6 units] II h. Paleontology (1-4) [Rpt./6 units] II i. Paleontology-Paleoenvironments (1-4) [Rpt./6 units] II j. Geomorphology (1-4) [Rpt./6 units] II k. Geophysics (1-4) [Rpt./6 units] II l. Geomathematics (1-4) [Rpt./6 units] II m. Sedimentology (1-4) [Rpt./6 units] II n. Stratigraphy (1-4) [Rpt./6 units] II o. Regional Tectonics (1-4) [Rpt./6 units] II p. Hydrogeology (1-3) [Rpt./6 units] II (Identical with H.W.R. 596p, which is home) q. General Geochronology (1-4) [Rpt./6 units] II r. Quaternary Geochronology (1-4) [Rpt./6 units] II (Identical with Anth. 596r) s. Sedimentary Petrography (1-4) [Rpt./6 units] II t. Organic Geochemistry (1-4) [Rpt./6 units] II u. Inorganic Geochemistry (1-4) [Rpt./6 units] II v. Dendrochronology (1-4) [Rpt./6 units] II w. Palynology (1-4) [Rpt./6 units] II x. Paleobotany (1-4) [Rpt./6 units] II y. Role of Water in Geologic Processes (1-4) [Rpt./6 units] II z. Topics in Geophysics (1-4) [Rpt./6 units] II


648a-648b. Advanced Ore Deposit Geology (4-4) Geology, characteristics and origins of ore deposits in igneous, sedimentary, and metamorphic rocks. Labs. include field trips, analytical techniques, problem solving. 2R, 6L. P. 445/456, Chem. 480a or CR. Tilley/Guilbert


651. Climatic Geomorphology (3) I 1992-93 Effects of climatic changes on geomorphic processes, landforms, and soils; paleoclimatic and
German (GER)

Modern Languages Building.
Room 571
(602) 621-7385

Professors Louis F. Helbig, Head, David H. Chisholm, Max Dufner (Emeritus), Renate A. Schultz, David J. Wooshin (Emeritus), Associate Professors Dennis I. Greene (Emeritus), Babette Luz (Emerita), Steven D. Martinson, Roland Richter
Assistant Professors Albrecht Classen, Barbara Kosta, Kamakshi P. Murti, Mary Widner-Bassett
Lecturer John R. Wendel

The Department of German provides instruction designed to develop fluency in oral and written communication, knowledge of German literature, and insights into German cultural traditions. A study-abroad exchange program at the University of Tübingen is available for qualified students. A major in German, by itself or in combination with another field, can open the door to careers in education, international business, the foreign service and many other professions.

The degrees available are Bachelor of Arts and Master of Arts with a major in German, and Bachelor of Arts in Education and Master of Education with a teaching major in German.

The major: 24 units beyond 200-level courses, including 302a or 302b, 315a-315b, 400a-400b, and 410a-410b. Ger. 307a-307b is highly recommended.

The supporting minor must be selected with the assistance and approval of the major advisor.

The German minor: includes 201, 202, 302a-302b, 315a-315b, 307a or 307b.

The German minor with an emphasis in German culture: includes 8 units of language study beyond 102, and 12 units selected from the following: 275, 276, 320, 375, 410a-410b, and 455.

The teaching major: includes 302a or 302b, 315a-315b, 400b, 410a-410b, 475a, and 479 and 480. Candidates must demonstrate oral proficiency in German at the level of the ACTFL/ETS Proficiency Intermediate High Level or the equivalent.

For graduate admission and degree requirements, consult the Graduate Catalog.

The department participates in the honors program.

In addition to the courses listed below, the Department of German faculty is prepared to offer courses in the following areas, subject to faculty availability and student interest: Special Topics in German Literature; Linguistic and Computer-Assisted Approaches to Literature; Scandinavian Literature in English Translation; German Cinema; German Reading for Graduate Students; and Second Language Acquisition, Teaching and Testing.

101. Elementary German I (4) CDT Both 101 and 102 are offered each semester.

101i. Elementary Intensive German (6) CDT Offered during Summer Session I only.

102. Elementary German II (4) CDT Both 101 and 102 are offered each semester.

201. Intermediate German I (4) CDT Speaking, understanding, writing, and reading German. P. 102 or 101i. Both 201 and 202 are offered each semester.

201i. Intermediate Intensive German (6) CDT Offered during Summer Session II only. P. 201 or 201i.

202. Intermediate German II (4) CDT Speaking, understanding, writing, and reading German. P. Both 201 and 202 are offered each semester.

203. Intensive Intermediate German (8) I GRD Intensive intermediate German for students to proceed at an accelerated pace to cover a greater variety of materials and topics than offered in German 201 and 202. An honors section is available. Enrollment contingent on personal interview and an exam given in the first week of class. 2L. P. Honors program requirements; consult department before enrolling.

207a-207b. Conversation (2-2) CDT Intermediate course for students who wish to concentrate on spoken Ger. P. 102. 207a is not prerequisite to 207b.

270a-270b. German Literature in Translation (3-3) Reading and discussion of representative works from the 13th century to the present. 270b: Emphasis on modern works after Romanticism. Will not count toward fulfillment of language requirement or a major or minor in German. 270a is not prerequisite to 270b.

275. Creative Minds: The German Classical Heritage (3) I From Apollo to Dionysus and beyond. Weimar Classicism and its reception in German literature, philosophy and art history. Lectures and readings in English.

276. Hermann Hesse’s Life and Works (3) II S Examines the life and the main works of Hermann Hesse in translation.

277. Eroticism and Love in the Middle Ages (3) I II Introduces the student to the culture and mentality of the Middle Ages focusing on attitudes toward love, sex and marriage. Concepts of the body, of human relationship, and eroticism will be highlighted. (Identical with Engl. 277 and Span. 277)


302a-302b. Masterpieces in German Poetry and Prose (3-3) Careful study of significant expressions in literature of German thought and life, with attention to periodic and individual differences in style. P. 202. 302a is not prerequisite to 302b.

307a-307b. Advanced Conversation (2-2) CDT Intensive practice leading toward fluency in spoken German, using material based upon topics of current interest. P. 202 or 207b. 307a is not prerequisite to 307b.

315a-315b. Oral Expression and Written Composition (3-3) CDT Review and practical application of important grammatical principles; vocabulary building. P. 202 or 207b. 315a is not prerequisite to 315b.

320. History of German Cinema (3) I The important films in the development of German cinema of the pre-1945 period and the cinema of the Federal Republic of Germany after 1945 to the present.

375. Vienna 1890-1920: Its Cultural Legacy to the Modern World (3) I II To explore the human condition as it reveals itself in the artistic and philosophical works of artists, writers, and composers who are associated with Vienna at the turn of the 20th century. Lectures and readings in English. P. freshman composition, junior standing.

400a-400b. History of German Literature (3-3) Historical survey of German literary development from the beginning to the modern period; lectures in German, alternating with conferences in English. P. 6 units of upper-division German. 400a is not prerequisite to 400b.

405. History of the English Language (3) I II (Identical with Engl. 405) May be convened with 505.

410a-410b. Cultural Development of Germany (3-3) Social, political, religious, and artistic elements entering into the growth and development of Germany; lectures in English. 410a is not prerequisite to 410b. Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

455. Music and German Literature (3) I 1992-93 The interrelationship between music and German literature from the 16th through the 20th century. Concentrates on major works of German music, poetry, and prose and their musical settings. Lectures in English. Readings primarily in English, some German. P. 202. (Identical with Mus. 455) May be convened with 555.

475a-475b. Advanced Grammar and Stylistics (3-3) CDT Practical training in written German through the study of the more complex refinements of German grammar and style, as found in representative documents. P. 315b.
475a is not prerequisite to 475b. May be convened with 575a-575b.

479. Issues in Foreign Language Teaching
(3) I Modern methods of language teaching with emphasis on German as a foreign language. May be convened with 579.

480. Applied Linguistics for Foreign Language Teaching
(3) II Issues in and methods of applied linguistics with emphasis on Germanic languages. May be convened with 580.

485. Linguistic and Computer-assisted Approaches to Literature
(3) [Rpt./6 units] I 1992-93 Application of computers to literary style, authorship, vocabulary measures, indexes and concordances, metrics and versification. P. 3 units of literature at the 300 level or above. (Identical with Fre. 485, Clas. 485, Ling. 485, Russ. 485, and Span. 485) May be convened with 595.

496. Seminar
a. Translation (3) [Rpt./2] I II P. 315b.

497. Workshop
a. Literature (1-5) [Rpt./5 units] I II May be convened with 597a.
b. Pedagogy (1-5) [Rpt./5 units] I II May be convened with 597b.
c. Culture (1-5) [Rpt./5 units] I II May be convened with 597c.
d. Linguistics (1-5) [Rpt./5 units] I II May be convened with 597d.
e. Translation (1-5) [Rpt./5 units] I II May be convened with 597e.

500. Intensive Reading German for the Sciences and Humanities
(4 hrs/wk., no credit) S Rapid acquisition of reading proficiency in German. No prior knowledge of German is necessary. Proficiency certification obtained from this course fulfills graduate foreign language requirement in some departments (consult department for information).

501. German Lyric Verse from the Reforma-
tion through Classicism
(3) II 1992-93 Introduction to the principles and forms of poetry; analysis and interpretation of outstanding examples of German lyric verse from the 16th through the 18th centuries. P. 6 units of upper-division German.

502. German Lyric Verse from Romanticism to the Present
(3) I 1991-92 Introduction to the principles and forms of poetry; analysis and interpretation of outstanding examples of German lyric verse of the 19th and 20th centuries. P. 6 units of upper-division German.

503. Eighteenth-Century German Literature
(3) II 1991-92 Klopstock, Lessing, Wieland, Goethe, Schiller, Hoelderlin and other authors. P. 6 units of upper-division German.

504. German Romanticism and Realism
(3) I 1992-93 Readings and discussions of representative works from 1797 to 1843. P. 6 units of upper-division German.

505. History of the English Language
(3) I II (Identical with Engl. 505) May be convened with 405.

506. German Literature from 1848 through Naturalism
(3) I 1991-92 Readings of major prose and dramatic works of the second half of the 19th century, in German. P. 6 units of upper-division German.

507. Goethe's Faust
(3) II 1992-93 A close reading of the poem and an introduction to some of the critical secondary literature. P. 6 units of upper-division German.

508. German Literature from 1900 through the Weimar Republic
(3) II 1991-92 Readings of major prose and dramatic works between 1900 and 1933, in German. P. 6 units of upper-division German.

509. German Literature from 1933 to the Present
(3) I 1992-93 Readings of major prose and dramatic works after 1933, in German. P. 6 units of upper-division German.

511. Middle High German
(3) II 1992-93 Introduction to Middle High German language and literature; selective readings from representative literary works of the period. P. 302b, 315b.

520. History of the German Language
(3) II 1991-92 Introduction to Germanic philology; an overview of the development of the German language from its roots in the Indo-European language family to New High German. P. 8 units of upper-division German. (Identical with Engl. 520)

525. Beowulf
(3) II (Identical with Engl. 525, which is home)

527a. Studies in Medieval Language and Literature
(3) (Identical with Engl. 527a)

555. Music and German Literature
(3) I 1992-93 For a description of course topics, see 455. Graduate-level requirements include two oral reports or lectures-recitals on a specific topic. P. 202. (Identical with Mus. 555) May be convened with 455.

575a-575b. Advanced Grammar and Stylistics
(3-3) CDT For a description of course topics, see 475a-475b. Graduate-level requirements include an in-depth research paper on an important issue of foreign language teaching. May be convened with 475a-475b.

579. Issues in Foreign Language Teaching
(3) I For a description of course topics, see 479. Graduate-level requirements include an in-depth research paper on an important issue of foreign language teaching. May be convened with 479.

585. Linguistic and Computer-assisted Approaches to Literature
(3) [Rpt./6 units] I For a description of course topics, see 485. Graduate-level requirements include an in-depth research paper on an aspect of applied linguistic research. May be convened with 485.

586. Seminar
a. Literature (1-5) [Rpt./5 units] I II P. 6 units of upper-division German.
b. Pedagogy (1-5) [Rpt./5 units] I II P. 6 units of upper-division German.
c. Culture (1-5) [Rpt./5 units] I II P. 6 units of upper-division German.
d. Linguistics (1-5) [Rpt./5 units] I II P. 6 units of upper-division German.
e. Translation (1-5) [Rpt./5 units] I II P. 6 units of upper-division German.

597. Workshop
a. Literature (1-5) [Rpt./5 units] I II May be convened with 497a.
b. Pedagogy (1-5) [Rpt./5 units] I II May be convened with 497b.
c. Culture (1-5) [Rpt./5 units] I II May be convened with 497c.
d. Linguistics (1-5) [Rpt./5 units] I II May be convened with 497d.
e. Translation (1-5) [Rpt./5 units] I II May be convened with 497e.

601. Materials and Methods of Research
(3) I Survey of the tools and methods of literary and linguistic research and introduction to principles of literary analysis.

696. Seminar
a. Literature (2-4) [Rpt.] I II
b. Linguistics (2-4) I II (Identical with Engl. 696b)
c. Folklore (2-4) I II (Identical with Engl. 696c)
d. Pedagogy (2-4) [Rpt.] I II
e. Translation (2-4) [Rpt.] I II

Gerontology (GERO)
Geonomo Hotel
800 East University Boulevard
Suite 340
(602) 626-8104

Committee on Gerontology (Graduate)
Professors Alfred W. Kaszniaik, Chair (Psychology), Carol W. Barnes (Psychology), Robert B. Bechtel (Psychology), John T. Boyer (Internal Medicine), Herbert E. Carter (Emeritus, Biochemistry), Theodore H. Koff (Management and Policy), Roy Q. Spece, Jr. (Law), William A. Stini (Anthro-
Because of its multidisciplinary nature, courses in gerontology are located in a number of departments. The Committee on Gerontology plays a facilitating role in the coordination and development of aging studies and will guide students who wish to include an emphasis in gerontology in their course of study. Although the committee offers neither an undergraduate nor graduate major, it is possible for students to include an emphasis in gerontology in several ways. Students may choose to incorporate courses into their regular degree program to supplement work in their major field. In addition they can pursue a gerontological focus through work in a practicum, internship, independent study or thesis. While no formal recognition is offered, it is possible to obtain a rich background in gerontology in this way.

Formal recognition for gerontological study is available at both undergraduate and graduate levels. In the College of Arts and Sciences and in some graduate programs students may satisfy requirements for a minor in Subject Area III in interdisciplinary studies by following an approved curriculum. The committee coordinator serves as minor advisor for these students. At the graduate level the Committee offers a doctoral minor which is most appropriate for students in areas such as education, administration, health, nutrition, and the social and behavioral sciences. A minimum of 15 units is required. In addition it is possible for graduate students to obtain formal recognition through the Committee's Gerontology Certificate Program, an 18-unit course of study similar to that offered in many other colleges and universities in this country. The program is designed primarily for individuals planning to enter or to continue in a profession which involves provision of services and/or administration of programs for the aging.

Students should consult with the major department about developing a gerontological emphasis within the major field through course work, research, thesis and dissertation. This most commonly occurs in the following academic units: Counseling and Guidance, Management and Policy, Psychology, Special Education and Rehabilitation, Speech and Hearing Sciences, the School of Family and Consumer Resources, and the Colleges of Education, Nursing and Pharmacy. In addition, graduate work with a strong gerontological focus is available in human services administration (M.P.A.) and gerontological nursing (M.S.).

Courses in other departments identified as having content which deals with elderly and able in human services administration (M.P.A.) work with a strong gerontological focus are available in Nursing and Pharmacy. In addition, graduate programs for the aging.

For further information, contact the coordinator at the address above.

Students wishing further information should contact the coordinator at the address above.

238. Theories of Biological Aging (2) II (Identical with N.F.S. 238)
243. Sociology of Adult Life (3) II (Identical with Soc. 243)
406. Social Gerontology (3) II (Identical with Soc. 406) May be convened with 506.
413. Issues in Aging (3) II (Identical with F.S. 413) May be convened with 513.
435. Adult Development and Aging (3) I (Identical with Psych. 435) May be convened with 535.
436. Economics of Aging (3) II (Identical with F.S. 436) May be convened with 536.
445. Clothing for Special Needs (3) I (Identical with M.C.S. 445) May be convened with 545.
447. Perspectives in Geriatrics Laboratory (1) II (Identical with Ph.Pr. 447) May be convened with 547.
448. Perspectives in Geriatrics (2) II (Identical with Ph.Pr. 448) May be convened with 548.
457. Law of the Elderly (2) II (Identical with M.A.P. 457) May be convened with 557.
470. Human Adaptability (3) I (Identical with Anth. 470a) May be convened with 570a.
506. Social Gerontology (3) II (Identical with Social 506) May be convened with 406.
513. Issues in Aging (3) II (Identical with F.S. 513) May be convened with 413.
536. Economics of Aging (3) II (Identical with F.S. 536) May be convened with 436.
538. Problems in the Biochemistry of Aging (2) I (Identical with N.F.S. 538).
545. Clothing for Special Needs (3) I (Identical with M.C.S. 545) May be convened with 445.
547. Perspectives in Geriatrics Laboratory (1) II (Identical with Ph.Pr. 547) May be convened with 447.
548. Perspectives in Geriatrics (2) II (Identical with Ph.Pr. 548) May be convened with 448.
557. Law of the Elderly (2) II (Identical with M.A.P. 557) May be convened with 457.
570. Human Adaptability (3) I (Identical with Anth. 570a) May be convened with 470a.
589. Health of the Older Adult (3) I (Identical with Nurs. 589).
659. Colloquium a. Research in Gerontology (1) I II (Identical with Ph.Pr. 695a)

Health Education
(See Health-Related Professions)

Health-Related Professions (HLTH/OSH/EXSS/MEDT)

Charles M. Tipton, Director

The School of Health-Related Professions, an integral part of the Arizona Health Sciences Center, offers the following degree programs: the Bachelor of Science in Health Sciences with majors in exercise sciences, health education, physical education, medical technology, and occupational safety and health, the Master of Science and Master of Arts degrees with a major in exercise and sport sciences, and the Master of Education degree with a major in health education.

Community and Environmental Health

1435 N. Fremont Ave., Room 111 (602) 882-5852

Associate Professors Richard L. Papenfuss, Head, Kam Nasser Assistant Professors Clifford D. Crutchfield, Mark D. Van Ert Lecturer Judith D. Nevin Instructor Sheila H. Parker Adjunct Lecturer Michael Andaloro

The Division of Community and Environmental Health provides instructional programs to prepare students for careers in school health education, community health education, and industrial hygiene and safety. Undergraduate studies lead to the Bachelor of Science in Health Sciences with the following majors: health education, occupational safety and health. Admissions and degree requirements for these majors are listed in the Health-Related Professions section of this catalog (under Colleges and General Divisions).

Students selecting a teaching major other than health education may elect a teaching minor in health education in consultation with a College of Education advisor. The teaching minor in health education consists of 21 units, including Hlth. 178, 278, 306, 330, 381, 430 or 432, and 434.

Students intending to minor in health education or to use health education as a general studies concentration area are expected to have a background in anatomy and physiology, nutrition, and principles of communicable diseases. Required courses include Hlth. 178, 278, 306, 330, 400, 433, 493a and O.S.H. 486.

At the time this catalog was being edited, the Master of Education degree with a major in health education was being redesigned. All current and prospective students should check with the Division of Community and Environmental Health for current admission and degree requirements in this major, and should consult the Graduate Catalog.

Government
(See Political Science)

Greek
(See Classics)
Health Education (HLTH)

178. Personal Health and Wellness (3) I II Introduces and analyzes basic personal and community health problems, with emphasis on current scientific information essential to health promotion and maintenance of individual health. Credit for this course of 278, but not for both.

278. Health Science Promotion (4) II Basic concepts of health science, optimal health, lifestyle factors and health risks associated with the college-age population; emphasis on health promotion and intervention techniques; practical experience with individual and group health behavior change projects, 3R, 3L. Credit is allowed for this course or 175, but not for both.


330. Human Sexuality (3) I II Discussion of the basic aspects of human sexuality, including male and female reproductive physiology, congenital defects, venereal disease, myths and fallacies, variations of sexual response. Credit is allowed for 330 or Soc. 324, but not for both.

381. School Health Education (3) II Emphasis on health science information applicable to health education classes; for students preparing to teach in the public schools.

400. Contemporary Community Health Problems (3) II Analysis of the concept of community health services, human ecology, and conservation of human resources, with emphasis on modern miasmas such as air, water, and noise pollution; sociological problems of alcohol, alcoholism, and drug abuse.

430. Critical Analysis of Health Education (3) I Analysis of the epidemiological data to determine the health problems of our people; behavioral relationships; and the study and application of theory-based educational strategies designed to prevent health problems.

432. Organization and Administration of Health Education (3) I Principles for planning, implementing, administering and evaluating health education programs utilizing the PRECEDE Model as a framework.

433. International Health (3) I Interprets the major health problems not only of the developed and emerging nations, but also the situations in underdeveloped countries; includes assistance programs by international health organizations. Writing -Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

475. Alcohol Abuse and Alcoholism (1) S Review of the nature and ramifications of alcohol problems, as well as analysis of physical, psychological and social implications.

493. Internship a. Field Work in Health Education (3) I II Open to health education majors only.

Occupational Safety and Health (OSH)

402. Industrial Hygiene Instrumentation and Analysis (2-4) I Introduction to field sampling instruments and strategies, quality control, and statistical analysis, with emphasis on instrument selection and calibration. 2R, 3L. P, 486, Chem. 322, 323. May be convened with 502. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

410. Physical Exposures (3) II Recognition, evaluation, and control of physical exposures, including radiation, noise, vibration, and heat stress. Student is required to recognize potential exposures, use correct instrumentation to collect and evaluate data, and develop controls. 2R, 3L. P, 486. (Identical with Tox. 410) May be convened with 510.

412. Hazardous Materials (2-4) I Recognition, evaluation, and control of exposure to environmental and industrial air contaminants. P, 486. May be convened with 512.

460. Introduction to Epidemiology (3) I II Introduction to the purposes, principles, and methods of epidemiology.

461. Accident Prevention (2) II (Identical with Mn. E. 461) May be convened with 561.

466. Fundamentals of Industrial Hygiene (3) I Introduction to the principles of occupational safety and health, with emphasis on industrial hygiene aspects including recognition, evaluation, and control of environmental and industrial health hazards. (Identical with C.E. 486, G.En. 486, Mn. E. 486, and Tox. 486) May be convened with 565.

487. Advanced Industrial Hygiene and Safety (3) II An in-depth coverage of the industrial hygiene and safety professions emphasizing the principles of contaminant behavior and the design of industrial hygiene/safety programs. P, 486. (Identical with C.E. 487 and Tox. 487) May be convened with 587.

488. Applied Industrial Safety (3) II Thorough study of technical safety topics such as fire technology, systems safety, manual materials handling; selected topics in construction and manufacturing safety. P, 486.


502. Industrial Hygiene Instrumentation and Analysis (2-4) I For a description of course topics, see 402. Graduate-level requirements include in-depth laboratory reports. P, 586. (Identical with Tox. 502) May be convened with 402.

510. Physical Exposures (3) II For a description of course topics, see 410. Graduate-level requirements include completion of comprehensive laboratory reports, detailing exposure potential, use of correct instrumentation, and control recommendations. P, 486. (Identical with Tox. 510) May be convened with 410.

512. Hazardous Materials (2-4) I For a description of course topics, see 412. Graduate-level requirements include a comprehensive paper detailing hazards associated with a particular chemical. P, 566. (Identical with Tox. 512) May be convened with 412.

561. Accident Prevention (2) II (Identical with Mn. E. 561) May be convened with 461.

566. Fundamentals of Industrial Hygiene (3) I For a description of course topics, see 486. Graduate-level requirements include a comprehensive paper addressing occupational health topics. (Identical with C.E. 586, G.En. 586, Mn. E. 586, and Tox. 586) May be convened with 486.

587. Advanced Industrial Hygiene and Safety (3) II For a description of course topics, see 487. Graduate-level requirements include participation in an industrial hygiene assessment of a plant and completion of a formal report describing the results of the survey. P, 486 (Identical with C.E. 587 and Tox. 587) May be convened with 487.

Exercise and Sport Sciences (EXSS)

Ine A. Gittings Building, Room 101 (602) 621-6989


Assistant Professors Ralph F. Fregosi, Erik J. Hennessy, Youn-Jin C. Kregel

Lecturers Thomas L. Akers, Barbara S. Fair, Michael E. Haddow, Susan K. Hillman, Monica Mize, Judy A. Sorensen, Ronald A. Sutherland

The Department of Exercise and Sport Sciences is concerned with advancing the body of knowledge in the exercise and sport sciences and preparing professionals for careers in exercise science, teaching, coaching, and research. Undergraduate majors in exercise sciences and physical education for the Bachelor of Science in Health Sciences are offered. Admission and degree requirements for both majors are listed in the School of Health-
Related Professions section of this catalog (under Colleges and General Divisions).

Students selecting a teaching major other than physical education may elect a teaching minor in physical education in consultation with a College of Education advisor. Interdisciplinary studies majors in the College of Arts and Sciences may elect to take at least 24 approved units of course work in exercise and sport sciences as Subject Area III or as a minor.

The physical education teaching minor: Chem. 103a-103b, 104a-104b, Ecol. 159a-159b, 160a-160b; Biol. 261 or 377, 285, 360, 373, 377, 379, 380, 381. A departmental skills requirement must be satisfied through proficiency examination or completion of a minimum of eight courses and 12 units from Professional Activity courses.

The athletic coaching minor (not available to physical education majors): 285, 360, 373, 374, 377, 385, 394a; 4 units from 286 and 354, to include a minimum of 2 units in 354. It is recommended that students complete background courses in anatomy and physiology (Ecol. 159a-159b, 160a-160b) before selecting this minor.

The department offers programs leading to the Master of Science and the Master of Arts in health-related professions. Students who have completed a baccalaureate degree and who have met the intermediate prerequisites, may repeat the beginning course for credit. Intermediate- and advanced-level courses may be repeated once for credit

The department offers a free locker for students registered in activity courses. Failure to return the lock will result in a financial encumbrance.

100. Adapted Physical Activities (1) I II
103. Aerobic Dance (1) I II a. Beginning Aerobic Dance
109. Backpacking (1) I II Two-day field trip.
110. Badminton (1) I II a. Beginning Badminton
b. Intermediate Badminton
114. Basketball (1) I II a. Intermediate Basketball
116. Body Dynamics (1) I II
123. Country Swing (1) I II
125. Cycling (1) I II
128. Diving (1) I II
132. Fencing (1) I II a. Beginning Fencing
b. Intermediate Fencing
136. Beginning Folk Dance (1) S Daily, group instruction in folk dances of different regions of Mexico. Offered in Guadalajara only. SS.
137. Golf (1) I II S Fees.
a. Beginning Golf
b. Intermediate Golf
c. Advanced Golf
141. Hiking (1) I II S Field trips.
145. Jogging (1) I II
148. Karate (1) I II a. Beginning Karate
b. Intermediate Karate P. 148a
150. Lifeguard Training (1) I II S P. 169d.
159. Racketball (1) I II a. Beginning Racketball
b. Intermediate Racketball
164. Soccer (1) I II a. Beginning Soccer
b. Intermediate Soccer
166. Softball (1) I II a. Beginning Softball
b. Intermediate Softball
169. Swimming (1) I II a. Beginning Swimming
b. Swimming for Beginners with Limited Experience
69c. Intermediate Swimming
c. Advanced Swimming
170. Swimming for Fitness (1) I II S P. 169c.
179. Tennis (1) I II a. Beginning Tennis
b. Tennis for Beginners with Limited Experience
c. Intermediate Tennis
d. Advanced Tennis
176. Touch Football (1) I II
177. Triathlon Training (1) I II S P. 169c.
181. Volleyball (1) I II a. Beginning Volleyball
b. Intermediate Volleyball
c. Advanced Volleyball
184. Weight Training (1) I II a. Beginning Weight Training
Professional Activity Courses

Open to physical education majors and minors only.
208. Aerobic Dance Fitness (1) I II*
211. Badminton (1) I II*
213. Basketball (2) I II*
217. Folk Dance (1) I II*
218. Football (1) I II*
219. Golf (1) I II*
221. Women's Gymnastics (2) I II*
223. Handball-Racketball (1) I II*
225. Soccer (2) I II*
227. Softball (1) I II*
229. Swimming—Lifeguard Training (2) I II*
230. Tennis (2) I II*
231. Track and Field (2) I II*
232. Volleyball (2) I II*

*Development of knowledge and skill competencies necessary for teaching each activity, with emphasis on skill progressions, practice opportunities, and error diagnosis and correction.

Professional Preparation Courses

260. Water Safety Instructor (2) I II American Red Cross Water Safety Instructor Certificate will be issued to those students qualifying. P. current advanced lifeguard certificate.
261. Advanced First Aid and Emergency Care (2) I II Instruction in first-aid and emergency care procedures. The American Red Cross Advanced First Aid and Emergency Care Certificate will be awarded to those students qualifying.
267. Controlling Stress and Tension (2) I II S Psychophysiology of stress and its relationship to health, with emphasis on identifying and understanding personal stress patterns and learning appropriate stress management techniques such as relaxation, cognitive intervention strategies, meditation, autogenic training, and physical activity.
269. Peak Performance (2) I II Examinations approaches to psychological training which lead to peak performance in sport and other endeavors. Develops individualized training procedures for maintaining optimal arousal, motivation, concentration, and confidence.
285. Principles of Teaching Physical Activities (3) I II General principles and practical experiences related to analysis of movement skills, correction of movement errors, and pre-instructional planning applied specifically to teaching physical activities. Mize/Sorensen.
286. Sports Officiating (1) I II Guiding principles and standards; rules, mechanics and procedures for officiating sports common to secondary school interscholastic and community club programs. Consult department before enrolling.
a. Basketball (Men and Women's Rules)
b. Baseball-Softball
b. Football
b. Soccer I
b. Volleyball II
288. Historical and Philosophical Perspectives of Sport and Physical Education (3) I II Study of the development of sport and physical education from ancient societies through the 20th century; history of philosophic thought and influences on current practices. Simko.

Professional Preparation Courses

294. Practicum
a. Movement Experiences for Children (1) [Rpt./1] I II S P. 279, 285. Mize
320. Psychological Foundations for Exercise and Sport (3) I II Examinations principles of motor learning and performance; psychological factors such as personality, anxiety, and motivation which influence learning and performance; and psychology of exercise. P. Psych. 101.
350. Movement Experiences for Elementary School Children (2) I II Development of knowledge and skill competencies necessary for teaching fundamental movements, rhythms and dance, gymnastics, games, and sports to children. Open to majors only.
351. Elementary School Physical Education (2) I II S Purposes and practices of physical
education at the elementary school level; instruction in recommended activities; teaching and evaluation techniques; class organization.

354. Theory of Coaching (2) I II Advanced instruction in sports common to secondary school curricula; teaching and coaching principles, advanced techniques, and organizational and practice methods. P. 285 (not required for athletic coaching minor).

355. Physical Education Instruction Strategies (2) I Analysis of alternative models of teaching physical education; research of teaching physical education; and systematic analysis of physical education teacher effectiveness. Open to majors only. P. 285, 394b or CR.

360. Functional Kinesiology (3) II Anatomical and mechanical factors affecting human movement, particularly in sport and exercise situations. Open to majors only. P. 159a-159b, 160a-160b, Math. 117R/ S. Atwater

361. Special Physical Education (3) I II Designed to provide the knowledge and experience necessary for the physical education and recreation of persons having various handicaps. Three hours per week of related experiences by arrangement required. P. Ecol. 159a-159b.

373. Physiological Basis of Physical Education and Athletics (3) I II Physiological responses and adaptations to physical activity in various populations and environments; emphasizes fitness evaluation and application of training principles to exercise and sport. P. or C. 103a-103b, 104a-104b. Ecol. 159a-159b, 160a-160b, Math. 117R/S. Roby

374. Physiological Basis of Physical Education and Athletics Laboratory (1) I I PH 373. Roby

377. Techniques in Prevention and Treatment of Athletic Injuries (3) I II Prevention, treatment, and rehabilitation of athletic injuries; practical experience in application of preventive taping and bandaging. P. Ecol. 159a-159b. Delforge

380. Scientific Foundations of Motor Learning (3) I I Introductory investigation of the nature of motor skill learning, including topics such as learning theory, neural basis, models of motor skill acquisition and factors which affect motor performance and learning. P. 360. Psy. 101. Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). Russell

381. Measurement and Evaluation (3) I II Tests and measurements in physical education; analysis techniques for test evaluation, test construction, and grading; experience with tests of fitness, sport skills, and sociometric measures. Munroe

385. Principles of Athletic Coaching (3) II Duties, responsibilities and ethics of the athletic coach; the role of interscholastic sport in public school settings with emphasis on administrative functional, liability, facilities coordination, and game and contest management. P. 8 units of 200- or 300-level Ex.S.S. course work. Baker

386. Administration of Interscholastic Athletics (2) I II Roles of athletics in secondary education, with emphasis on administrative philosophy, staff relations, business procedures, facilities, and the conduct of athletic events. Baker


401. Sport in Contempoary Society (3) I Study of contemporary sport from the perspectives of its personal, social, cultural, economic and educational dimensions. May be convened with 510. Russell

420. Exercise Physiology (3) I II Regulation and adjustment of physiological systems during acute exercise and adaptations with chronic exercise in various populations and environments; emphasizes physiological mechanisms. P. Chem. 103a-103b, 104a-104b. Ecol. 159a-159b, 160a-160b, Math. 117R/S, 118. Phys. 102a-102b. May be convened with 520. Fregosi

421. Exercise Physiology Laboratory (1) II P. CR, 420. May be convened with 521.

452. Teaching Physical Education in the Elementary School (3) I II Theory and methods of providing movement experiences for young children; emphasis placed upon curriculum development, methods of teaching, class organization, and management. Practical experiences at the elementary level. Open to majors only. P. 221, 231, 285, 350. Mize

460. Biomechanics of Human Movement (3) I II Analysis of human motion focusing on the mechanical interaction between the human body and the external environment. 2R, 3L. P. 373 or 420/520. Tipton/ Enoka/Fregosi/Henriksen/Kregel/Lohman/Seals


491. Preceptorship (3) I II P. 562. Enoka

502. Principles of Neuroanatomy (4) I II (Identical with Anat. 502)

510. Sport in Contemporary Society (3) I For a description of course topics, see 410. Graduate-level requirements include an in-depth research paper on one issue of contemporary sport. May be convened with 410. Russell

520. Exercise Physiology (3) I II For a description of course topics, see 420. Graduate-level requirements include a research-review paper on an approved topic. P. Chem. 103a-103b, 104a-104b. Ecol. 159a-159b, 160a-160b. Math. 117R/S, 118. May be convened with 420. Fregosi

521. Exercise Physiology Laboratory (1) I II Graduate-level requirements include additional laboratory reports. P. CR, 520. May be convened with 421.

525. Motor Learning and Human Performance (3) I Neuropsychological approach to the study of motor skill acquisition and learning variables affecting human potential for physical performance. Fairchild

527. Psychology of Sport and Exercise (3) I Examines the effects of motivation, personality, attitudes, competition and group dynamics on sport performance as well as the psychological effects of exercise, exercise adherence and exercise addiction. Williams

529. Psychological Interventions and Ergogenic Aids for Peak Performance (3) I The application and effectiveness of ergogenic aids, as well as psychological interventions, in enhancing performance. P. 528. Williams

530. Advanced Physiology of Exercise (4) I II Metabolic, cardiopulmonary, thermoregulatory, fluid-electrolyte, neuroendocrine, neuromuscular and various environmental factors which influence physiological adjustments to acute exercise and the physiological adaptations to chronic exercise. P. 373 or 420/520. Tipton/ Enoka/Fregosi/Henriksen/Kregel/Lohman/Seals

536. Administration of Sports Programs (3) I Designed to provide a theoretical framework for the study of sports management careers and others interested in various functions involved in the conduct of sport programs. Baker

545. Evaluation and Regulation of Body Build and Composition (3) I Laboratory and field assessment of body fat, lean body mass and somatotype; anthropometry; body build and composition of the athlete; morphology of fat and lean tissue; exercise and dietary regulation of obesity and chronic underweight. P. 373 and 374, or 420/520 and 421/521. Math. 117R/S. Lohman

550. Advanced Exercise Physiology Laboratory (3) I II Experiments designed to demonstrate basic concepts of physiological responses to exercise with emphasis on development of skills in laboratory instrumentation and techniques of research. P. 530. Roby/ Enoka/Fregosi/Henriksen/Kregel/Lohman/Seals

560. Biomechanics of Human Movement (3) I II For a description of course topics, see 450. Graduate-level requirements include a research-dissertation project. P. 380 or 462. Ecol. 159a-159b, 160a-160b. May be convened with 460. Atwater/Enoka.
571R. Lectures in Clinical Immunology and Immunohematology (3) [Rpt./1] I For a description of course topics, see 472R. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory serology or blood banking. P, consult committee before enrolling. May be convened with 472R.

572L. Fundamental Laboratory Techniques in Clinical Immunology and Immunohematology (1) [Rpt./1] I For a description of course topics, see 472L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical laboratory serology or blood banking. P, CR, 472R/572R, consult committee before enrolling. May be convened with 472L.

573R. Lectures in Clinical Chemistry (5) [Rpt./1] I For a description of course topics, see 473R. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory chemistry. P, consult committee before enrolling. May be convened with 473R.

573L. Fundamental Laboratory Techniques in Clinical Chemistry (1) [Rpt./1] I For a description of course topics, see 473L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical chemistry. P, CR, 473R/573R, consult committee before enrolling. May be convened with 473L.

574R. Lectures in Clinical Bacteriology (4) [Rpt./1] I For a description of course topics, see 474R. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory bacteriology. P, consult committee before enrolling. May be convened with 474R.

574L. Fundamental Laboratory Techniques in Clinical Bacteriology (1) [Rpt./1] I For a description of course topics, see 474L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical bacteriology. P, CR 474R/574R, consult committee before enrolling. May be convened with 474L.

575a-575b-575c. Topics in Clinical Microbiology (2-1-1) [Rpt./1] I For a description of course topics, see 475a-475b-475c. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory parasitology, virology, mycology or mycobacteriology. P, consult committee before enrolling. May be convened with 475a-475b-475c.

576. Principles of Laboratory Science (3) [Rpt./1] I For a description of course topics, see 476. Graduate-level requirements include a research paper on selected topics that focus on the use of statistical analysis for biological systems, or on selected topics relating to new techniques in body fluid analysis or urinalysis. P, consult committee before enrolling. May be convened with 476.

581. Clinical Laboratory Hematology (4) [Rpt./1] I For a description of course topics, see 481. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical hematology. P, 481, 471R/571R, 471L/571L, 472R/572L, 473R/573R, 473L/573L, 474R/574R, 474L/574L, 475a/575a, 475b/575b, 475c/575c, 476/576, 496a, consult committee before enrolling. May be convened with 481.

582. Clinical Laboratory Immunology and Immunohematology (5) [Rpt./1] I II For a description of course topics, see 482. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical serology or blood banking. P, 482, 471R/571R, 471L/571L, 472R/572L, 473R/573R, 473L/573L, 474R/574R, 474L/574L, 475a/575a, 475b/575b, 475c/575c, 476/576, 496a, consult committee before enrolling. May be convened with 482.

583. Clinical Laboratory Immunohematology (4) [Rpt./1] I II For a description of course topics, see 483. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical hematology. P, 483, 471R/571R, 471L/571L, 472R/572L, 473R/573R, 473L/573L, 474R/574R, 474L/574L, 475a/575a, 475b/575b, 475c/575c, 476/576, 496a, consult committee before enrolling. May be convened with 484.

History (HIST)

Social Sciences Building, Room 215 (602) 621-1586

Professors Michael Schaller, Head, Herman E. Bateeman (Emeritus), Gail Bernstein, Robert P. Bowers (Emeritus), Paul A. Carter, Richard A. Cosgrove, Leonard Dinnerstein, James Donohoe (Emeritus), Harwood Hinton (Emeritus), Ursula Lamb (Emerita), Oscar Martinez, John V. Mering, Michael C. Meyer, Roger L. Nichols, Heiko A. Oberman, Jerry Gregory Oswald (Emeritus), Thomas W. Parker (Emeritus), Boyd Shaper (Emeritus), Robert Vignery, Donald Weinstein


Assistant Professors Bert Barickman, John Campbell, Linda Darling, Kevin Gosner, Tessa Liu, Patrick Miller, Laura Tabili, Douglas Weiner

Lecturer William R. Noyes

The Department of History offers courses designed to provide broad perspectives on the human past, with more specialized instruction in particular areas and periods, and with theoretical and practical training in historical research. The department offers the degrees of Bachelor of Arts, Master of Arts and Doctor of Philosophy with a major in history. A Bachelor of Arts in Education and a Master of Education
with a teaching major in history are also available. For information on graduate degrees, please see the Graduate Catalog.

The major: 33 units, including 396a, 3 units in a course dealing with the period before 1500, and 6 units in three of the following areas: United States, Latin America, Europe, Asia, and comparative. No fewer than 18 units must be upper-division. No more than 3 units of independent study or 6 units of internship may be applied toward the major. If a student takes more than 9 units of history courses to fulfill the Study Area requirements in General Education, he or she may count those hours beyond nine toward the history major.

The supporting minor should be selected from foreign languages, the humanities, the social sciences, and other subjects as may be individually justified.

The teaching minor: 21 units, including 101, 102, 106, 107, one upper-division United States history course, and two other history courses. The department participates in the honors program.

101. History of Western Civilization: Backgrounds and Formation to 1648 (3) GRD I S The western heritage of ideas, values, and artistic expression in interaction with economic, social, and political processes and experiences.

102. History of Western Civilization: Emergence of the Modern World - Since 1648 (3) GRD II S The western heritage of ideas, values, and artistic expression in interaction with economic, social, and political processes and experiences.

103. Topics in Civilization (3) I II [Rpt. 9 units] Topical approaches (e.g., slavery, imperialism) to issues in civilization.

107. History of the United States from 1877 to 1977 (3) I II CDT Political, economic, and social history of the American people from the founding of colonial Jamestown to 1877.

108. History of the United States from 1877 to the Present (3) I II CDT Political, economic, and social history of the American people from the end of Reconstruction to the present.

117. History of England to 1603 (3) I Survey of English history from pre-history to 1603, with emphasis on legal and constitutional history.

118. History of England from 1603 to the Present (3) II Survey of English history from 1603 to present, with emphasis on political and social history.

119. Colonial Latin America (3) I Survey of the history of Spanish America and Brazil from the Age of Discovery to Independence.

120. Modern Latin America (3) II Survey of Latin American history from Independence to the present.

121. Indian Civilization (3) (Identical with N.E.S. 170)

122. Ancient Civilizations of the Near East (3) I (Identical with N.E.S. 171)

123. Islamic Civilization: Traditional and Modern Middle East (3) II (Identical with N.E.S. 172)

124. Chinese Civilization (3) I (Identical with Chin. 174)

204. Ancient History: Greek History (3) I A political, social and cultural history of Greek civilization from the Bronze Age to the death of Alexander the Great. (Identical with Clas. 204)

205. Ancient History: Roman History (3) II A survey of Roman civilization from the founding of the monarchy to the emperors of Constantine the Great. (Identical with Clas. 205)

214a-214b. European Cultural History (3-3) 214a: Ancient Europe to Absolutism. 214b: Age of Revolution to Present. 214a is not prerequisite to 214b.

223. History of the Mexican American (3) I Survey from the 16th century to the present, with emphasis on social, political and economic trends in their historical context. (Identical with M.A.S. 233)

226. Indians in U.S. History (3) History of Indians in U.S. development from 1500 to the present with emphasis on relations between competing Indian groups and between Indians and whites.

244. Western America (3) Survey of the patterns of American expansion and settlement in the western United States.

245. Frontier America (3) Survey of the patterns of frontier expansion and settlement in the western United States.

253a-253b. History of Women in the United States (3) Changing role of women in American society from colonial times to the present. (Identical with W.S. 253a-253b)

270. Modern East Asia: A History (3) II (Identical with E.A.S. 270)

271. The History of Christianity (3) S The history of Christianity is presented with its many shifts, shadows and differing stages, from the Apostles' Council in 48, through Vatican II (1962-65). (Identical with Rel. 271)

272. Japanese Civilization (3) I The study of the evolution of Japanese social values, aesthetic expression, religion, and political institutions in order to understand Japan's cultural heritage and contemporary society. (Identical with Jpn. 272)

312. Economy and Society in Historical Discourse (3) I Compares historical narratives about economic theories in their contexts.

315. United States Military History (3) I Survey of American wars from colonial times to the present; military institutions, doctrine, application of the principles of war, campaign strategies and tactics, technology, and leadership.


317. History of Modern Ireland (3) II 1992-93 Survey of Irish history from the Union in 1800 to the present; the course will emphasize the political, cultural, and religious bases of Irish history.

318. English Legal and Constitutional History (3) I II 1992-93 Survey of the origins and development of the English common law from the Anglo-Saxons to the present.

322. Vietnam and the Cold War (3) S Causes and effects of America's longest war in light of global U.S.-Soviet rivalry and Asian nationalism.

339. Cultural Traditions, Technology and Business (3) Traces the technological aspects of North Atlantic civilization and culture with emphasis on the role of technology in nineteenth and twentieth century capitalist development.

347. The Old South (3) Social, economic, cultural and political history from Jamestown to Secession. (Identical with A.A.S. 347)

348. The South Since the Civil War (3) From the Civil War to the present. (Identical with A.A.S. 348)

351. Race and Class in Latin America (3) I The impact of commercial expansion, urbanization, industrialization, and ideological change on race and class relations in Latin America from the 18th to early 20th century. (Identical with A.A.S. 351 and L.A.S. 351)

361. The U.S.-Mexico Border Region (3) I Evolution of the borderlands since the mid-nineteenth century, with emphasis on binational interaction and interdependence. (Identical with M.A.S. 361)

368. Colonial Mexico (3) I From discovery through the War for Independence. (Identical with L.A.S. 368 and M.A.S. 368)

369. Mexico Since Independence (3) II Struggle for political, economic and social stability; international relations, cultural patterns. (Identical with L.A.S. 369 and M.A.S. 369)


372a-372b. History and Religion of Israel in Ancient Times (3-3) (Identical with Ju.S. 372a-372b)

374. The Holocaust (3) II 1992-93 Socioeconomic and intellectual roots of modern antisemitism, evolution of Nazi policy, the world of death camps, responses of Axis and Allied governments, and responses of the Jews. (Identical with Ju.S. 374 and Reli. 374)

375. History of China (3-3) (Identical with Chin. 375)

376. History of China (3-3) (Identical with Chin. 376)

396. Proseminar a. Nature and Practice of History (3) I II Open to majors only; exception by permission of department. Writing-Emphasis Course.

396H. Honors Proseminar (3) I

401. Ancient Mesopotamia (3) I (Identical with Anth. 401) May be convened with 501.

403a-403b. History of Greece (3-3) 403a: From prehistoric times to the outbreak of the Peloponnesian War. 403b: From the outbreak of the Peloponnesian War to the end of the Hellenistic Age. 403a is not prerequisite to 403b. (Identical with Clas. 403a-403b)

404a-404b. History of Rome (3-3) 404a: The Republic to the death of Caesar. 404b: The Empire through the reign of Constantine the Great. 404a is not prerequisite to 404b. (Identical with
can interaction with Japan and China since the Opium Wars, with special attention given to economic, cultural, and military relations and conflicts. P. 3 units of any history course. (Identical with E.A.S. 451) May be convened with 551.

452. American Ethnic History (3) II A history of the various ethnic minorities in America from Colonial times to the present, with emphasis on acculturation and degrees of assimilation. P. 3 units of any history course. (Identical with A.A.S. 452) May be convened with 552.

453. History of Women and Work (3) I History of women and work in western and non-western nations from prehistoric times to the present. P. 3 units of any history or women's studies course. (Identical with W.S. 453) May be convened with 553.

454. Spanish Inquisition (3) I The Inquisition in Spanish, European, and ethnic history; its bureaucrats and procedures; its festivities, its victims; New and Old Christians, and witches. (Identical with J.U.S. 454 and Reli. 454)

455. Central America: From Colonialism to Revolution (3) II Social, economic, and political history of Central America from colonial period to the present focusing on the origins of contemporary crisis. (Identical with L.A.S. 456) May be convened with 555.

457. The Mexican Revolution (3) I A detailed examination of Mexico's social upheaval of 1910, and its implications for contemporary Mexican society. Offered in Guadalajara only. May be convened with 557.

458. Feminism: A Comparative History (3) II International history of feminism as an ideology and a political movement from the 17th century to the present. P. 3 units of any history or women's studies course. (Identical with W.S. 458) May be convened with 558.

462. Intellectual History of Latin America and a political movement from the 17th century to the present focusing on the origins of contemporary crisis. (Identical with L.A.S. 462) May be convened with 562.

465. History of Spain (3) I II History of Spain from remote times to the present; emphasis on the period from 1492, Spain's role in the world and the Spanish Civil War; Spain's cultural contributions. May be convened with 565.

466. History of Brazil (3) II History of Brazil from 1500 to the present. (Identical with L.A.S. 466) May be convened with 566.

467. Contemporary Latin America (3) I Revolution, social change and reaction in Latin America from 1930 to the present. P. junior or senior standing. (Identical with L.A.S. 467) May be convened with 567.

468a-468b. Asia and the West (3-3) 1991-92 Processes of interaction between Europeans and the peoples and cultures of the Middle East, South Asia, and East Asia, from the Portuguese explorations to the present. (Identical with N.E.S. 468a-468b) May be convened with 568a-568b. Writing-Emphasis Course* for general major.

469. History of Women in Latin America (3) II Women's history in Latin America from the Conquest to the present. P. junior or senior standing and 3 units of any lower-division Latin American history or women's studies course. (Identical with L.A.S. 469 and W.S. 469) May be convened with 569.

470. Religious History of India (3) Development of major religious traditions of South Asia: Vedic Religion, Buddhism, Jainism, Hinduism, Sikhism, and Islam. (Identical with N.E.S. 470) May be convened with 570.

472. History of Medieval India (3) I Survey of Indian history from the 7th century to 1750. (Identical with N.E.S. 472) May be convened with 572.

473. History of Modern India and Pakistan: 1750-Present (3) II Survey of political, social, and economic developments in South Asia from the mid-18th century to the present. (Identical with N.E.S. 473) May be convened with 573. Writing-Emphasis Course* for India-Pakistan specialization.

474a-474b-474c. History of Japan (3-3-3) Social, cultural, economic and political history of Japan. 474a: From earliest times to 1500. 474b: 1500-1800. 474c: 1800-present. (Identical with Jpn. 474a-474b-474c) P. junior or senior standing and 3 units of any history. Japanese, Japanese or East Asian studies course. May be convened with 574a-574b-574c. 474a-474b-474c are Writing-Emphasis Courses* for Japan specialization.

475a-475b-475c-475d-475e. Periods in Chinese History (3-3-3-3-3) (Identical with Chn. 475a-475b-475c-475d-475e) May be convened with 575a-575b-575c-575d-575e.

476. Modern Chinese History (3) (Identical with Chn. 476) May be convened with 576.

477a-477b. History of the Middle East (3-3) (Identical with N.E.S. 477a-477b) May be convened with 577a-577b.

478. Modern History of the Middle East (3) I (Identical with N.E.S. 478) May be convened with 578.

479. The Ottoman Empire to 1800 (3) II 1991-92 History of Ottoman Empire from its origins through the direct Western European impact, focusing on the political and social history of the empire in Europe and Asia. May be convened with 579.

482. Social History of China (3) (Identical with Chn. 482) May be convened with 582.

488. History of Byzantium (3) II Political, social, and cultural history of Byzantium from A.D. 325 to 1453, including the Byzantine legacy in Europe and the Middle East. (Identical with Clas. 488 and Reli. 488) May be convened with 588.

489. Women in East Asia (3) I Women in traditional China and Japan; analysis of changes occurring in the modern period. P. junior or senior standing. (Identical with E.A.S. 489 and W.S. 489) May be convened with 589.

490. Philosophy of History (3) I Introduction to historical thinking from antiquity to the present, with emphasis on ideas in European and North American historical writings during the modern and contemporary eras. May be convened with 590.

492. History of Sufism (3) II Origin and development of Sufism and its impact on the Muslim and non-Muslim worlds. (Identical with N.E.S. 492) May be convened with 592.

495. Colloquium (3) A. Studies in Early Europe (3) [Rpt./] I II P. one semester of history.

b. Studies in Black America (3) II (Identical with A.A.S. 495b)

d. Latin American Studies Special Topics (3) [Rpt./] I (Identical with L.A.S. 495d, which is home) May be convened with 595d.

e. Chinese History Since 1949 (3) I II (Identical with Chn. 495r, which is home) May be convened with 595r.

*Writing-Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)

501. Ancient Mesopotamia (3) I (Identical with Anth. 501) May be convened with 401.

504a-504b. History of Rome (3-3) For a description of course topics, see 404a-404b. Graduate-level requirements include an additional in-depth research paper. May be convened with 404a-404b.

505a-505b. Medieval Europe (3-3) For a description of course topics, see 405a-405b. Graduate-level requirements include additional work with primary and foreign-language secondary sources. May be convened with 405a-405b.

506. Medieval England (3) II For a description of course topics, see 406. Graduate-level requirements include additional work with primary and foreign-language secondary sources. May be convened with 406.

507a-507b. Intellectual History of Medieval Europe (3-3) II For a description of course topics, see 407a-407b. Graduate-level requirements include additional work with primary and foreign-language secondary sources. May be convened with 407a-407b.

509. The Renaissance (3) I For a description of course topics, see 409. Graduate-level requirements include an in-depth research paper. May be convened with 409.

510. The Reformation (3) II For a description of course topics, see 410. Graduate-level requirements include additional work with primary and foreign-language secondary sources. May be convened with 410.

511. European Social and Intellectual History to 1750 (3) I For a description of course topics, see 411. Graduate-level requirements include more advanced readings and an in-depth research paper. May be convened with 411.

512. European Intellectual History: 1750 to 20th Century (3) II For a description of course
topics, see 412. Graduate-level requirements include an in-depth research paper. May be convened with 412.

513. War and Peace in Europe (3) I For a description of course topics, see 413. Graduate-level requirements include an in-depth research paper. May be convened with 413.

514. Cultural History of Germany to 1714 (3) I For a description of course topics, see 414. Graduate-level requirements include a research paper. May be convened with 414.

515. Cultural History of Germany 1714 to 1899 (3) I For a description of course topics, see 415. Graduate-level requirements include a research paper. May be convened with 415.

516. Tudor-Stuart England (3) I For a description of course topics, see 416. Graduate-level requirements include a research paper. May be convened with 416.

517. History of Modern Britain (3) I For a description of course topics, see 417. Graduate-level requirements include a paper on the historiography of a problem currently debated by historians writing on this period. May be convened with 417.

518. France under the Old Regime, 1589-1789 (3) I For a description of course topics, see 418. Graduate-level requirements include substantial additional independent reading. May be convened with 418.

519. The French Enlightenment (3) I For a description of course topics, see 419. Graduate-level requirements include substantial additional independent reading. May be convened with 419.

520. The French Revolution and Napoleon (3) I For a description of course topics, see 420. Graduate-level requirements include substantial additional independent reading. May be convened with 420.

521. History of Russia: Early Period (3) I For a description of course topics, see 421. Graduate-level requirements include a research paper. May be convened with 421.

522. History of Russia: Modern Period (3) I For a description of course topics, see 422. Graduate-level requirements include a research paper. May be convened with 422.

523. Intellectual History of Russia (3) I For a description of course topics, see 423. Graduate-level requirements include a research paper. May be convened with 423.

524. The Russian Revolutions (3) I For a description of course topics, see 424. Graduate-level requirements include a research paper. May be convened with 424.

525. History of the Soviet Union (3) I For a description of course topics, see 425. Graduate-level requirements include a research paper. May be convened with 425.

531. Colonial America (3) I For a description of course topics, see 431. Graduate-level requirements include different, additional reading and reports thereon. May be convened with 431.

532. The Era of the American Revolution (3) I For a description of course topics, see 432. Graduate-level requirements include different, additional reading and reports thereon. May be convened with 432.

533. Jefferson and the New Nation, ca. 1789-1828 (3) I For a description of course topics, see 433. Graduate-level requirements include an additional, substantial research of historiographical paper, to be decided on in consultation with the instructor. May be convened with 433.

534. Jacksonian Era, 1828-1856 (3) I For a description of course topics, see 434. Graduate-level requirements include an additional, substantial research or historiographical paper, to be decided on in consultation with the professor. May be convened with 434.

535. The Coming of the Civil War, U.S. 1845-1861 (3) I For a description of course topics, see 435. Graduate-level requirements include a research exercise. May be convened with 435.

536. Civil War and Reconstruction, U.S. 1861-1878 (3) II For a description of course topics, see 436. Graduate-level requirements include a research exercise. May be convened with 436.

537. U.S. 1876-1919 The Gilded Age and Progressive Era (3) For a description of course topics, see 437. Graduate-level requirements include an in-depth research paper. May be convened with 437.

538. U.S. 1918-1945 From World War I through World War II (3) For a description of course topics, see 438. Graduate-level requirements include taking examinations which consist entirely of essay questions, completing a research paper on a topic chosen in consultation with the professor, assisting the professor in leading discussion groups with undergraduates, and possibly presenting a lecture to the class if the student is nearing completion of graduate work. May be convened with 438.

540. United States: 1945 to Present (3) I For a description of course topics, see 440. Graduate-level requirements include an in-depth research paper on a topic approved by the professor. May be convened with 440.

541. U.S. Economy in the Global Economy (3) For a description of course topics, see 441. Graduate-level requirements include an in-depth research paper on a topic chosen in consultation with the professor. May be convened with 441.

542. History of American Society and Thought: Pre-Civil War (3) I For a description of course topics, see 442. Graduate-level requirements include an in-depth research paper. May be convened with 442.

543. History of American Society and Thought Since the Civil War (3) II For a description of course topics, see 443. Graduate-level requirements include an in-depth research paper. May be convened with 443.

546. History of Arizona (3) I For a description of course topics, see 446. Graduate-level requirements include an in-depth research paper on a pertinent topic. May be convened with 446.

549. History of American Foreign Relations to 1914 (3) I For a description of course topics, see 449. Graduate-level requirements include an in-depth research paper and additional course readings. May be convened with 449.

550. History of American Foreign Relations since 1914 (3) I For a description of course topics, see 450. Graduate-level requirements include an in-depth research paper and additional course readings. May be convened with 450.

551. The United States and East Asia: 1840 to the Present (3) I For a description of course topics, see 451. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 451.

552. American Ethnic History (3) I For a description of course topics, see 452. Graduate-level requirements include writing a lengthy research paper demonstrating a familiarity with basic secondary works as well as investigating primary sources on a pertinent topic. May be convened with 452.

553. History of Women and Work (3) I For a description of course topics, see 453. Graduate-level requirements include writing a lengthy research paper that will use primary materials and demonstrate familiarity with secondary materials on their topic. May be convened with 453.

555. Central America: From Colonialism to Revolution (3) I For a description of course topics, see 455. Graduate-level requirements include an extra four-page book review and a ten-page research paper. (Identical with L.A.S. 556) May be convened with 456.

556. The Mexican Revolution (3) I For a description of course topics, see 457. Graduate-level requirements include extra readings and an in-depth research paper. Offered in Guadalajara only. May be convened with 457.

558. Feminism: A Comparative History (3) I For a description of course topics, see 458. Graduate-level requirements include writing a lengthy research paper that will use primary materials and demonstrate familiarity with secondary materials on their topic. May be convened with 458.

559. History of Books and Printing (3) I (Identical with L.I.S. 559)

562. Intellectual History of Latin America Since 1810 (3) I For a description of course topics, see 462. Graduate-level requirements include a series of short research papers based on primary sources from the intellectual history of Latin America. May be convened with 462.

563. Asian Marxism (3) I (Identical with E.A.S. 563) May be convened with 463.

564. History of Argentina (3) I For a description of course topics, see 464. Graduate-level requirements include an in-depth research paper on an approved topic. (Identical with L.A.S. 564) May be convened with 464.

565. History of Spain (3) I For a description of course topics, see 465. Graduate-level requirements include a research paper on a topic chosen in consultation with the professor. May be convened with 465.

566. History of Brazil (3) I For a description of course topics, see 466. Graduate-level requirements include a paper on the role of Carlos Lacerda. (Identical with L.A.S. 566) May be convened with 466.

567. Contemporary Latin America (3) I For a description of course topics, see 467. Graduate-level requirements include an in-depth paper on
a topic approved by the instructor. (Identical with L.A.S. 567) May be convened with 467.

568a-568b. Asia and the West (3-3) 1991-92 For a description of course topics, see 468.
Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. (Identical with L.A.S. 569) May be convened with 468a-468b.

569. History of Women in Latin America (3) For a description of course topics, see 470.
Graduate-level requirements include additional research or writing; see instructor for details. (Identical with N.E.S. 568a-568b) May be convened with 468a-468b.

570. Religious History of India (3) For a description of course topics, see 470.
Graduate-level requirements include additional research or writing; see instructor for details. (Identical with N.E.S. 570) May be convened with 470.

572. History of Medieval India (3) 1991-92
For a description of course topics, see 472.
Graduate-level requirements include additional research or writing; see instructor for details. (Identical with N.E.S. 572) May be convened with 472.

573. History of Modern India and Pakistan: 1750-Present (3) II For a description of course topics, see 473.
Graduate-level requirements include additional research or writing; see instructor for details. (Identical with N.E.S. 573) May be convened with 473.

574a-574b-574c. History of Japan (3-3-3) For a description of course topics, see 474a.
Graduate-level requirements include an additional research paper. (Identical with Jpn. 574a-574b-574c). May be convened with 474a-474b-474c.

575a-575b-575c-575d-575e. Periods in Chinese History (3-3-3-3-3) (Identical with Chn. 575a-575b-575c-575d-575e) May be convened with 475a-475b-475c-475d-475e.

576. Modern Chinese History (3) (Identical with Chn. 576) May be convened with 476.

577a-577b. History of the Middle East (3-3) (Identical with N.E.S. 577a-577b) May be convened with 477a-477b.

578. Modern History of the Middle East (3) (Identical with N.E.S. 578) May be convened with 478.

579. The Ottoman Empire to 1800 (3) II 1991-92
For a description of course topics, see 479.
Graduate-level requirements include an in-depth research paper. May be convened with 479.

582. Social History of China (3) (Identical with Chn. 582) May be convened with 482.

588. History of Byzantium (3) II For a description of course topics, see 488.
Graduate-level requirements include a research paper. (Identical with Chs. 588) May be convened with 488.

589. Women in East Asia (3) II For a description of course topics, see 489.
Graduate-level requirements include an additional research paper. (Identical with E.A.S. 589) May be convened with 489.

590. Philosophy of History (3) I For a description of course topics, see 490.
Graduate-level requirements include a research paper. May be convened with 490.

592. History of Sufism (3) II For a description of course topics, see 492.
Graduate-level requirements include an additional research paper on a topic selected in consultation with the professor. (Identical with N.E.S. 592) May be convened with 492.

c. Advanced Studies in European History (3) [Rpt./10] I I[d. Latin American Studies Special Topics (3) [Rpt./1] (Identical with L.A.S. 595d, which is home) May be convened with 495d.
e. Advanced Studies in the History of Women (3) [Rpt./10] I II GRD (Identical with W.S. 595e)
f. Advanced Studies in Ancient History (3) [Rpt./10] II Consult department before enrolling. (Identical with Clas. 595f)
f. Chinese History Since 1949 (3) II (Identical with Chn. 595r, which is home) May be convened with 495r.

h. Nineteenth-Century Europe (3) [Rpt./10] I II
i. Twentieth-Century Europe (3) [Rpt./10] I II
j. Colonial Latin America (3) [Rpt./10] I II (Identical with L.A.S. 596i)
k. Latin America: Modern Period (3) [Rpt./10] I II (Identical with L.A.S. 596j)
l. Historical Writing and Editing (3) [Rpt./10] I II
m. Mexican-American Heritage Bibliography — A Library Seminar (3) [Rpt./10] I (Identical with M.A.S. 596m, which is home)

598. History and Philosophy of Science (HPSC) Social Sciences Building, Room 213 (602) 621-3120 Committee on History and Philosophy of Science (Graduate)
Professors Henry C. Byerly (Philosophy), Chair, Robert M. Harnish (Philosophy and Linguistics), William A. Longacre (Anthropology), Richard E. Michod (Ecology and Evolutionary Biology)

History and Philosophy of Science (Graduate)
History of science deals with the origins and development of the human quest for understanding of the world in which we live. Philosophy of science treats the logical analysis of scientific reasoning, the clarification of fundamental scientific concepts, and methodological problems common to many fields of inquiry.

The committee offers a Doctor of Philosophy minor in the history and philosophy of science. For admission and degree requirements, please see the Graduate Catalog.

Home Economics
(See Family and Consumer Resources)

Honors Center (HONR)
Slonaker House (602) 621-6901 Clifford M. Lytle, Director

The Honors Center provides special opportunities to those students who demonstrate the highest levels of creativity, curiosity, maturity, and academic achievement. Responsibility for the program is shared between academic departments and the Honors Center. Departments generally assume responsibility for those courses which are endemic to their respective disciplines while the Honors Center participates in this joint venture by offering seminars and colloquia that are broader, often interdisciplinary in focus, and by exposing students to a variety of noncredit, cultural opportunities designed to enrich campus life.

In the Schedule of Classes students receive prior to registration, all honors courses are identified by the suffix "H" attached to the course number (History 106H) or to a section designation positioned under the course number (History 106, section 5H). Honors courses are reserved exclusively for honors students. Course offerings sponsored by the Honors Center and the participating academic departments include, but are not limited to, those listed below. It is important to note that, in order to develop an appropriate blend of honors offerings, these courses may not be offered every semester or year. Students should check the Schedule of Classes each semester to determine if a specific course is available.

Honors Center Courses

280H. * Student Planning Board (2) I II Open to select students interested in working in the Honors Program organization. Prior permission required.

295H.* Honors Colloquium (1-3) I II Small group discussions exploring special topics. Open to all Honors students.

391H. * Honors Preceptorship (1-3) I II Open to select upper-division students interested in gaining teaching or practical experience in a department. (Prior permission required.)

396H. * Honors Prospective Seminar (3) I II A small, interdisciplinary class focusing on specialized topics.

*Certain colloquia and seminars in other departments may be used for history graduate credit.
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399H.* Honors Independent Study (1 -3) I II
Open to selected students who wish to work independently under the supervision of a faculty member.

*The above courses are available only to members of the Honors Program.

Department Course Offerings

Anatomy

Independent laboratory opportunities available.

Anthropology

102.* Introduction to Cultural Anthropology (3) I
111.* Exploring Physical Anthropology (3) II
396H. Honors Proseminar (3) II

Art

118*. Survey of World Art (3) I
396H. Honors Proseminar (3) (offered alternatively with Music and Drama).

Biochemistry

182.* Introductory Biology II (4) II
Additional independent laboratory opportunities are available.

Chemistry

105a -105b. Honors Fundamentals of Chemistry (4 -5) I II
242a -242b. Honors Lectures in Organic Chemistry (3-3) I II
396H. Honors Proseminar (3) II

Civil Engineering

196H. Honors Proseminar (1) I II
214.* Statics (3) I II
217.* Mechanics of Materials (3) I II
Additional independent research opportunities available.

Classics

396H. Honors Proseminar (3) I

Communication

396H. Honors Proseminar (3) I

Ecology and Evolutionary Biology

182.* Introductory Biology II (4) II
Additional independent laboratory opportunities available.

Economics

201a-201b.* Principles of Economics (3-3)
332.* Aggregate Economic Analysis (3) I II
361.* Intermediate Price Theory (3) I II
396H. Honors Proseminar (3) II
441.* International Trade Theory (3) II
442.* International Economics (3) I

460.* Economic Organization and Government Policy (3) I
461.* Economics of Regulated Industry (3) II
481.* Economics of Wage Determination (3) I

Engineering and Mines

101. Problem Solving Using Computers (3) I II

English

103H. Freshman Composition (3) I II
104H. Freshman Composition (3) I II
109H. Advanced Freshman Composition (3) I II
495. Colloquium
   a. Honors for Juniors (3) II
   b. Honors for Seniors (3) I II

Fine Arts

207.* Western Civilization and the Arts: The 20th Century (3) I II
307.* Western Civilization and the Arts: Paleolithic Through Renaissance (3) I
317.* Western Civilization and the Arts: Baroque Through 19th Century (3) II

French

201, 202.* Intermediate French (4-4)
396H. Honors Proseminar (3) I II

Geosciences

101, 102. Introduction to Geology (3-3)
103, 104.* Introduction to Geology Laboratory (1-1)
391H. Honors Preceptorship (1-3) I II
396H. Honors Proseminar (3) I

History

101.* History of Western Civilization: Backgrounds and Formation to 1648 (3) I II
106.* History of the United States from 1607-1877 (3) II
396H. Honors Proseminar (3) I

Humanities

250a-250b-250c.* Introduction to Humanities (4-4-4)
396H. Honors Proseminar (3) II

Journalism

396H. Honors Proseminar (3) II

Management and Policy

396H. Honors Proseminar (3) I

Management Information Systems

396H. Honors Proseminar (3) II

Mathematics

125b.* Calculus (3) II

Microbiology and Immunology

181.* Introductory Biology I (4) I
182.* Introductory Biology II (4) II
396H. Honors Proseminar (1-3) II
Additional independent laboratory opportunities available.

Molecular and Cellular Biology

181.* Introductory Biology I (4) I
182.* Introductory Biology II (4) II
Additional independent laboratory opportunities available.

Music

107.* Survey of Music (3) I
108.* Survey of Music (3) II
396H. Honors Proseminar (3) I

Nursing

379.* Analysis of Nursing Problems (2) I II
388.* Issues in Nursing and Health Care Delivery (2) I II
389.* Research Methods in Nursing (2) I II
393H. Honors Internship (3-6) S for 10-12 weeks
396H. Honors Proseminar (1-3) I II

Nutrition and Food Science

396H. Honors Proseminar (3) I

Philosophy

111.* Introduction to Philosophy (3) I
113.* Introduction to Moral and Social Philosophy (3) II
396H. Honors Proseminar (3) I

Physics

110.* Introductory Mechanics (4) I II
116.* Introductory Electricity and Magnetism (4) I II
396H. Honors Proseminar (3) II

Political Science

102.* American National Government (3) I
250.* Contemporary National Politics (3) II
396H. Honors Proseminar (3) I II

Psychology

101.* Introduction to Psychology (3) I II
396H. Honors Proseminar (3) I

Russian and Slavic Languages

101a-101b.* Elementary Russian (4-4)
201a-201b.* Intermediate Russian (4-4)
396H. Honors Proseminar (3) I

Sociology

100.* Introduction to Sociology (3) I II
396H. Honors Proseminar (3) I
Theatre Arts

140a-140b. * History of Theater and Drama in Western Civilization (3-3)
396H. Honors Proseminar (3) II

Women's Studies

396H. Honors Proseminar (3) I

*Honors section available. Consult Schedule of Classes for information.

Other Honors Courses

In addition to the courses listed above, all departments and colleges participating in the Honors Center offer the following standardized courses (available only to students who are members of the Honors Center):

199H. Honors Independent Study
Grades available A-B-C-D-E-I-W.

299H. Honors Independent Study
Grades available A-B-C-D-E-I-W.

399H. Honors Independent Study
Grades available A-B-C-D-E-I-W.

499H. Honors Independent Study
Grades available A-B-C-D-E-I-W.

498H. Honors Thesis (3) [Rpt./6 units]
An honors thesis is required of all students graduating with honors. Students ordinarily sign up for this course as a two-semester sequence. The first semester the student performs research under the supervision of a faculty member; the second semester the student writes an honors thesis. Grades available A-B-C-D-E-I-W.

Individual departments frequently offer honors courses in addition to those listed above. Information on these specific programs may be obtained from the Honors Center or from the respective college honors advisors.

In order to graduate with honors, a student must: (1) maintain and graduate with a 3.5 grade-point average, (2) complete 30 units in university-wide, college, or departmental honors courses (18 units if entering as a junior or senior), (3) complete both semesters of 498H as part of the 30-unit honors requirement, and (4) submit a completed honors thesis to the Honors Center prior to graduation. The format of the program is structured such that a student can fulfill the academic honors requirements by enrolling in at least one honors course each semester, plus completing the required 498H sequence (6 units).

Humanities (HUM)
TKE Building, Room 201
(602) 621-3933

Professor Ingeborg M. Kohn, Director
Senior Lecturers Donna E. Swaim, Bella Zweig
Lecturers Ann Kerwin, Mark Luprecht, Richard Poss, Susan Scaff, Richard H. Wilkinson

The Humanities Program provides interdisciplinary courses designed to deepen consciousness of ethical and aesthetic concerns pertinent to human experience from ancient times to the present. These courses explore essential questions about being human and living a satisfying personal and public life.

The Humanities Program offers a 21-22 unit concentration for the interdisciplinary studies major as follows: 250a, 250b, 250c, 260; and 9 to 10 units from the following: 310, 330, 355, 396H, 451, 489H (Honors Thesis in Humanities), a 300- or 400-level literature course, and a 400-level course in Art History or Philosophy. Grades available A-B-C-D-E-I-W.

The Humanities Program participates in the Honors Program.

250a-250b-250c. Introduction to Humanities (3-3-3) 250a: Major Ancient Cultures, from the Sumerian through the early Christian, with emphasis on the Greek I P, 6 units in freshman composition or CR Engl. 103H or 104H. 250b: European Culture, from the Medieval Period through the Enlightenment I I P, 6 units in freshman composition or CR Engl. 103H or 104H. (250c is not a prerequisite to 250b.) 250c: The Modern World: Eighteenth, Nineteenth and Twentieth Centuries I I I P, 250a or 250b; or Hist. 101 and 102.

260. Intercultural Perspectives (3) I I S Cultural, literary, and artistic contributions of Afro-Asian-, Hispanic-, and Native-American men and women to American civilization. Traces roots in the past, but emphasizes modern works. P, 6 units in English Composition.

310. Voyage of Discovery (3) S Small group (8-14) travel to cultural centers of Europe to experience major works of art and architecture studied in 250a-250b-250c and 355. P, 6 units in interdisciplinary humanities.

330. Women in Antiquity (3) (Identical with Clas. 330)

355. Contemporary Complexities (4) I II S An interdisciplinary survey of contemporary culture and its roots as expressed in literature, art, and philosophy. Field trips. P, 250a or 250b or 250c. May be repeated with departmental approval.

396H. Honors Proseminar (3) II

451. Science and the Humanities (3) [Rpt./1] II Interrelationships between the works of a scientist or a school of scientists and contemporary culture and/or the arts. Emphasis varies. P, completion of Western Civilization requirement.

452. Ancient Egypt: Culture/Language (3) II Examination of the culture of ancient Egypt through an introduction to hieroglyphics and study of selected inscriptions and texts. Topics include Egyptian kingship, art, literature, and religion.

Hydrology and Water Resources (HWR)
Geology Building, Room 122
(602) 621-5082

Professors Soroosh Sorooshian, Head (Systems and Industrial Engineering), Nathan Buras, Donald R. Davis, Stanley N. Davis (Geosciences), Robert E. Dickinson (Atmospheric Physics, Tree Ring Lab), Lucien Duckstein (Systems and Industrial Engineering), Daniel D. Evans (Emeritus), Martin M. Fogel (Watershed Management), John W. Harshbarger (Emeritus), Richard H. Hawkins (Watershed Management), Simon Ince (Civil Engineering), Austin Long (Geosciences), William B. Lord, Thomas Maddock III, Shlomo P. Neuman, Eugene S. Simpson (Emeritus), Ernest T. Smerdon (Civil Engineering)

Associate Professors Roger C. Bales, Randy L. Bassett, Michael D. Bradley

Assistant Professors Martha H. Conklin, Dara Entekhabi, Michael J. Sully, T-C. Jim Yeh

Hydrology and water resources include the origin, distribution, and properties of the waters of the Earth, as well as the development and management of water resource systems for multiple purposes. The faculty offers competence in hydrogeology, hydrogeochemistry, environmental hydrology, ground-water and surface-water hydrology, hydroclimatoloy, water quality, mathematical and statistical methods in hydrology (including numerical modeling), and water resources planning, management and administration.

The department offers the Bachelor of Science in Hydrology and the Master of Science and Doctor of Philosophy degrees with majors in both hydrology and water resources administration. See College of Engineering and Mines section of this catalog for the undergraduate requirements. For information regarding graduate degrees, please see the Graduate Catalog.

The department participates in the honors program.

101a-101b. Water and the Environment (4-4) Relation of physical and biological sciences to the understanding of the water cycle; man's impact on water resources, with emphasis on factors affecting the availability and quality of water in arid and humid regions. 3R, 3L. Field trips. 101a is not prerequisite to 101b. Open to nonmajors only. Clark

250. Principles of Hydrology (3) II Introduction to the hydrologic cycle and review of main processes, such as precipitation, evaporation and transpiration, runoff, infiltration, and ground water. Some concepts and tools for water resources management are discussed. 2R, 3L

Sorooshian

396. Proseminar

a. Hydrology (1) [Rpt./1] II D. Davis

408. Vadose Zone Monitoring (2) II 1992-93 Laboratory and field methods for characterizing water flow and contaminant transport through unsaturated geologic media. 6L. P. 407. May be convened with 508. Sully

414a-414b. Field Hydrology (Summer Camp) (3-3) S Field methods of collection, compilation, and interpretation of data in surface and ground-water hydrology; investigation of a small water resources project; preparation of hydrologic reports. Daily field work. Fees. P. 250 or 423 or 440; 431. May be convened with 514a-514b. Ince/Sully

415. Introduction to Water Resources Policy (3) II Water resources policy including the identification of regional problems of water use, the elements of water planning, water rights, and a consideration of institutional structures and processes. P. Math. 125a. (Identical with Geog. 415) May be convened with 515. Writing-Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). Bradley

423. Hydrology (3) I (Identical with C.E. 423) May be convened with 523.

431. Hydrogeology (3) I II Geologic and hydrogeologic factors controlling occurrence and development of ground water. 2R, 3L. Field trips. P. Geos. 101. (Identical with Geos. 431) Writing-Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). May be convened with 531. S. Davis

440. Advanced Surface Water Hydrology (3-4) II Theory and selected design problems from fluvial dynamics, flood hydrology, flood routing, and water supply hydrology. 1D. Discussion section is mandatory for undergraduates. Field trips. P. 250 or 423, C.E. 321. May be convened with 540. Ince

443. Quantitative Planning Methods in Water Resources Administration (3) I Application of statistical analysis to water resource management; benefit-cost analysis; optimization; structure and basis of planning process; risk analysis. P. microeconomics, Math. 125a. May be convened with 543. D. Davis

444. Quantitative Design Methods in Water Resources Administration (3) II Application of quantitative methods to water resource management; benefit-cost analysis; optimization; operations research methods (linear, quadratic, and dynamic programming); P. FORTRAN, microeconomics, Math. 125a. May be convened with 544. Maddock

445. Statistical Hydrology (3) I Application of statistics and probability to uncertainty in the description, measurement, and analysis of hydrologic variables and processes, including extreme events, error models, simulation, sampling, and optimization. P. statistics or probability theory. May be convened with 545. D. Davis/Entekhabi

450. Environmental Hydrology (4) II Chemistry of surface and subsurface water, the predominant chemical processes affecting composition in relation to man's use; classification, identification, and mobility of contaminants; introduction to chemical and transport modeling. 3R, 3L. P. 250, Chem. 103a-103b, Math. 125b, knowledge of computer language. May be convened with 550. Basseff

457. Low Temperature Geochemistry (3) II (Identical with Geos. 457) May be convened with 557.

460. Watershed Hydrology (3) I (Identical with Wa.S. 460) May be convened with 560.

461. Population and Resources (3) I (Identical with Geog. 461)

471. Water Quality Control (3) II (Identical with C.E. 471) May be convened with 571.

476. Natural Resource Economics (3) II (Identical with A.E.C. 476)

478. Global Change (3) II (Identical with Geos. 478) May be convened with 578.

481. Environmental Policy (3) II (Identical with Pol. 481) May be convened with 581.

482. Hydrologic Systems (3) I Introduction to ground-water flow and transport modeling, with emphasis on model construction and simulation. 3L. P. 408. May be convened with 582. Maddock

483. Physical Oceanology and Limnology for Hydrologists (2) I Origin, distribution, and characteristics of oceanic water; advective and convective processes; estuarine and shoreline processes; effect on coastal aquifers; classification and hydrologic regime of lakes. P. Math. 125b. May be convened with 583. Bales

500. Ecosystemology for Urban Planning (3) I Introduction to conceptual tools used in complex ecosystems, particularly cities and urban areas; integration of human residents with larger natural systems (human ecology); environmental impact assessment (EIA) and statement (EIS). Water resource planning and impact on regional ecosystems; technical, legal, ethical dimensions of water transfer. (Identical with Ping. 500) Bradley

503. Subsurface Fluid Dynamics (3) I Dynamics of fluids in porous and fractured media, with emphasis on hydrodynamic, anisotropy, and scaling issues. P. A.M.E. 331a or C.E. 321. (Identical with C.E. 503) Neuman

504. Numerical Methods in Subsurface Hydrology (4) II Finite difference, finite element and boundary integral methods for subsurface fluid flow and mass transport; applications to aquifers, unsaturated soils, seepage through earth structures. P. Math. 422a or consult department before enrollment. (Identical with C.E. 504) Neuman

505. Vadose Zone Hydrology (3) II 1991-92 Fundamental concepts of multiphase flow and transport in the vadose zone. Methods for characterization of hydraulic properties and analytical and numerical solutions for particular cases. P. 407 or S.W. 470. Sully

506. Water Quality Dynamics (3) I Chemical and physical methods are used to study the quality of ground and surface waters with emphasis on organic contaminants, colloids, and surface processes including sorption phenomena. Equilibrium and dynamic models of water chemistry. P. 517R/L. Bales/Conklin

507. Hydrology of Unsaturated Media (3) I For a description of course topics, see 407. Graduate-level requirements include an in-depth research paper. P. Phys. 116, Math. 125b. (Identical with S.W. 507) May be convened with 407. Sully

508. Vadose Zone Monitoring (2) II 1992-93 For a description of course topics, see 408. Graduate-level requirements include an in-depth laboratory reports. P. 507 or 518. May be convened with 408. Sully


514a-514b. Field Hydrology (Summer Camp) (3-3) S For a description of course topics, see 414a-414b. Graduate-level requirements include an in-depth report on one aspect of the field work or participation and assistance in the preparation and conduction of a field project. Daily field work. Fees. P. 518, 519. May be convened with 414a-414b. Ince/Sully

515. Introduction to Water Resources Policy (3) II For a description of course topics, see 415. Graduate-level requirements include an in-depth term paper. P. Math. 125b. (Identical with Geog. 515) May be convened with 415. Bradley

516. Hydrologic Transport Processes (3) I Development and application of equations describing mass and energy transport in subsurface environment. P. 503 or 535, S.I.E. 270. Yeh

517R. Fundamentals of Water Quality (3) I Introduction to chemical processes affecting the behavior of major and minor chemical species in the aquatic environment. Physical, equilibrium, organic, and analytical principles as applied to natural waters. Open to majors only. 517R may be taken in conjunction with or independent of 517L; however, 517R is prerequisite to 517L. P. Chem. 103b, 116, and Math. 125b; CR, Math. 254. Bales/Bassett/Conklin

517L. Fundamentals of Water Quality Laboratory (1) I Experiments in water quality analysis. 3L. P. CR, 517R. Bales/Bassett/Conklin

518. Subsurface Hydrology (3) I Physical, mathematical, geologic, and engineering fundamentals to subsurface hydrologic processes. Open to majors only. P. CR, A.M.E. 331a or C.E. 321; Math. 254; P. Geos. 101. S. Davis/Maddock/Sully


520. Water Resources Management, Planning, and Rights: A Policy Approach (3) I An introduction to basic concepts and issues of water resources management and administration, emphasizing water law and rights, water resources planning, institutional and organizational arrangements, and policy processes
such as adjudication and rule-making. Open to majors only. Bradley/Lord


522. Well Logging Interpretation (3) II (Identical with G.En. 522)

523. Hydrology (3) I (Identical with C.E. 523) May be convened with 423.

524. Hydroclimatology (3) I Precipitation formation processes, the surface and atmospheric branch of the hydrologic cycle, land surface-atmosphere interaction, surface energy balance, evapotranspiration, heat and moisture fluxes into the soil. P. consult department before enrolling. Entekhabi

525. Water Quality Modeling (3) I (Identical with C.E. 525)

526. Water Quality Management (3) II Optimization and systems analysis techniques used in modeling; current models used in formulation and implementation of water quality policy. P. 525. (Identical with C.E. 526) Buras

531. Hydrogeology (3) II For a description of course topics, see 431. Graduate-level requirements include a research paper on a topic related to hydrogeology but not covered in lectures. P. Geos. 101. (Identical with Geos. 531) May be convened with 431. S. Davis


536. Development of Ground-Water Resources (3) II Analytic techniques to evaluate geohydrologic systems; case histories used to study management of ground- and surface-water resources; planning and design of regional water resource investigations. Field trips. P. 535. (Identical with Geos. 536) S. Davis

540. Advanced Surface Water Hydrology (3-4) II For a description of course topics, see 440. Graduate-level requirements include an indepth paper or project. 1D. Discussion section is optional for graduate students. Field trips. P. 519 or 523. May be convened with 440. Ince

543. Quantitative Planning Methods in Water Resources Administration (3) I For a description of course topics, see 443. Graduate-level requirements include a research paper on an applied aspect of the course. P. microeconomics, Math. 125a. May be convened with 443. D. Davis

544. Quantitative Design Methods in Water Resources Administration (3) II For a description of course topics, see 444. Graduate-level requirements include an indepth research paper and/or project. P. FORTRAN, microeconomics, Math. 125a. May be convened with 444. Maddock

545. Statistical Hydrology (3) II For a description of course topics, see 445. Graduate-level requirements include an indepth simulation project. P. knowledge of computer language, Stat. 160 or 361. May be convened with 445. D. Davis

550. Environmental Hydrology (4) II For a description of course topics, see 450. Graduate-level requirements include an indepth research paper. P. Chem. 103a-103b, Math. 125b, knowledge of computer language. May be convened with 450. Bassett

557. Low Temperature Geochemistry (3) II (Identical with Geos. 557) May be convened with 457.

560. Watershed Hydrology (3) I (Identical with W.S.M. 560) May be convened with 460.

561. Ground-Water Management (3) II Management techniques for regional aquifer systems. Quantitative methods for both quantity and quality aspects of ground-water management. P. 444 or 544. (Identical with C.E. 561) Maddock

563. Isotope Hydrology (3) (Identical with Geos. 453)

570. Computer Simulation of Hydrochemical Processes (3) I Introduction to the fundamentals of solving complex water chemistry problems using computer codes as tools. Equilibrium, mass transfer, or 1-D transport models with multielement chemistry, thermodynamic concepts, and use of equations in models; placing natural chemical processes into an interpretable framework, evaluation of error and uncertainty. 3L. P. CR, 506 (recommended) or 517R/L. Bassett

571. Water Quality Control (3) II (Identical with C.E. 571) May be convened with 471.

576. Advanced Natural Resource Economics (3) I (Identical with A.Ec. 576)

577. Natural Resource Economics and Public Policy (3) II (Identical with A.Ec. 577)

578. Global Change (3) II (Identical with Geos. 578) May be convened with 478.

581. Environmental Policy (3) II (Identical with Pol. 581) May be convened with 481.

582. Hydrologic Systems (3) I For a description of course topics, see 480. Graduate-level requirements include an indepth research paper and/or project. May be convened with 482. Maddock

583. Physical Oceanography and Limnology for Hydrologists (2) II For a description of course topics, see 483. Graduate-level requirements include an indepth research report. P. Math. 125b. May be convened with 483. Bales

596. Seminar k. Risk and Society (3) [Rpt./1] I (Identical with Geog. 596k, which is home)

603. Well Hydraulics and Pumping Test Analysis (2) II 1992-93 Flow to wells in aquifers, with emphasis on design and interpretation of pumping tests; confined, unconfined, and leaky aquifer systems; fractured rocks. P. 503 or 535. Neuman

605. Soil Water Dynamics (3) II 1990-91 (Identical with S.W. 605)

642. Analysis of Hydrologic Systems (3) I Presentation and evaluation of a variety of mathematical modeling techniques, presentation of theoretical basis of linear/nonlinear systems, advantages and limitations of various approaches, e.g., linear vs. nonlinear, lumped vs. distributed, used in hydrologic modeling; interrelation between function development and model calibration requirements. P. Math. 254. Sorosian

643. Water Resources Systems Analysis (3) II Applications of mathematical programming to the analysis of interactions of hydrology, engineering, economics, and socio-institutional environment in regional water resources systems. P. 521 or consult department before enrolling. Buras


655. Stochastic Hydrology (3) I 1991-92 Advanced application of statistics and probability to hydrology; multivariate regression, Bayesian techniques, Markov chains, time series and frequency analysis, optimal interpolation and forecasting. P. 519 or 545. Entekhabi

695. Colloquium a. Hydrology and Water Resources Administration [1-3] [Rpt./1] I II For majors only; consult department before enrolling.

696. Seminar a. Unsaturated Flow (1-3) I I

697. Workshop a. Interdisciplinary Problem Solving in Natural Resources I (2) II 1992-93 is part of a two-semester sequence. Credit and grade for 697a will be awarded only upon completion of 697b. P. consult department before enrolling. (Identical with R.N.R. 697a) Lord, Fogel, Glennon, Maddock, Schager, Wilson

b. Interdisciplinary Problem Solving in Natural Resources II (2) II 1992-93 is part of a two-semester sequence. Credit and grade for 697a will be awarded only upon completion of 697b. P. 697a. (Identical with R.N.R. 697b) Lord/Fogel/Glennon/Maddock/Schager/Wilson

Industrial Engineering (See Systems and Industrial Engineering)
Interdisciplinary Graduate Programs
1010 N. Martin Avenue
(602) 621-8368

Interdisciplinary graduate programs are offered by the following committees:

- American Indian Studies
- Applied Mathematics
- And Rands Resource Sciences
- Biophysics
- Cancer Biology
- Cognitive Science
- Comparative Literature and Literary Theory
- Environment and Behavior
- Epidemiology
- Genetics
- Gerontology
- History and Philosophy of Science
- Latin American Studies
- Medieval Studies
- Neuroscience
- Nutritional Sciences
- Optical Sciences
- Pharmacology and Toxicology
- Physiological Sciences
- Planning
- Remote Sensing
- Second Language Acquisition and Teaching

For a specific program listing, refer to the committee name in this section.

For additional information, see "Office of Interdisciplinary Graduate Programs" under The Graduate College section elsewhere in this catalog.

Journalism (JOUR)
Franklin Building, Room 101M
(602) 621-7556

Professors George W. Ridge, Jr., Head; Donald W. Carson, Abraham S. Chasin, Philip Mangelsdorf (Emeritus), Jacqueline E. Sharkey

Associate Professors Ford N. Burkhart, William F. Greer, James W. Johnson, Jim Patten

Assistant Professor Virginia Escalante, Addie M. Rimmer

Lecturers Wallace Beeene, C. Bickford Lucas

The department's program is designed to balance a student's development in the theory and practice of journalism with an even stronger emphasis on the humanities, arts and sciences. The department offers instruction in the reporting, writing and editing skills necessary for a journalism career along with in-house internships for professional development. Courses are also required to provide students with an understanding of journalism's role in U.S. society. The department offers programs combining the major in journalism with that in Oriental studies or Latin American studies.

The department offers a major in journalism for the degrees of Bachelor of Arts and Master of Arts. For graduate admission and degree requirements, consult the Graduate Catalog. A Bachelor of Arts in Education with a teaching major in journalism also is available.

The major in journalism: 26 units in addition to the general education requirements for the Bachelor of Arts degree described in the College of Arts and Sciences section of this catalog. All majors must take 205, 206, 208, 301, 302, 320, 413, 450, 455 and 470. Students then select elective courses in the following areas: newspapers, magazines, community journalism, public information, photojournalism. Students must complete one advanced course from among Jour. 411, 412, 415, 417, 419, 451 and 452. No more than 35 units of journalism will count toward the 125 units needed for the degree. Journalism majors must complete at least 9 units in English writing or literature in addition to freshman English.

The supporting minor: Students are strongly advised to minor or obtain a second major in economics, English writing or literature, history, political science, a modern language, anthropology, psychology, sociology or the natural sciences.

The teaching major: 30 units, including 205, 206, 208, 301, 302, 320, 411 or 413, 450, 470.

The teaching minor: 20 units, including 205, 206, 301, 302, 422, 470.

The department participates in the honors program.

The Arizona Journalism Institute: The department has a permanent center for study and conference among professional journalists in the state.

Freedom of the Press Award: Each year the department gives the John Peter Zenger Award to a journalist whose professional work has made an outstanding contribution to the preservation of freedom of the press and the people's right to know.

Publications: The department publishes the local edition of The Tombstone Epitaph; the bilingual South Tucson Independente; and The Pretentious Idea, a media review. In addition, students report on state government and the legislature for community newspapers. During the spring semester, the department awards the Don Bolles Fellowship to permit one student to work in Phoenix covering the legislature.

Guadalajara Exchange: Students interested in Latin American reporting are offered a one-year exchange program with the School of Journalism at the Autonomous University of Guadalajara in Mexico.

The Department of Journalism is accredited by the Accrediting Council on Education for Journalism and Mass Communications.

151. News in Mass Communications (3) I II

Designed to acquaint the nonjournalist with communications techniques used by newspapers, wire services, information agencies, news magazines and broadcast news; analysis of social and historical influence on the news media.

205. Reporting the News (3) I II Gathering, evaluating, and writing news. P, CR 206, Freshman Composition, knowledge of typing. Consent of department before enrolling. (Identical with M.Ar. 205)

206. Advanced Reporting (3) I II Comprehensible and accurate news presentation, with emphasis on interview techniques and coverage of major news stories. P, CR 205.

208. Law of the Press (3) I II Introduction to Freedom of Expression. Responsibility of the media; libel; and laws pertaining to broadcast and print journalism. (Identical with M.Ar. 208)

301. Photojournalism (1) I II Reporting and interpreting the news through pictures.

302. Photojournalism Laboratory (1) I II Open to majors only. P, CR 301.

305. Broadcast Writing (3) I II (Identical with M.Ar. 305)

320. Editing (2) I II Theory and techniques of copy editing and headline writing; training on video display terminals. 1R, 3L. P, CR 206 or CR. Department permission required.

362. Writing for Media (3) I II (Identical with M.Ar. 362)

364. Creative Advertising (3) I II Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog. (Identical with Mktg. 364)

366. Public Relations (3) I II Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog. (Identical with Mktg. 366)

381. Reporting for Broadcast News (3) I (Identical with M.Ar. 381)

396H. Honors Proseminar (3) II

403. Advanced Photojournalism (3) I II Reporting and interpreting the news through photos, photo documentaries, and photo analysis. Open to majors only. P, CR 301, 302. May be convened with 503.

405. The Study of News (3) I II Critical study and problem analysis of the media. Field work
may include publication of conclusions. May be convened with 505.

406. Magazine Color Photography (3) S Techniques for taking and editing color photographs to illustrate magazine articles. Preparation of resumes and photo portfolios. Graduate-level requirements include additional readings and two additional photo assignments. Field trips. May be convened with 506.

411. News Features (3) I II Writing the basic news feature article; specialized reporting and rewriting techniques. P, 206. May be convened with 511. Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).


413. Reporting Public Affairs (3) I I Study and practice of newsgathering on executive, legislative, and judicial levels in city, county, state and federal governments, with emphasis on news sources and interpretive writing. P, 206, 208. May be convened with 513. Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

414. The News Agency: Arizona News Service (1) [Rpt.] I II Role and operations of the news agency, wire service or syndicate. Class members will form staff of Arizona News Service to supply client newspapers from bureaus in Tucson and Phoenix. Field trips. P or CR, 411 or 413. May be convened with 514.

415. The Editorial Page (3) I I Critical study of opinion-makers, with emphasis on editors and public-affairs columnists; analysis of editorial pages in a changing society; writing of editorials. P, 206. May be convened with 515.

417. Sports News Writing (3) I Students will cover sports events and write sports features. Interview and rewriting techniques. P, 206. May be convened with 517.

419. Public Information Writing (3) I I S The history, principles and techniques of public information, the relation between news media and government, and the responsibilities of government and other public information specialists. P, 206. May be convened with 519.


439. Ethics and the News Media (3) I Analysis of ethical theory and how it relates to journalists' roles and responsibilities in a democratic society. Case studies involve questions of bias, accuracy, privacy and national security. (Identical with L.A.S. 439 and Phil. 439) May be convened with 539.

450. Community Journalism: The Tombstone Epitaph (3) [Rpt.] I II Class members work as editorial staff to produce a local newspaper for Tombstone, Arizona. Intensive study of problems and responsibilities of community newspapers. P, 206, 208, 301, discussion of preparation with instructor. May be convened with 550.

451. Community Journalism: El Independiente (3) [Rpt.] I II Class members work as editorial staff to produce a publication for the community of South Tucson. Intensive study of problems and responsibilities of journalism. P, 206, 208, 301, discussion of preparation with instructor. May be convened with 551.

452. Press Criticism: The Pretentious Idea (3) I II Study of press criticism, including the publication of a press review. Open to majors only. P, 206, 208, discussion of preparation with instructor. May be convened with 552.

470. The Press and Society (3) I I Critical study of press performance in current affairs; changing requirements for socially responsible and professional journalism in a democracy. (Identical with M.Ar. 470) May be convened with 570.

471. International Communications (3) I II Study of world news systems, including newsgathering agencies, role of the foreign correspondent, the foreign press, the factors influencing international news flow.

466. Seminar
a. Directions in News Technology (3) [Rpt./1] S May be convened with 596m.

497. Workshop
a. Color Photography (2) [Rpt./1] S Two-week field trip. May be convened with 597a.

502. Freedom of Expression (3) II Analysis of access and barriers to information and communication at local, state, national and international levels; intensive study of the legal relationship between mass media and society. Open to majors only.

503. Advanced Photojournalism (3) I II For a description of course topics, see 403. Graduate-level requirements include an intensive photo essay illustrating a social problem unique to the Southwest. Open to majors only. P, 301, 302. May be convened with 403.

505. The Study of News (3) I II For a description of course topics, see 405. Graduate-level requirements include a major research paper. Open to majors only. P, 301, 302. May be convened with 405.

506. Magazine Color Photography (3) S For a description of course topics, see 406. Graduate-level requirements include additional readings and two additional photo assignments. Field trips. May be convened with 406.

511. News Features (3) I II For a description of course topics, see 411. Graduate-level requirements include an in-depth profile of an Arizona newspaper. P, 206. May be convened with 411.

512. Reporting for Magazines (3) I II For a description of course topics, see 412. Graduate-level requirements include a major article demonstrating proficiency in the use of fiction-writing techniques used in non-fiction. P, 206. May be convened with 412.

513. Reporting Public Affairs (3) I II For a description of course topics, see 413. Graduate-level requirements include identification, through study and interviews, of a major Tucson issue and completion of a series of articles that suggest resolution of the issue. P, 206, 502. May be convened with 413.

514. The News Agency: Arizona News Service (1) [Rpt.] I II For a description of course topics, see 414. Graduate-level requirements include a research paper; Field trips. P or CR, 411 or 413. May be convened with 414.

515. The Editorial Page (3) I II For a description of course topics, see 415. Graduate-level requirements include formation of an editorial board to seek consensus on current issues and writing editorials according to the consensus. P, 206. May be convened with 415.

517. Sports News Writing (3) I For a description of course topics, see 417. Graduate-level requirements include assuming leadership positions such as news editor or copydesk chief during lab simulations. P, 320. May be convened with 421.

519. Public Information Writing (3) I S For a description of course topics, see 419. Graduate-level requirements include a research paper. P, 206. May be convened with 419.

513. Advanced Editing (3) I For a description of course topics, see 421. Graduate-level requirements include assuming leadership positions and providing a critique regarding how the media resolved the issue. (Identical with L.A.S. 539 and Phil. 539) May be convened with 421.

550. Community Journalism: The Tombstone Epitaph (3) [Rpt.] I II For a description of course topics, see 450. Graduate-level requirements include assuming leadership roles, such as city editor or news editor, on the publication. P, 206, 208, 301, discussion of preparation with instructor. May be convened with 450.

551. Community Journalism: El Independiente (3) [Rpt.] I II For a description of course topics, see 451. Graduate-level requirements include a major research paper, such as city editor or news editor, on the publication. P, 206, 208, 301, discussion of preparation with instructor. May be convened with 451.

552. Press Criticism: The Pretentious Idea (3) I II For a description of course topics, see 452. Graduate-level requirements include assuming leadership roles, such as editor, on the publication. P, 206, 208, discussion of preparation with instructor. May be convened with 452.
570. The Press and Society (3) I II For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper addressing a modern media problem and proposing a solution to it. May be convened with 470.

596. Seminar

a. Reporting Governmental Affairs (3) I II
b. Community Journalism (3) I III
c. Latin-American Press (3) I II (Identical with L.A.S. 596h)
d. News Analysis (3) I II
e. Risk and Society (3) I (Identical with H.W.R. 596k, which is home)
f. Directions in News Technology (3) [Rpt./1] S May be convened with 496m.

597. Workshop

a. Color Photography (2) [Rpt./1] S Two-week field trip. May be convened with 497a.

Judaic Studies (JUS)

Franklin Building, Room 308
(602) 621-9114

Committee on Judaic Studies

Associate Professors Daniel Swetschinski, Chair, Esther Fuchs
Lecturer Shoshana Green
Adjunct Professor Lou H. Silberman
Adjunct Lecturer J. Edward Wright

The Committee on Judaic Studies offers an interdisciplinary program of study in the language, culture, history, and literature of Judaism and the Jews.

The major in Judaic studies leads to the Bachelor of Arts degree. The major requires 35 credit hours including two years of modern Hebrew, and a minimum of three units in each of the following areas: history, culture/religion, and literature. All courses are chosen in consultation with and approved by a committee advisor.

103a-103b. Elementary Modern Hebrew (5-5) CDT Intensive introduction to basic oral skills, reading and writing in class and language lab.; leads to an understanding of modern Hebrew. (Identical with N.E.S. 103a-103b)

273. Introduction to Judaism (3) I 1992-93 An introduction to the main values of traditional Judaism through a study of the common prayerbook, the Sabbath, and the Passover ceremonies. (Identical with Rel. 273)

382. Archaeology and the Bible (3) II (Identical with N.E.S. 382)

370a-370b. History of the Jews (3-3) (Identical with Hist. 370a-370b)

372a-372b. History and Religion of Israel in Ancient Times (3-3) Survey of the history and religion of ancient Israel. 372a: Biblical period through the Babylonian Exile; introduction to the Hebrew Bible. 372b: Ezra-Nehemiah to the Roman Empire, with emphasis on the formation of rabbinic Judaism. (Identical with Hist. 372a-372b, N.E.S. 372a-372b, and Reli. 372a-372b)

374. The Holocaust (3) II 1992-93 (Identical with Hist. 374)

382. Archaeology and the Bible (3) II Discussion of areas of common interest to Biblical studies and archaeology, with a survey of the major discoveries which illuminate the Old and New Testaments. (Identical with Rel. 382)

401. Ancient Mesopotamia (3) I (Identical with Anth. 401) May be convened with 501. Writing-Emphasis Course for Judaic studies majors.

403a-403b. Intermediate Modern Hebrew (5-5) CDT Intermediate grammar, reading, conversation, and extensive presentation of the syntax and vocabulary of modern Hebrew, leading to a firm foundation in the language. P. 103b. (Identical with N.E.S. 403a-403b)

409a-409b. Biblical Hebrew (3 to 4 -3 to 4) 1992-93 CDT (Identical with N.E.S. 409a-409b)

430. Prophecy in Ancient Israel (3) II Nature and origins of Biblical prophecy and its ancient Near-Eastern analogues, including intensive study of several major Biblical prophets. (Identical with Rel. 430) May be convened with 530.


453. Advanced Hebrew (3) [Rpt.] Advanced topics in Biblical, Rabbinic, and/or modern Hebrew language and literature. May be convened with 553.

454. Spanish Inquisition (3) I 1992-93 (Identical with Hist. 454)

455. Introduction to Rabbinic Literature (3) II Reading in translation and interpretation of Hellenistic, Jewish, Rabbinic, and related literatures including legal, ethical, moral, and social interpretation of Scripture and oral traditions (Identical with Reli. 455)

495. Colloquium

f. Ancient Near East (3) [Rpt./4] (Identical with N.E.S. 495f, which is home)
g. Judaic Studies (3) [Rpt./4] Consult department before enrolling.

496. Seminar

w. Sex Roles in the Bible (3) II May be convened with 596w.

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

501. Ancient Mesopotamia (3) I (Identical with Anth. 501) May be convened with 401.

530. Prophecy in Ancient Israel (3) II For a description of course topics, see 430. Graduate-level requirements include a research paper. May be convened with 430.

553. Advanced Hebrew (3) [Rpt.] For a description of course topics, see 453. Graduate-level requirements include additional reading and translation. P. 403b, 409b or 509b. May be convened with 453.

595. Colloquium

g. Judaic Studies (3) [Rpt./4] Consult department before enrolling.

596. Seminar

w. Sex Roles in the Bible (3) II May be convened with 496w.

Landscape Architecture
(See Renewable Natural Resources)

Language, Reading and Culture
(See Education)

Latin
(See Classics)

Latin American Studies (LAS)

1522 E. Drachman Street
622-4002

Latin American Area Center

Director Donna J. Guy
Assistant Director Raul P. Saba

Committee on Latin American Studies (Graduate)

Professors Donald W. Carson (Journalism), Roger Fox (Agricultural Economics), Lanin A. Gyurko (Spanish and Portuguese), Boris S. Kozolchyk (Law), Oscar Martinez (History), Michael C. Meyer (History), Leland Pederson (Geography and Regional Development), Eliana Rivero (Spanish and Portuguese), Charles M. Tatum (Spanish and Portuguese), Edward J. Williams (Political Science), Clifton E. Wilson (Political Science)

Associate Professors Donna Guy, Chair (History), Celestino Fernandez (Sociology), Jacqueline E. Sharkey (Journalism)

Assistant Professors Paul G. Buchanan (Political Science), Tim Finan (Bureau of Applied Research in Anthropology), Kevin M. Gouner (History), Raul P. Saba (Latin American Studies), Kathleen C. Schwartzman (Sociology)

The Latin American Area Center offers an interdisciplinary program designed primarily for students pursuing government, business, teaching, or other careers. The center offers a Bachelor of Arts degree, a Master of Arts degree, and a doctoral minor in Latin American studies. A student with an interest in the Latin American area selects a concentration in one department and enriches that concentration with related studies, cultural or professional, in other departments.

Undergraduate students majoring in Latin American Studies must complete a minimum of 30 upper-division units for the major. At least 12 of these must come from a concentration in one of the following areas: anthropology, geography and regional development, history, political science, Portuguese, or Spanish. A maximum of 18 upper-division units, with no fewer than six
in any one area, must be selected from two or three areas offering related studies: agricultural economics, anthropology, art history, economics, geography and regional development, history, journalism, political science, Portuguese, sociology, or Spanish.

At some point in their programs students must also take the interdisciplinary Latin American Studies colloquium (L.A.S. 495a). Depending on its subject matter, this course may be counted toward their area of concentration or toward one of their related studies. Competence in Portuguese or Spanish is required and may be demonstrated by completing Portuguese 206 or Spanish 301b with a grade of B or by an equivalency exam.

Although most Latin American studies-related courses do not have prerequisites, students planning to major in the field are strongly advised to take some of the introductory and survey courses related to Latin America at the lower-division level. In all cases, students majoring or minoring in Latin American studies should consult with an advisor at the Latin American Area Center early in their undergraduate programs.

For graduate admission and degree requirements, students should consult the Graduate Catalog.

The department participates in the honors program.

301a-301b. Intermediate Portuguese (3-3) I (Identical with Port. 301a-301b)
319. Mexican American Culture (3) I (Identical with Anth. 319)
320. Readings in the Literary Genres (3) I (Identical with Span. 320)
329. Intermediate Grammar and Writing (3) I (Identical with Span. 329)
330. Intermediate Writing and Oral Skills (3) I (Identical with Span. 330)
351. Race and Class in Latin America (3) I (Identical with Hist. 351)
358. Colonial Mexico (3) I (Identical with Hist. 358)
369. Mexico Since Independence (3) I (Identical with Hist. 369)
371a-371b. Commercial and Technical Spanish (3-3) (Identical with Span. 371a-371b)
384. Sociology of Latin American Societies (3) I (Identical with Soc. 384)
388. Immigration and Refugee Policy (3) I (Identical with Pol. 388)
400. Survey of Brazilian Literature (3) 1989-90 (Identical with Port. 400)
401a-401b. Survey of Spanish-American Literature (3-3) (Identical with Span. 401a-401b)
402. Survey of Mexican Literature (3) S (Identical with Span. 402)
405. Advanced Composition and Conversation (3) I (Identical with Span. 405) May be counted with 505.
409. Economic Anthropology (3) I (Identical with Anth. 409) May be counted with 509.
411. Middle America (3) I (Identical with Geog. 411) May be counted with 511.
412. South America (3) I (Identical with Geog. 412) May be counted with 512.
415. Creative Writing in Spanish (3) II (Identical with Span. 415) May be convened with 515.
417. Cultures of Ancient Mexico (3) S (Identical with Anth. 417) May be convened with 517.
422a-422b. Pre-Columbian Art (3-3) (Identical with Ar.H. 422a-422b) May be convened with 522a-522b.
423. Peoples of Mexico (3) II (Identical with Anth. 423) May be convened with 523.
430. Studies in Brazilian Culture and Civilization (3) I 1991-992 (Identical with Port. 430)
431. Anthropology and Development (3) II (Identical with Anth. 431) May be convened with 531.
432. Pre-Columbian Culture and Myths (3) II 1992-93 (Identical with Span. 432) May be convened with 532.
437. Democracies, Emerging and Evolving (3) I (Identical with Pol. 437) May be convened with 537.
439. Ethics and the News Media (3) I (Identical with Jour. 439) May be convened with 539.
441. Children's Literature in Spanish (3) I (Identical with Span. 441) May be convened with 541.
442. Mexican-American Poetry (3) I 1990-91 (Identical with Span. 442) May be convened with 542.
443. Mexican-American Literature (3) II (Identical with Span. 443) May be convened with 543.
445. Novel of the Mexican Revolution (3) I (Identical with Span. 445) May be convened with 545.
447. Latin-American Political Development (3) II (Identical with Pol. 447) May be convened with 547.
448. Government and Politics of Mexico (3) I (Identical with Pol. 448) May be convened with 548.
449. Brazilian Literature in Film (3) I 1992-93 (Identical with Port. 449) May be convened with 549.
450. Religion and Politics (3) II (Identical with Pol. 450) May be convened with 550.
453a-453b. Mesoamerican Archaeology (3) III I (Identical with Anth. 453a-453b) May be convened with 553a-553b.
454. Andean Archaeology (3) II (Identical with Anth. 454) May be convened with 554.
456. Central America: From Colonialism to Revolution (3) III I (Identical with Hist. 456) May be convened with 556.
457. Inter-American Politics (3) I (Identical with Pol. 457) May be convened with 557.
459. Agricultural Economic Development in Latin America (3) II (Identical with A.Ec. 459) May be convened with 559.
461. Population and Resources (3) II (Identical with Geog. 461)
463. Studies in Brazilian Literature (3) I 1991-92 (Identical with Port. 463)
464. History of Argentina (3) I (Identical with Hist. 464) May be convened with 564.
465. Women in International Development (3) II (Identical with Anth. 465) May be convened with 565.
466. History of Brazil (3) II (Identical with Hist. 466) May be convened with 566.
467. Contemporary Latin America (3) I (Identical with Hist. 467) May be convened with 567.
469. History of Women in Latin America (3) II (Identical with Hist. 469) May be convened with 569.
470. Advanced Grammar (3) I II (Identical with Span. 470)
495. Colloquium
   a. Latin American Studies (3) [Rpt.] II P. Spanish or Portuguese proficiency. May be convened with 595a. Writing-Emphasis Course. F. satisfaction of the upper-division writing-proficiency requirement (see “Writing-Emphasis Courses” in the Academic Guidelines section of this catalog).
   b. Latin American Studies Special Topics (3) [Rpt./1] (Identical with Hist. 495d) May be convened with 595d.
503. Economic Anthropology (3) II (Identical with Anth. 509) May be convened with 409.
511. Middle America (3) I (Identical with Geog. 511) May be convened with 411.
512. South America (3) I (Identical with Geog. 512) May be convened with 412.
515. Creative Writing in Spanish (3) II (Identical with Span. 515) May be convened with 516.
517. Cultures of Ancient Mexico (3) S (Identical with Anth. 517) May be convened with 417.
522a-522b. Pre-Columbian Art (3-3) (Identical with Ar.H. 522a-522b) May be convened with 422a-422b.
523. Peoples of Mexico (3) II (Identical with Anth. 523) May be convened with 423.
530. Hispanic-American Chronicles (3) I 1991-92 (Identical with Span. 530)
531. Anthropology and Development (3) II (Identical with Anth. 531) May be convened with 431.
532. Pre-Columbian Culture and Myths (3) II 1992-93 (Identical with Span. 532) May be convened with 432.
533. Colonial Narrative Fiction (3) I 1992-93 (Identical with Span. 533)
537. Democracies, Emerging and Evolving (3) I (Identical with Pol. 537) May be convened with 437.
538. Pre-Columbian Literature (3) I 1991-92 (Identical with Span. 538)
539. Ethics and the News Media (3) I (Identical with Jour. 539) May be convened with 439.
541. Children's Literature in Spanish (3) I (Identical with Span. 541) May be convened with 441.
543. Mexican-American Literature (3) II (Identical with Span. 543) May be convened with 443.
545. Novel of the Mexican Revolution (3) I (Identical with Span. 545) May be convened with 445.
547. Latin American Political Development (3) II (Identical with Pol. 547) May be convened with 447.
548. Government and Politics of Mexico (3) I (Identical with Pol. 548) May be convened with 448.
549. Brazilian Literature in Film (3) I 1992-93 (Identical with Port. 549) May be convened with 449.
550. Religion and Politics (3) II (Identical with Anth. 550) May be convened with 450.
553a-553b. Mesoamerican Archaeology (3-3) II (Identical with Anth. 553a-553b) May be convened with 453a-453b.
554. Andean Archaeology (3) II (Identical with Anth. 554) May be convened with 454.
556. Central America: From Colonialism to Revolution (3) II (Identical with Hist. 556) May be convened with 456.
557. Inter-American Politics (3) I (Identical with Pol. 557) May be convened with 457.
559. Agricultural Economic Development in Latin America (3) II (Identical with A.Ec. 559) May be convened with 459.
560. History of Brazil (3) II (Identical with Anth. 560) May be convened with 460.
561. History of Women in Latin America (3) II (Identical with Hist. 561) May be convened with 461.
565. Women in International Development (3) II (Identical with Anth. 565) May be convened with 465.
566. History of Brazil (3) II (Identical with Hist. 566) May be convened with 466.
567. Contemporary Latin America (3) I (Identical with Hist. 567) May be convened with 467.
568. Spanish-American Nineteenth Century Novel (3) II 1992-93 (Identical with Span. 568)
569. History of Women in Latin America (3) II (Identical with Hist. 569) May be convened with 469.
572. Spanish-American Vanguardist Poetry (3) II 1992-93 (Identical with Span. 572)
575c. Spanish-American Novel of the Twentieth Century (3) (Identical with Span. 575c)
595. Colloquium  
b. Advanced Studies in Latin American History (3) [Rpt.] II I 1992-93 (Identical with Hist. 595a, which is home)
c. Latin American Studies Special Topics (3) [Rpt./1] I 1992-93 (Identical with Hist. 595d) May be convened with 495d.
596. Seminar  
a. Latin American Studies (3) [Rpt.] I P, Spanish or Portuguese proficiency.
b. Comparative Politics (3) [Rpt./2] I II I 1992-93 (Identical with Pol. 596d)
  a. Latin-American Press (3) I II (Identical with Jour. 596h, which is home)
  i. Colonial Latin America (3) [Rpt.] I II (Identical with Hist. 596i, which is home)
  j. Latin America: Modern Period (3) [Rpt.] I II (Identical with Hist. 596j, which is home)
  b. Latin American Political Development (3) (Identical with Span. 547) May be convened with 447.
  c. Latin American Political Development (3) II (Identical with Anth. 547) May be convened with 447.
  d. Latin American Regionalization (3) (Identical with Anth. 547) May be convened with 447.
  e. Latin American Regionalization (3) II (Identical with Anth. 547) May be convened with 447.

620. History of the Spanish Language (3) I 1991-92 (Identical with Span. 620)
621. Spanish in the Americas (3) I 1992-93 (Identical with Span. 621)
696. Seminar  
  a. Spanish Literature (3) I II (Identical with Span. 696b, which is home)
  b. Spanish Literature (3) I II (Identical with Span. 696c, which is home)
  i. Brazilian Literature: 20th Century (3) I II (Identical with Port. 696i, which is home)

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**Law (LAW)**

Law Building, Room 110  
(602) 621-1373


Associate Professors Leslie Espinoza, Lakshman Gurushwamy, Jane B. Korn, Patricio P. Lopez

The College of Law offers course work leading to the Juris Doctor degree. The course program has been thoroughly revised and expanded to include a modernized set of required courses and a wide variety of problem-method courses, seminars and clinical programs. For course descriptions and degree requirements, please see the College of Law Catalog.

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600. Contracts (5)
601a-601b. Introduction to Legal Process and Civil Procedure (3-2)
602. Criminal Procedure (4)
603. Research and Writing (2)
604a-604b. Torts (2-3)
605. Property (5)
606. Constitutional Law I (3) I
607. Appellate Practice and Moot Court (1)
608. Evidence (4)
609. The Legal Profession (2)
610. Health Law (3) I II
611. Employment Law (3) I II
612. Family Law (3) II
613. Law and Medicine (3) II
614. Workers' Compensation (2) II
615. Constitutional Law II (4) II
616. Corporations (3) I II
617. Corporate Finance (2) II P, 616.
618. Antitrust Law (3) II
619. Estates and Trusts (4) I
620. Immigration Law (3) I
621. Administrative Law (3) II
622. Law Review (1-3) I II
623. Conflict of Laws (3) II
624. Labor Law (3) I
625. American Legal History (2) I
626. Jurisprudence (3) I
627. Copyright (2) II
628. Comparative Law (3) I
629. Agency and Partnership (2) II
630. Law and Humanities (3) II
631. Indian Law (3) I (Identical with A.in.S. 631)
633a-633b. Commercial Transactions (3-3) 633a is not prerequisite to 633b.
635. Basic Insurance (3)
637. Real Estate Planning (3) I II
638. Real Estate Transactions (3) II
639. Community Property (2) I
640. Mining and Public Land Law (3) I
641. Water Law (3) I
642. Federal Jurisdiction (3) II
643. Arizona Civil Procedure (3) II
644a-644b. Remedies (1-3)
645a-645b. Trial Practice (2-3) P, 608, 609.
646. Federal Income Taxation (5) I
647. Corporate Taxation (3) II P, 646.
648. Estate and Gift Taxation and Basic Estate Planning (2) I
649. Trusts (3) II
650. Criminal Law (3) II
651. Accounting and the Law (2) II
652. Income Taxation of Estates and Trusts (2) II P, 646.
653. Advanced Appellate Practice and Moot Court (2) II
654. The First Amendment (3) II 1991-92
658. Securities Regulation (3) II
660. Land-Use Planning (3) II
661a-661b. Moot Court Board (2-1) 661a I: Moot Court National Team. 661b II: Moot Court Board.
662a-662b. Debtor-Creditor Law (1-2) II 662a: Debtor-creditor law. 662b: Bankruptcy. 662a is not prerequisite to 662b.
663. Individual Income Tax (3) I
664. Law and Social Science (2) II
665a-665b. Interviewing, Counseling and Negotiating (1-1) 665a is not prerequisite to 665b.

503. Library Collection Development (3) I II Principles of collection development; evaluation and review of materials; selection tools; acquisition of materials; problems in selection, including censorship.

504. Foundations of Library and Information Services (3) I II Elements of librarianship, historical backgrounds, types of libraries, the role of the library in American life, current issues.

505. Basic Reference (3) I II Survey of general reference sources; discussion of reference technique.

506. Research Methods (3) I II Need and opportunities for research in librarianship; types of research; research methodology; study of research design; elementary statistics.

507. Library Management (3) I II Introduction to management concepts, the organizational structure of libraries, systems analysis, financial administration and the utilization of library personnel.

509. Information Sources for Agricultural Scientists (1) I (Identical with Pt.S. 509) I II

510. Introduction to Information Science (3) Methods, theories, and technology of information science; elements of computer programming and systems design; implementation and management of computer systems in libraries and information centers.

511. Information Storage and Retrieval (3) Student involvement in on-line, interactive systems.

512. Automation in Libraries (3) I II Introduction to automated procedures currently in use in libraries, including systems analysis of actual technical services and planning for their automation.

513. Library Systems Analysis (3) I Introduction to quantitative methods for the design, analysis and control of library systems.

519. Cartographic Information Management (3) I Cartographic format as an information transfer medium. History of cartography and problems in interpretation of cartographic products. Role and place of maps in the information environment.

521. Advanced Cataloging (3) I II Comparative study of Dewey Decimal Classification and Library of Congress Classification; advanced problems in descriptive cataloging, subject headings, and library filing.

526. Introduction to Bibliography (3) I II Introduction and critical examination of various styles of bibliographic description; practical application in construction of a systematic bibliography.

530. Public Librarianship (3) I Administration of tax-supported libraries serving the general public, including problems of governmental relationships, community responsibilities, financial support, buildings, personnel, collections.

540. Academic Librarianship (3) I Present trends in academic libraries, including financial administration, collection evaluation, personnel requirements and building needs.

541. Children's Literature in Spanish (3) I (Identical with Span. 541) May be convened with 441.

543. Mexican-American Literature (3) I II (Identical with Span. 543) May be convened with 443.

550. Special Librarianship (3) I II Mission, organization and administration of the special library.

559. History of Children's Literature (3) I Survey of the history of books and printing from early times to the present, including development of the alphabet, manuscript books, the invention and dissemination of printing and modern printing techniques. (Identical with Hist. 559)

561. History of Children's Literature (3) I Survey of literature for children in England and America from earliest times to the close of the 19th century and international study of cultural and social values reflected in the literature. (Identical with Engl. 561)

570. Literature of Science and Technology (3) I Creation, organization, and dissemination of scientific and technical literature; reference function and problems of bibliographic control. A science background is not required.

571. Information Sources and Services in the Social Sciences (3) I II Information resources and services in history, geography, political science, sociology, anthropology, psychology, education, economics and business.

572. Information Sources and Services in the Humanities (3) I II Information resources and services in art and architecture, music, language and literature, theatre and dance, philosophy and religion.

573. Government Publications (3) I II Examination of the varieties of government publications available from municipal, county, state, national and international agencies, with emphasis on selection and use of publications of the U.S. government.


576. Administration of Reference (2) I Theory of information service, policy development, special services, and administration of reference services. Open to majors only.


581. School Library Administration and Organization (3) I II Services, finances, personnel, evaluation, quarters, organization and technical services in the school library.

582. Management of Nonprint Resources (3) I I Examines management of nonprint resources and their role in providing informational, recreational and educational services.

585. Literature for Adolescents (3) I II Literature to meet recreational and developmental needs of the junior and senior high school age,

589. Scholarly Communication (3) II Structure and workings of scholarly communication and products in the U.S. Examines the content and technology of scholarly communication in various disciplines. (Identical with Comm. 589)

600. Introduction to Graduate Study in Music (3) II (Identical with Mus. 600)

607. Planning Library Services (3) I The total planning cycle as a management approach to various library/information center services. Open to majors only.


615. Scientometrics and Bibliometrics (3) Examines quantitative techniques for measuring scientific and technical literature. Covers the history and theory as well as current techniques. Emphasis on current research and theory.

620. National and International Information Policy (3) Investigates the formulation and implementation of those laws and policies that govern the flow of scientific and technical information in the United States and between the United States and selected countries.

695. Colloquium
   a. Theory of Classification (1-3) I II
   b. Children's and Youth Services and Literature (2-3) [Rpt.] I II
   c. Government Information Issues (3)
   d. Issues in Library and Information Science (1-4) [Rpt.] I II
   e. Current Resources in School Libraries (3) S

Linguistics (LING)

Douglass Building, Room 200E (602) 621-6897

Professors D. Terence Langendoen, Head, Richard Demers, Merrill Garrett (Psychology, Speech and Hearing Sciences), Robert M. Harnish (Philosophy), Jane Hill (Anthropology), Adrienne Lehrer, Susan Steele

Associate Professors Diana Archangeli, Richard T. Oehrle

Assistant Professors Andrews Barss, Molly Diesing, Michael Hammond, Simin Karimi (Near Eastern Studies), Ofelia Zepeda

The Department of Linguistics offers instruction in introductory, intermediate, and advanced topics in phonology, syntax, and semantics. It also offers course work in Native American languages of the Southwest (e.g., Navajo and O'odham) and courses on the native languages of North America. Undergraduate majors in linguistics can expect to be prepared to undertake professional graduate study in linguistics and related areas or to pursue careers in such language related fields as education, publishing, and certain sectors of business.

The Department of Linguistics offers programs leading to a Bachelor of Arts, a Master of Arts, and a Doctor of Philosophy with a major in linguistics. For graduate admission and degree requirements, please see the Graduate Catalog.

The major for the Bachelor of Arts: 30 units, including 101, 300, 310 and 315, and one year of work in an uncommonly taught language (Greek, Latin, Russian, or any non-Indo-European language). The remainder is to be selected in consultation with the undergraduate advisor.

Majors are urged to continue their foreign language study beyond the minimum 16 units required by the college.

Course work for the supporting minor is selected in consultation with the undergraduate advisor. A minor in linguistics requires a minimum of 20 units including 101, 300, and 315.

101. Introduction to Language (3) I II Survey of linguistic concepts and methods: communication among animals; physiology of human speech; elementary phonetics, syntax, and language change; language and the brain; language and thought.

102. Linguistics for Native American Communities (3) S Introduction to descriptive linguistics for Native Americans; practical linguistic and social issues in Native American languages; phonetics and phonology; orthography; dialects and language change; classroom applications. (Identical with A.In.S. 102)

203a-203b. Elementary Navajo Language (3-3) Speaking, reading, writing, understanding and transcribing. (Identical with A.In.S. 203a-203b)

210. Native Languages of North America (3) I II Genetic and typological diversity of North American native languages; areal features, i.e., characteristics spread over a geographical region; and the history of the study of these languages, concentrating on individuals and the problems of classification. (Identical with A.In.S. 210)

222. The Structures and Sources of American English Words (3) I S Linguistic principles governing the internal structure of English words and the ways in which new words are created, with a focus on spelling, sounds and morphemes.


285. Introduction to Humanities Computing (3) S (Identical with Ger. 285)


303. Gender and Language (3) I 1992-93 (Identical with Anth. 303)

307a-307b. Elementary O'odham (Papago) Language (3-3) GRD Speaking, reading, writing, and oral comprehension in the O'odham (Papago) language. 3R, 1L. (Identical with A.In.S. 307a-307b)

310. Morphology and Morpho-syntactic Properties of the World's Languages (3) I Introduces the student to the commonly shared features of word building rules in the world's languages and provides an introduction to the theoretical issues involved in languages for which the word/sentence distinction does not exist. Students will have many problem sets containing data from dozens of languages. P, 101.

315. Fundamentals of Linguistic Analysis (3) II Considers the sound structure of a wide variety of human languages, with the aim of finding principles that describe in an insightful way the properties of their sounds and sound patterns. In addition the course will introduce the student to the higher level organizational principles governing the combinations of sounds into morphemes, words, and phrases. P, 101.

320. Language and Social Issues (3) I II S 1991-92 Focuses on the theme that individuals identify with groups (in part) on the basis of the language or dialect they use. Examines the role of the individual as a language-user being involved in the problems of self-identity and of social difference, not only in our multilingual-multicultural country, but in the world as well.

376. Introduction to the Philosophy of Language (3) I 1992-93 (Identical with Phil. 376)

403. Foundations of Syntactic Theory I (3) I Introduction to fundamental issues in the theory of syntax. Familiarizes the student with the essentials of (1) government binding theory and its precursors, and (2) standard generative grammar and its relatives. P, 101, 300. May be taken with 503.

410. Foundations of Phonological Theory I (3) I Investigation of the principles that underlie current phonological theory, concentrating on the representation of sounds and the regular patterns of sound in natural language. Topics include distinctive feature theory, syllable theory, the core skeleton, rule formulation and rule interactions. P, 101, 315. May be taken with 510.

411. Modern Japanese Grammar (3) (Identical with Jpn. 411) May be taken with 511.

420. Modern Japanese Grammar (3) (Identical with Jpn. 420) May be taken with 512.

422. Linguistic Semantics and Lexicology (3) I II 1992-93 Study of word and sentence meaning, relationship between the lexicon and the grammar, idioms, metaphor, etymology, and change of meaning. P, one course in linguistics. (Identical with Phil. 422) May be taken with 522.

423a-423b. Theory of Spanish Syntax (3-3) (Identical with Span. 423a-423b) May be taken with 523a-523b.

426. Introduction to Arabic Linguistics (3) II (Identical with N.E.S. 426) May be taken with 526.

427. Applied Linguistics (3) I (Identical with Span. 427) May be taken with 527.


453. Pragmatics (3) II Study of language use, its relationship to language structure and context; topics such as speech acts, presupposition, implication, performatives, conversations. (Identical with Phil. 465) May be convened with 565.

454. Natural Language Processing (3) II Introduction to the processes underlying speech production and comprehension: speech sounds, words, parsing, semantics and pragmatics. (Identical with Phil. 473 and Psyc. 473) May be convened with 573.

455. Language in Culture (3) II (Identical with Anth. 476) May be convened with 576.


457. Historical Comparative Linguistics (3) I (Identical with Anth. 480) May be convened with 580.

458. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Ger. 485) May be convened with 585.

459. Computational Linguistics (3) I Fundamentals of formal language theory; syntactic and semantic processing; the place of word knowledge in natural language processing. P, a course in one of the following: formal languages, syntax, data structures, or compilers. (Identical with C.Sc. 488 and Psyc. 488) May be convened with 588.

460. Colloquium I a. Linguistics (1) [Rpt./3] I II May be convened with 595a.

461. Linguistics for Nonmajors (3) II I Conceptual foundations, methodology, and current theoretical frameworks. Students will carry out actual linguistic analysis. For students in fields other than linguistics.

462. Foundations of Syntactic Theory I (3) For a description of course topics, see 403. Graduate-level requirements include a greater number of problems. May be convened with 403.

463. Government Binding Theory II Continuation of 503, focusing on government, control, binding, thematic relations, and the theory of logical form.


465. Foundations of Phonological Theory I (3) II For a description of course topics, see 410. Graduate-level requirements include a greater number of problems. May be convened with 410.

466. Modern Japanese Grammar (3) (Identical with Jpn. 511) May be convened with 411.

467. Modern Japanese Grammar (3) II (Identical with Jpn. 512) May be convened with 412.

468. Foundations of Phonological Theory II (3) II Investigation of the evidence and arguments for non-linear representations (autosemantic and metrical) and of the organization of the phonological component of grammar, including evidence for its interaction with morphological structures and rules.

469. Linguistic Structure of Modern Chinese (3) (Identical with Chn. 519) May be convened with 419.

470. Linguistic Structure of Modern Chinese (3) II (Identical with Chn. 520) May be convened with 420.

471. Linguistic Semantics and Lexicology (3) II 1992-93 For a description of course topics, see 422. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with Phil. 522) May be convened with 422.

472a-472b. Theory of Spanish Syntax (3-3) (Identical with Sp. 523a-523b) May be convened with 423a-423b.

473. Introduction to Arabic Linguistics (3) II (Identical with N.E.S. 526) May be convened with 426.

474. Applied Linguistics (3) I (Identical with Span. 527) May be convened with 427.

475. Language Variation (3) II For a description of course topics, see 430. Graduate-level requirements include mastery of the formalism, solving data-set problems, and a higher level of performance. May be convened with 430.

476. Syntactic Analysis (3) I An examination of the syntactic diversity presented by natural human languages and an exploration of the issues that such diversity presents for syntactic analysis. Topics include AUX, word order, constituency, and subjects.


478. Linguistics and the Study of Literature (3) II 1992-93 For a description of course topics, see 461. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with C.Sc. 561 and Psyc. 563) May be convened with 461.

479. Formal Semantics (3) (Identical with Phil. 564).

480. Pragmatics (3) For a description of course topics, see 465. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with Phil. 565) May be convened with 465.

481. Natural Language Processing (3) II For a description of course topics, see 473. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with Phil. 573 and Psyc. 573) May be convened with 473.

482. Language in Culture (3) II (Identical with Anth. 576) May be convened with 476.

483. Discourse and Text (3) II 1989-90 (Identical with Anth. 577) May be convened with 477.

484. Historical Comparative Linguistics (3) I (Identical with Anth. 580) May be convened with 480.

485. Sociolinguistics (3) I (Identical with Anth. 583).

486. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Ger. 585) May be convened with 485.

487. Computational Linguistics (3) I For a description of course topics, see 488. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with C.Sc. 588 and Psyc. 588) May be convened with 488.

488. Colloquium I a. Linguistics (1) [Rpt./3] I II May be convened with 495a.

489. Current Issues in Linguistic Research (3) [Rpt./1] Current research in linguistics, with emphasis on relationships among syntax, semantics, and phonology.

490. Seminar I a. Syntax and Semantics (3) [Rpt./2] II b. Topics in Phonological Theory (3) [Rpt./2] III c. Diachronic Linguistics (3) [Rpt./2] II d. Current Issues in Syntactic Theory (3) [Rpt./2] f. Linguistic Investigations and Applications (3) II (Identical with Comm. 696, which is home) g. Topics in Experimental Phonology (3) [Rpt/2] h. Topics in Morphology (3) [Rpt./2] II II
Management and Policy (MAP)  
Harvill Building, Room 409  
(602) 621-1035

Professors Michael R. Gottfredson, Head, Lee R. Beach, Don L. Bowen (Emeritus), Terence Connolly, Edwin B. Filippo (Emeritus), Barbara A. Gutek, Travis W. Hirschi (Sociology), James P. Logan (Emeritus), June M. Morrison (Emerita), Raymond A. Mulligan (Emeritus). Thomas R. Navin (Emeritus), Arthur L. Silvers, George W. Summers (Emeritus)

Associate Professors Marvin Fortman, H. Brinn Milward, Gregory B. Northcraft, David A. Tansik, Robert E. Tindall

Assistant Professors Lawton R. Burns, Jolene R. Gallegher, Terri L. Griffith, Sherry K. Schneider, Christina Shalley

The Department of Management and Policy offers course work focusing on organizational behavior and policymaking in the public and private sectors. The curriculum is designed to prepare students for a wide variety of managerial and staff positions, as well as for postgraduate work in such fields as business, public administration, and law. The department participates in the following undergraduate degrees:

Bachelor of Science in Public Administration with majors in health services administration, public management, human services administration, and criminal justice administration.

Bachelor of Science in Business Administration with a major in personnel management.

For degree requirements, please see the College of Business and Public Administration section of this catalog.

The Master of Science in Public Administration with majors in health services administration, public management, human services administration, and criminal justice administration.

Bachelor of Science in Business Administration with a major in personnel management.

For degree requirements, please see the College of Business and Public Administration section of this catalog.

The Master of Science with a major in management and policy is also available, and the department participates in the Master of Business Administration, Master of Public Administration, and the Doctor of Philosophy with a major in business administration programs. For admission and degree requirements, please see the Graduate Catalog.

The department participates in the honors program.
485. *Zoning Fundamentals* (3) I Survey of the zoning process; nature, structure, and function of zoning, problems of zoning administration, new concepts of zoning content and administration. (Identical with Ping. 485)

496. *Seminar* a. Honors (3) [Rpt./2] I I

*Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.*

500. *Management Case Analysis and Presentation* (3) I I Written analysis of cases and other reports; development of skills in analysis, decision making, and written and oral presentation, with emphasis on the total situation of each case considered. Open only to students admitted to B.P.A. graduate programs.

502. *Organization Theory and Behavioral Relations* (3) I I The interactions, effects, and interrelationships of managers, employees, and organizational structures and systems. Open only to students admitted to a B.P.A. graduate program.

503. *Human Resource Management* (3) I I Principles, methods, research relevant to management of an organization's human resources, with emphasis on employment psychology, training, development, compensation. P, 305 or 502.


506. *Fundamentals of Physical Planning* (3) I I Basic considerations in site analysis and planning, and transportation and utility systems; subdivision planning and plat review. (Identical with Ping. 506)

507. *Social Service Planning* (3) I I Survey of the variety of planning efforts designed specifically to increase social welfare through the delivery of services using historical, comparative, and evaluative perspectives. (Identical with Ping. 507)

514. *Cost-Benefit Analysis* (3) I I (Identical with A.Ec. 514)

532. *Conflict and Cooperation in the Dyad* (3) I I Critical exposition of the essential ideas of two-person game theory and the findings of experimental research on strategic interactions in the dyad. (Identical with Psy. 532)

535. *International Management* (3) I I I S For a description of course topics, see 435. Graduate-level requirements include additional research and writing on more complex issues. May be convened with 435.

537. *Finance for New Ventures* (3) I I (Identical with Fin. 537)

538. *Marketing, Negotiation and Decision Tactics* (3) I I Development of and decision-making skills through simulated negotiations and role playing. Open only to students in the entrepreneurship program. P, Econ. 500a-500b, Fin. 511, Mktg. 500. (Identical with Mktg. 538)

539. *Planning of New Ventures* (3) I I New venture development, financial projections, resource assessment, and long-range planning. Open only to students in the entrepreneurship program. P, Econ. 500a-500b, Fin. 511, Mktg. 500. (Identical with Fin. 539)


545. *Interactive Behavior in Small Groups* (3) I I Critical survey of the essential ideas of n-person game theory (n >2) and the findings of experimental research on social dilemmas bargaining and coalition formation. (Identical with Psyc. 545)

554. *Research Methodology* (3) I I Behavioral research techniques; bias, validity, reliability, and applicable statistical techniques; critiques of research articles and reports.

557. *Law of the Elderly* (2) I I For a description of course topics, see 457. Graduate-level requirements include an in-depth research paper utilizing legal material and a class report on that research. (Identical with Gero. 557) May be convened with 457.


567. *Design and Control of Production Systems* (3) I I (Identical with M.I.S. 567)

568. *Environmental Scanning* (3) I I (Identical with Mktg. 568)


575. *Housing and Residential Areas* (3) I I Physical, social, and economic aspects of housing development and residential areas and their relationship to other land uses and functions. (Identical with Ping. 575)

580a-580b. *Theory of Management and Organization* (3-3) 580a: Analysis of behavior in organizational systems; review of classical, behavioral, and contingency theories of management with a focus on internal systems phenomena. 580b: Organizations in their environments; analysis of organizations in the context of their environmental interfaces. P, 305 or 502. 580a is not prerequisite to 580b.

586. *Behavioral Research in Judgment and Decision Making* (3) I I Survey and research on the strategies and abilities of human judges and decision makers. Focus is upon behavioral, as contrasted with normative, investigation, and upon methods of improving judgment and decision performance. P, statistics. (Identical with Psy. 586)

595. *Colloquium* a. Local Government Administration (3) I I [Rpt./12 units] I I

b. Health Care (3) [Rpt./12 units] I I

c. Aging and Society (3) [Rpt./12 units] I I

d. Criminal Justice (3) [Rpt./12 units] I I

600. *Behavioral Science Theory and Method in Management* (3) [Rpt./1] I Concept-
tual and theoretical frameworks for the analysis of management problems from a behavioral science perspective. Emphasis on formulation of research questions and alternative research strategies for answering them.

601. Public Management (3) I Fundamentals of management structure and process in public sector; emphasis on professional practice. Open only to students admitted to a B.P.A. graduate program.

602. Analytic Methods in Planning and Management (3) II Methods and models for program planning and policy analysis; forecasting, service demand, facility location in capital investment programming, task sequencing, program analysis and evaluation. P. 457 or 552. (Identical with Pmg. 602)

605. Research and Evaluation in Public Administration (3) I Research and evaluative methodologies which support public sector policies and administration, including the philosophical basis of these methods and a research design exercise. P. 601.

609. Policy Problems in Structure and Change (3) II Problems presented by structure and change in modern urban society from the standpoint of social systems analysis; evaluation of strategy and effectiveness of public policy and planning. (Identical with Geog. 609 and Pmg. 609)

610a-610b. Fiscal and Budgetary Administration of Public Agencies (3-3) 610a: Internal fiscal operation and the budgetary cycle of public and nonprofit agencies. P. 601, Acct. 572. 610b: Cost-benefit analysis for public agencies. Investment analysis. 610a is not prerequisite to 610b. (Identical with Pol. 610a-610b)

612a-612b. Projects in Policy and Planning (2-3) Lab. and field projects simulating various aspects of professional practice. Open to majors only. P. 12 units toward M.S. (Identical with Png. 612a-612b)

621. Administrative Patterns in the Federal System (3) I Legal, political, and social framework of interjurisdictional and interagency relations; trends, emerging issues, and devices for securing coordination and responsibility.

650. Analysis of Health Systems (3) I Introduces the student to the scope and nature of public and private health systems in the U.S., examines roles of government and private enterprise in the development and operation of health institutions. P. 601.

651. Health and Public Policy (3) II Examines public policy issues in health, including recent developments in health policy and planning at the national, state and local levels, and their impact on administrative behavior. P. 650. (Identical with Png. 651)

652. Management of Long Term Care Facilities and Programs (3) II Problems and principles of management of facilities and community based programs providing health and social services to the chronically impaired. P. 650.

653. Comparative Management in Health Administration (3) I Assists students in applying general management principles to particular types of health agencies. Models of organizational behavior are used to develop a paradigm for comparative analysis. P. 650.

655. Efficiency Analysis in Health Administration (3) II Professional-level treatment of economic and related principles as they apply to the health-care industry, and of the impacts of health policy and program alternatives; case study methods used. P. Econ. 500a. (Identical with Png. 655)

662. Aging and Public Policy (3) I Policy framework for administration of programs, plans, priorities, and legislation related to the aging in modern society. (Identical with Png. 662)

671. Business, Government and Society (3) I II Relationships between the institutions of business and government; economic, social and political aspects. P. 305 or 502. (Identical with Law 671)

693. Internship
b. Criminal Justice (1-6) I II
c. Public Management (1-6) I II
d. Health Services Administration (1-6) II
f. Long Term Care Administration (1-6) II
g. Policy and Planning (1-4) S Open to majors only. (Identical with Png. 693g)

696. Seminar
a. Development Administration (1-3) I II
b. Program Planning and Development (1-3) III
b. Performance Measurement and Accountability (1-3) I II
c. Judgment and Decision Making (3) II (Identical with Psc. 696d)
e. Health Services Administration (1-3) I II
g. Criminal Justice Administration (1-3) I II
h. Land-Use Regulation (3) I II (Identical with Png. 696e)

696d) Legal Inquiry in Policy and Planning (3) II (Identical with Png. 696d)

700. Environmental Planning (3) I II (Identical with Png. 700d)

701. Organizational Behavior (3) I II (Identical with Png. 701e)

701d) Environmental Planning (3) I II (Identical with Png. 701d)

701e) Organizational Behavior (3) I II (Identical with Png. 701e)

701f) Organizational Theory (3) I II (Identical with Png. 701f)

701g) Research Design: Statistical Methods (2-4) I II

Management Information Systems (MIS)

BPA Building, Room 406
(620) 621-2748

Professors Jay F. Nunamaker, Jr., Head, Andrew Bailey, Seymour Goodman, Barbara Gutke, James F. LaSalle, Averill M. Law and Michael T. Oliver


The department offers the Bachelor of Science in Business Administration with majors in management information systems and operations management. Interested students should follow the program of studies in the College of Business and Public Administration section of the catalog. Nonbusiness students who desire a minor in management information systems or operations management should contact the head of the department for a list of courses.

Management information systems: Education in management information systems enables students to establish careers involving the analysis, design, implementation, use and management of computerized information systems in an organizational environment. Course work is available at the graduate and undergraduate levels.

Operations management: This major offers preparation for management careers in manufacturing and service operations. Emphasis is placed on operation and control of inventory systems, materials management, plant and project scheduling, and service design. Both quantitative and computer-based techniques are used for specific applications in these areas. A Master of Science with a major in management information systems is also available. Management information systems is also a part of the Master of Business Administration. A Doctor of Philosophy degree with a major in business administration is available.

111. Introduction to Computing (3) I II S Description of computer hardware and software; computer terminology; program design; with emphasis on problem definition and flowcharting; introduction to a general purpose programming language and application software systems.

121. Business Programming (3) I II S COBOL and Pascal programming language; file organization, maintenance, and updating procedures. P. 111.

301. Program and Data Structures (3) I II S Application system development techniques, fundamental data structures; design and implementation of selected software procedures for business applications using Pascal. P. 121, Math. 123.

307. Computer Organization and Data Communications (3) I II S Computer organization, operating systems principles, systems software, data communications networks, protocols and distributed processing.

27. Comparative Programming Languages (3) I II (Identical with C.Sc. 327)

331. Data Management Systems (3) I II S Introduction to database management systems; relational, CODASYL, and hierarchical models; security concurrency, integrity and recovery issues; query interfaces. (Identical with C.Sc. 331)

341. Information Systems Analysis and Design (3) I II S The analysis and logical design of business data processing, management information and management control systems; project management and cost-benefit analysis; techniques for stating and analyzing information systems requirements; use of automated and non-automated techniques for logical system design. CR. 307.

342. Data Structures and Algorithms (3) I II (Identical with C.Sc. 342)

373. Basic Operations Management (3) I II S GRD Quantitative techniques applied to de-
471. *Policy Formation and Management Information Systems (3) I I S Integration of the M.I.S. activity with the functional operations of the business organization; utilization of case studies and a computer simulation model to enhance executive decision making relative to planning, organizing, controlling, and acting. Open only to BPA majors. P. Fin. 311, M.A.P. 305, Mkgt. 361, Senior Standing. Writing-Emphasis Course. P: SatisfACTION of the upper-division writing-communication requirement (see "Writing-Emphasis Course" in the Academic Guidelines section of this catalog).

473a-473b. *Production and Operations Management (3-3) Productive systems, including service type industries; activities entailed in selecting, designing, operating, controlling, and updating systems. 473a: Forecasting, aggregate planning, MRP, inventory models under uncertainty, scheduling. P. 373, 473b: Capacity expansion and facility location, facility layout, assembly line balancing, new technologies (GT, FMS, CAD/CAM) project management, case studies in manufacturing and services.

474. *Current Topics in Operations Management (3) II Coverage of new techniques and technologies in operations management. Examples of topics that may be covered are JIT, OPT, robotics. P. 473b or CR.

475. *Productivity Improvement (3) I Topics in productivity measurement, evaluation and control: work measurement, job design, statistical quality control, productivity improvement through effective management. P. 373.

476. *Management of Service Operations (3) I Application of operations management concepts to service organizations; exploration of critical issues such as facility location, layout, scheduling, and capacity management; case analyses and/or term project. P. 373.

477. *Materials and Logistics Management (3) I Organization, management, and control of material flow processes; logistical strategies and relationships of procurement, handling, warehousing, transportation, and inventory control. P. 373, 473a.

478. *Project Management (3) I Definition of programs and projects, organizational forms, developing the work breakdown structure, scheduling techniques (PERT and CPM), control mechanisms such as milestones, cost reports and progress reports. Lectures and case analyses. P. 305, 373.

479. *Computer Models for Operations Management (3) II Useful evaluation software packages to analyze dynamic operations management problems. P. 473b or CR. *Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.

501. Management Information Systems (3) I I I Introduction to managerial issues raised by the use and implementation of information technologies in business. Emphasis is on organizational and technical foundations of information systems; problem solving skills using PC-based software. Open only to students admitted to BPA graduate programs.

507a-507b. Information Systems Architecture and Data Communications (3-3) 507a: Fundamental concepts of operating systems; principles and techniques required for engineering and understanding operating systems will be covered. Examples from real systems. Hardware architecture and understanding of operating systems. P. CR, 531a. 507b: A comprehensive view of data and computer communications. Basic concepts and terminology used in the field, alternative approaches to meeting communication requirements of various users, and the nature and current status of protocol standards will be covered. Emphasis on network design for business applications. P. 531a.

511. Social Issues of Computing (3) I I S For a description of course topics, see 411. Graduate-level requirements include an additional term paper. May be convened with 411.

521a-521b. Advanced Systems Modeling and Simulation (3-3) The nature of simulation, simulation software, including animation model validation, selecting input probability distributions, random variate generation, statistical analysis of output data. Simulation of manufacturing systems, manufacturing issues addressable by simulation, SIMAN simulation language, and statistical issues in manufacturing simulation. Open only to students admitted to BPA graduate programs. P. 501, M.A.P. 552, Math. 519, knowledge of Fortran programming, probability and statistics. (Identical with C.Sc. 521a-521b)

522. Mathematical Programming and Applications (3) I For a description of course topics, see 422. Graduate-level requirements include an additional term paper or program. May be convened with 422.

531a-531b. Data Structures and Database Management (3-3) 531a: Abstract data types, data structures and their implementation in Pascal programs. Data structures covered include stacks, queues, lists and trees. 531b: Introduction to concepts of database processing in comparison with file processing. Various techniques for the logical and physical design will be studied in detail. Relational and CODASYL database models, as well as semantic models, will be examined. Implementation aspects of a database system will also be covered.

541a-541b. Computer-Aided Information Systems Analysis and Design (3-3) Analysis and logical design of M.I.S.; techniques for stating and analyzing information systems requirements; hardware/software selection and evaluation; system implementation and performance evaluation; strategic information systems and decision support systems. Open only to students admitted to BPA graduate programs. (Identical with C.Sc. 541a-541b)

550. Soviet Technology and Science (3) I For a description of course topics, see 450. Graduate-level requirements include an additional term paper or program and a class presentation. May be convened with 450.

551. *Business Systems Programming Methods (3) I For a description of course topics, see 451. Graduate-level requirements include an additional in-depth term paper and 30 percent more reading. P. 501. May be convened with 451.

552. Statistical Decision Making (3) I I II Probability and statistical analysis; random vari-
ables, sampling distributions, hypothesis testing, Bayesian analysis, time series, statistical investigation. Open only to students admitted to a BPA graduate program. P, 400, or Math. 119 and 123.

553. Software Systems for Business Applications (3) I II For a description of course topics, see 453. Graduate-level requirements include the production of several medium-sized programs, with emphasis on the program life-cycle, maintainability, and life-cost. Open to majors only. May be convened with 453.

554. Computer Graphics (3) II Computer graphic display hardware and software components; graphic data structure; pictorial data structures and management. P, 531a.

557. Design and Control of Production Systems (3) II An introduction to the design of production systems and how decisions about them are influenced by the acquisition and use of accounting data. Manufacturing and service strategy, aggregate planning, inventory control, and JIT. Open only to students admitted to BPA graduate programs. (Identical with M.A.P. 567)

570. Management and Evaluation of Information Systems (3) I II The methodologies of economics and management information systems applied to the problem of designing accounting and management information systems in the hierarchical structure of a profit-maximizing firm. An MBA integrative course. Open only to students admitted to BPA graduate programs. P, 501, Acc. 550, Econ. 500a. (Identical with Acct. 570 and Econ. 570)

572. Operations Management (3) I Intended for students without a background in production management. Survey of techniques useful in operating manufacturing and service production.


577. Discrete Mathematical Programming (3) II Introduction to the formulation, solution, and implementation of discrete and integer mathematical programming models; representative applications will be studied and solved on the computer. P, 422.

578. Systems Design for Management (3) I Decision support system concepts, applications and methodologies for developing and evaluating decision support systems; organizational and technical factors of office automation.


580. Introduction to Expert Systems (3) I II An in-depth technical background of the concepts and skills essential to analysis, design and development of business expert systems. Open only to BPA graduate students.

582a-582b. Multivariate Analysis in Management (3-3) 582a: Multiple, polynomial, stepwise regression including indicator variables, inference, remedial measures. 582b: Analysis of variance and covariance, principal components, discriminant analysis, canonical correlation. P, 275 or 552. 582a is not prerequisite to 582b.

585. Manufacturing Strategy (3) II 1992-93 Manufacturing strategy and related long-term issues; relationship between strategy and operating decisions; new developments in technology.


611a-611b. Topics in Research Methodologies in MIS (3-3) 611a: Introduces beginning doctoral degree students and advanced master's degree students to important research and survey articles in the field of management information systems. 611b: Provides a knowledge of research methodologies used in the MIS discipline, including experimental design, surveys, case studies, field work, and software engineering.

671. Domestic and International Issues (3) I Information technologies and their applications in national and international economic, social and political settings. Open only to BPA graduate students. P, 511 or consult with department before enrolling.

680. Artificial Intelligence and Expert Systems (3) I Managerial and organizational aspects using artificial intelligence (AI) and expert system technology. Advanced topics such as knowledge acquisition, impacts of AI and expert systems on organizations, and strategic advances of AI among expert systems applications will be studied. Cases will be used.


796a. Workshop (3) a. Research Issues (3) [Rpt./6 units] Open to majors only. b. Research Design (3) [Rpt./5] I II P, 796a.

Marketing (MKTG)
Harvill Building, Room 347 (602) 621-7479
Professors Dipankar Chakravarti, Head, Joseph W. Newman (Emeritus), John H. Wieland (Emeritus)
Assistant Professors Merrie L. Brucks, Bernard J. Jaworski, Christopher P. Puto, Richard A. Scott, Melanie R. Wallendorf

Marketing is the process of planning and executing conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives. Graduates may qualify for positions in product management, sales and sales management, retailing, advertising and promotion, marketing research, industrial marketing, distribution channels, and international marketing.

An undergraduate major in marketing is offered within the Bachelor of Science in Business Administration as described in the College of Business and Public Administration section of this catalog. The department offers a Master of Science degree with an emphasis on marketing research and also participates in the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration.

The department participates in the honors program.

361. * Introduction to Marketing (3) I II Role of marketing in the economy and in business and nonprofit organizations; environmental factors affecting marketing; nature of marketing management decisions. P, Econ. 200.

364. * Creative Advertising (3) I II Use of virtual and audio techniques to plan, create and produce effective advertising campaigns. Not acceptable for credit toward marketing major. (Identical with Jour. 364 and M.A.R. 364)

366. * Public Relations (3) I II The nature, role and management of public relations. Case problems and projects give practical experience in developing public relations programs. Not acceptable for credit toward marketing major. (Identical with Jour. 366 and M.A.R. 366)

370. * Marketing for Nonprofit Organizations (3) I II Application of marketing concepts and tools for public agencies, health services, public transportation, the arts, schools, museums, churches, etc.; role of marketing planning, research, product and service development, pricing, promotion, public relations. Not acceptable for credit toward the marketing major. P, 361.


450. * Buyer Behavior (3) I II Customer behavior and the application of concepts and research findings from the behavioral sciences in the solution of marketing problems. P, 361, M.I.S. 375, Math. 123.

454. Management of Sales Operations (3) II The sales function and its relationship to the total marketing program; sales strategies and objectives; development and administration of sales organization; control and evaluation of sales operations. P, 361, M.I.S. 375, Math. 123. May be repeated for credit with permission.


456. International Marketing Management (3) II Marketing operations for foreign environments; cultural, political and economic factors affecting the international marketer. P, 361.

457. Retailing Management (3) I II Management of the retail store, its environment, personnel, buying, merchandising, pricing, advertising, promotion, selling, expense control and customer service. P, 361; Acct. 200.

459. Product Management (3) III II Product (services) strategy for achieving financial growth; evaluating opportunities; generating ideas; launching new offerings; managing the product (services) portfolio. P, 361, M.I.S. 375, Math. 123.


471. Marketing Policies and Operations (3) III I An integrative, capstone course focusing on comprehensive marketing problems; development, control, and auditing of marketing organizations and operations. P, 445, 450; 3 additional units of marketing at the 400 level; Fin. 311, M.A.P. 305. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

480. New Venture Market and Industry Analysis (3) I Assessment of market opportunity; competitive strategy development; marketing structure analysis, forecasting techniques. Open only to entrepreneurship program students. P, 361, Econ. 330, Fin. 311. (Identical with Econ. 480)

483. Marketing Planning and Operational Decision-Making (4) II (Identical with M.A.P. 483)

456. Innovation and Economic Growth (3) I Role of entrepreneurship and innovation in economic growth. Development of the new venture idea and assessment of market potential. Open only to students in the entrepreneurship program. P, Econ. 500a-500b, Fin., 511, Mktg. 500. (Identical with Econ. 536)

538. Marketing, Negotiation and Decision Tactics (3) II (Identical with M.A.P. 538)

550. Consumer and Organizational Buyer Behavior (3) I Nature of the purchase decision process for goods and services. Theories, concepts and research methods and findings are examined for use in management and public policy decision making. P, 500.


554. Management of Sales Operations (3) III I II For a description of course topics, see 454. Graduate-level requirements include an in-depth research paper. P, 361, M.I.S. 375, Math. 123. May be repeated for credit with permission.

557. Industrial Marketing (3) II Problems and strategies for foreign environments; cultural, political, economic factors affecting the international marketer, multinational corporation and multinational market groups. P, 500.

558. Management for Global Competitive Success (3) III II Developing comprehensive strategies and programs for delivering quality goods and services to consumers as a basis for global competitive success. P, 500 or consent of department before enrollment.

559. Product Strategy (3) III II Formulating and implementing strategy for growth; analyzing and influencing market structure; developing, pricing, testing new entries; managing the portfolio. P, 500.

560. International Marketing (3) III II Marketing planning and strategies for foreign environments; cultural, political, economic factors affecting the international marketer, multinational corporation and multinational market groups. P, 500.

565. Management for Global Competitive Success (3) III II Developing comprehensive strategies and programs for delivering quality goods and services to consumers as a basis for global competitive success. P, 500 or consent of department before enrollment.

566. Environmental Scanning (3) III I An MBA integrative course. How information from the economy can be used to develop a firm's competitive strategy. Multi-disciplinary, using concepts from economics, marketing and management. Open only to BPA graduate students. P, 500, Econ. 500, Fin. 511. (Identical with Econ. 568 and M.A.P. 568)


573. Survey and Qualitative Marketing Research Methods (3) I Survey and qualitative research for marketing management information needs; secondary data search methods; experimental, sampling, field work, and data analysis; marketing research and projective methods. P, 500.

573. Experimental Research Methods in Marketing (3) I Statistical, methodological and interpretive issues in the design of laboratory and field experiments/quasi-experiments for marketing and consumer research. P, 500.

695. Colloquium (1) [Rpt./7] III

696. Seminar (1) [Rpt./7] III

Materials Science and Engineering (MSE)

Materials science is the science of the structure, properties, and behavior of metals, semiconductors, ceramics, polymers, and composite materials. The materials scientist strives to expand knowledge of the properties of existing materials and to develop new materials.

Materials engineering emphasizes the fundamental knowledge necessary to select, process, and apply materials for societal needs. The materials engineer strives to transform materials for practical use.

More than one-fourth of all scientists and engineers are involved in the science or engineering of materials, indicating that almost every field in science and engineering uses materials. Recognizing the importance of materials in nearly every aspect of technology, the University of Arizona recently committed its resources to expanding the Department of M.S.E. A wide range of courses, covering the many facets of M.S.E., is now offered at both the undergraduate and graduate levels.

The department offers the degrees of Bachelor of Science in Materials Science and Engineering, Master of Science with a major in materials science and engineering, and Doctor of Philosophy with a major in materials science and engineering.

110. Solid State Chemistry (4) I II Fundamental principles of the chemistry of condensed
states of matter including metals, polymers, molecular solids and ceramics. 4ES, P, Chem. 103a.

222. Introduction to Materials Science (3) I Introduction to the structure of materials and how structure influences properties. Elementary crystallography, crystal chemistry, and microstructure effects are covered. Examples are taken from all classes of materials: metals, semiconductors, ceramics, polymers, glasses, and composites. 3ES, P, Chem. 103b or M.S.E. 110, and Math. 125b; or consult department before enrolling.

240. Thermodynamics of Materials (4) I Introduction to the laws of thermodynamics, entropy, free energy, and the concept of equilibrium as applied to materials for conventional and advanced technological applications. 4ES, P, Math. 125b or consult department before enrolling.

255. Materials Science in Modern Society (3) I How the science of materials, including ceramics, glasses, and metals has affected society in recent history. The present state of materials and what we may expect in the future. 3ES. (Identical with Engr. 255)

256. Laboratory for Materials Science (1) Laboratory exercises involving materials. This laboratory accompanies 255. 1ES. CR, 255. (Identical with Engr. 256)

257. Materials Science of Art and Archaeological Objects (3) II The methods, content and practice pertinent to the study of art and archaeology. Materials science provides one of the keys for interpreting objects in their historical and cultural context. 3ES. (Identical with Anth. 257 and Engr. 257)

258. Materials Science of Art and Archaeological Objects Laboratory (1) II Laboratory exercises involving the materials science of art and archaeological objects. 1ES. (Identical with Anth. 258 and Engr. 258)


331R. Fundamentals of Materials for Engineers (3) I II Scientific principles which underlie and determine the behavior and properties of materials to their engineering applications. 3ES, P, Phys. 103a; Chem. 103a or CR.

331L. Engineering Materials Laboratory (1) I Fundamental laboratory techniques for the evaluation of properties and behavior of materials for engineering applications. 1R, 2L. 1ES, P, 331R or CR.


360L. Materials Laboratory (1) I Laboratory experiments on physical, electrical and optical properties of materials. 1ES, P, 260, CR, 360R.

380. Kinetic Processes in Materials (3) II Application of principles of thermodynamics and transport to kinetic processes in materials, including diffusion, phase transformations, and phenomena which impact microstructure development. 3ES, P, 240, 409.

395. Colloquium
a. Structure/Properties (1) II P, 360.


409. Transport Phenomena (3) I Principles of momentum, energy and mass transport, as applied to materials processing. 3ES, P, 240, Math. 254. May be convened with 509.

410. Applied Transport Phenomena (3) II Application of the principles of transport phenomena to the engineering aspects of materials processing. 0.5ES, 2.5ED. P, 409.

411. Mineral Processing (3) I (Identical with Mn. E. 411) May be convened with 511.

412. Physical Chemistry of Materials (3) I Physical and chemical topics of interest to materials scientists including surface chemistry, electrochemistry and chemical kinetics. P, 240, Math. 223.


423. Electrochemistry in Materials Science (3) I Principles and applications of electrochemistry in materials science with emphasis on charge-transfer reactions at electrode-solution interfaces; including electrodeposition, electroforming, electroless plating. 2.5ES, 0.5ED. P, 240. May be convened with 523.

424. Physics and Chemistry of Ceramic Materials (3) II Ceramic crystal structures, crystal chemistry, phase equilibria and sintering theory. 3ES, P. 260 or consult department before enrolling. May be convened with 524.

431. Science and Technology of Magnetic Recording Materials (3) I Magnetic properties of materials, materials for magnetic recording, technology of magnetic recording. 1.5ES, 1.5ED, P, a basic course in chemistry or materials science. May be convened with 531.

433. Electrical and Optical Properties of Semiconducting Materials (3) I II Properties of semiconducting materials as related to crystal structure, interatomic bonding and defect structures. 3ES, P, 360, Phys. 230 or Chem. 480b. (Identical with E.C.E. 434 and Opti. 434) May be convened with 533.

435. Corrosion (3) I II Science of corrosion reactions and their application to engineering problems. 3ES, P, 331R; 412 or Chem. 480b or CR. (Identical with Ch.E. 435 and Engr. 435) May be convened with 535.

440. Thermodynamics of Condensed Phases (3) I Advanced treatment of the principles of thermodynamics with application to electronic and optical materials; emphasis on solutions, defect chemistry and modeling of multicomponent systems. 3ES, P, 240. May be convened with 540.


444. Design Competition (3) II Students utilize their undergraduate experience in formulating and developing a materials design project which they present and defend before a review panel. 3ED, P, 442a.

450R. Materials Processing (3) I Applications of transport phenomena and materials science to solidification and semiconductor processing. Application of solids behavior to deformation processing. 3ED, P, 409 or 331R. May be convened with 550R.

450L. Materials Processing Laboratory (1) I Laboratory experiments in solidification and mechanical forming processes. 1ED, CR, 450R. May be convened with 550L.

452. Nondestructive Evaluation of Materials (3) I Introduction to the nondestructive testing and evaluation of the various classes of engineering materials. Methods considered include leak detection, penetrant, electromagnetic, radiographic, ultrasonic, electrical, electrical, eddy current, acoustic emission, and thermal. 2R, 3L. 2ES, 1ED, P, 331R or 360, or CR. May be convened with 552.

455. Physical Metallurgy and Processing of Steel (3) I Equilibrium and nonequilibrium transformations and phases, effects of alloy elements on mechanical properties in steels, isothermal transformation diagrams and continuous cooling diagrams. Processing aspects include heat treating, heat transfer during cooling and quenching, segregation effects, and surface hardening techniques. 2R, 3L. 1ES, 2ED, P, 331R or 360; 409 or A.M.E. 442. May be convened with 555.

457. Integrated Circuit Technology Laboratory (3) I (Identical with E.C.E. 457) May be convened with 557.

460. Materials Science of Polymers (3) I 1991-92; II 1992-93 Introduction to physical properties of polymers. Microstructure, crystalization, rheology, relaxation and mechanical properties. 1.5ES, 1.5ED, P, 331R or 360R. May be convened with 560.

461. Biological and Synthetic Materials (3) I 1991-92 Structural materials in biology include fibers (tendon and silk), rubber (elastic), composites (bone) and ceramics (teeth and shells). Their properties are compared with synthetics. 1.5ES, 1.5ED, P, Chem. 103a. May be convened with 561.

462. Structure and Properties of Polymers (3) I 1992-93 Topics of intensive current development. In each case, the relation between molecular structure, morphology and properties will be explored. Shows how polymers can be designed and tuned to have the properties needed to fulfill specialized functions. Topics include high modulus fibers, non-linear optical properties, conductive polymers and resins for composite materials. 1.5ED, 1.5ES, P, 460. May be convened with 562.

465. Microelectronic Packaging Materials (3) I II Design of microelectronic packaging systems based on the electrical, thermal and mechanical properties of materials. Chip, chip package, circuit board and system designs are considered. 3ED. May be convened with 565.

470. Technology of Polymers and Ceramics (3) I Processing and properties of polymers and ceramics; wide range of technological applications. Discussion of patent literature. 3ED, P, 260 or 331R. May be convened with 570.
471. The Formation and Structure of Glass (3) I The glass transition, Kauzmann's paradox, kinetic theory of glass formation, physics and chemistry of glass making, glass structure, thermal properties. 3ES, P. 260. May be convened with 571.

474. Preparation of Electronic Materials (3) I Principles of phase equilibria, thermodynamics, and reaction kinetics in the preparation of electronic and optoelectronic materials. 2ES, 1ED. May be convened with 574.

479. Culture and Materials Technology (3) I (Identical with Anth. 479) May be convened with 579.

480. Experimental Methods for Microstructural Analysis (3) II An introduction, through a combination of lectures and laboratory experiences, to both established and new techniques for microstructural characterization of materials. 3ES. May be convened with 580.

485. Technological Forecasting (3) I Introduction to basic forecasting technologies which include causal models, trend extrapolation, growth curves, relevance trees and other models. 2ES, 1ED. P. Math. 125b or knowledge of calculus. (Identical with Engr. 485) May be convened with 585.

486. Technology and Society (3) I The evolution of our technological civilization will be discussed with emphasis on possible future models of technological organizations and on the changing roles of the scientist and engineer. 1ES, 2ED. (Identical with Engr. 486) May be convened with 586.


503. Applied Surface Chemistry (3) I Fundamentals of surface phenomena, characterization of solid-vapor, solid-liquid and liquid-vapor interfaces, applications in ceramics, electronic and biomedical materials processing. P. A basic course in physical chemistry.

505. Advanced Extractive Metallurgy (3) II For a description of course topics, see 405. Graduate-level requirements include a mathematical model. Field trip. P. 380. May be convened with 405.

509. Transport Phenomena (3) I For a description of course topics, see 409. Graduate-level requirements include either a term paper or computer model. P. 240, Math. 254. May be convened with 409.


511. Mineral Processing (3) I (Identical with Mn.E. 511) May be convened with 411.


523. Electrochemistry in Materials Science (3) I For a description of course topics, see 423. Graduate-level requirements include a special project. P. 240. May be convened with 423.

524. Physics and Chemistry of Ceramic Materials (3) II For a description of course topics, see 424. Graduate-level requirements include an advanced topic term paper. P. 260 or consult department before enrolling. May be convened with 424.

525. Kinetics of Solid-State and Electrochemical Reactions (3) I Kinetics of nuclear semiconductor crystals and polycrystalline aggregates, and their effects on various properties. P. 360.

531. Science and Technology of Magnetic Recording Materials (3) I For a description of course topics, see 431. Graduate-level requirements include a term paper. P. A basic course in chemistry or materials science. May be convened with 431.

532. Solid-Fluid Reactions (3) I (Identical with Ch.E. 532)

533. Imperfections in Solids (3) I Nature and behavior of imperfections in metal, ceramic, and semiconductor crystals and polycrystalline aggregates, and their effects on various properties. P. 360.

534. Electrical and Optical Properties of Semiconducting Materials (3) I For a description of course topics, see 434. Graduate-level requirements include a term paper. P. 360, Phys. 230 or Chem. 480b. (Identical with E.C.E. 534 and Opt. 534) May be convened with 434.

535. Corrosion (3) II For a description of course topics, see 435. Graduate-level requirements include a term paper. P. 331R or 412 or Chem. 480b or CR. (Identical with Ch.E. 535) May be convened with 435.

536. Advanced Microstructural Characterization (3) I Theory and applications of modern techniques for characterizing chemical and microstructural features of solids, transmission and scanning electron microscopy, microprobe, and Auger analysis. 2R, 3L. P. 360, 480. Consult department before enrolling.

540. Thermodynamics of Condensed Phases (3) I For a description of course topics, see 440. Graduate-level requirements include a term paper. P. 240. May be convened with 440.

550R. Materials Processing (3) I For a description of course topics, see 450R. Graduate-level requirements include a term paper. P. 409 or 331R. May be convened with 450R.

550L. Materials Processing Laboratory (1) I For a description of course topics, see 450L. Graduate-level requirements include an additional report. P, CR, 450R. May be convened with 450L.

551. Atomistic Computational Techniques in Materials Science (3) II Monte Carlo and molecular dynamics techniques; classical and quantum dynamical models; application to calculation of materials properties (structural, thermodynamic, transport, electronic properties).

552. Nondestructive Evaluation of Materials (3) II For a description of course topics, see 452. Graduate-level requirements include a term paper. P. 331R or 360, or CR. May be convened with 452.


554. Electronic Packaging Principles (3) I I (Identical with E.C.E. 554)

555. Physical Metallurgy and Processing of Steel (3) I For a description of course topics, see 455. Graduate-level requirements include a research term paper or computer model. 3L. P. 331R or 380; 409 or A.M.E. 442. May be convened with 455.

557. Integrated Circuit Technology Laboratory (3) I I (Identical with E.C.E. 557) May be convened with 457.


562. Structure and Properties of Polymers (3) I 1992-93 For a description of course topics, see 462. Graduate-level requirements include a term paper. P. 460 or 560. May be convened with 462.

565. Micromechanical Packaging Materials (3) I For a description of course topics, see 465. Graduate-level requirements include an additional term paper. May be convened with 465.

570. Technology of Polymers and Ceramics (3) I For a description of course topics, see 470. Graduate-level requirements include the writing and presentation of an additional term paper. P. 260 or 331R. May be convened with 470.

571. The Formation and Structure of Glass (3) I For a description of course topics, see 471. Graduate-level requirements include a research paper or project. P. 260. May be convened with 471.


574. Preparation of Electronic Materials (3) I For a description of course topics, see 474. Graduate-level requirements include a research paper or project on electronic materials science. May be convened with 474.

579. Culture and Materials Technology (3) I (Identical with Anth. 579) May be convened with 479.
580. Experimental Methods for Microstructural Analysis (3) II For a description of course topics, see 480. Graduate-level requirements include an additional term paper. May be con- vened with 480.

585. Technological Forecasting (3) I For a description of course topics, see 485. Graduate-level requirements include an addi- tional term paper. May be convened with 485.

586. Technology and Society (3) I For a de- scription of course topics, see 486. Graduate- level requirements include an additional term paper. May be convened with 486.

588. Scanning Electron Microscopy (3) I For a description of course topics, see 488. Graduate-level requirements include additional lab work. Consult department before enrolling. May be convened with 488.

599. Transmission Electron Microscopy of Materials (3) I For a description of course topics, see 489. Graduate-level requirements include an additional term paper and presenta- tion. P, 480 or 580, or consult department before enrolling. May be convened with 489.

595. Colloquium a. Materials (1) [Rpt./5] II

602. Modern Methods in Materials Science (2) [Rpt./4 units] II Discussion of several recent theoretical methods or experimental techniques which have been applied to the study of mate- rials. Topics vary from year to year.

652. Statistical Thermodynamics in Mate- rials Science (3) I Introduction to classical and quantum statistical thermodynamics as applied to materials science. Electronic properties of metals and semiconductors; phase transforma- tions. P, 510 or other classical thermodynamics course.

Mathematics (MATH)

Mathematics Building, Room 108
(602) 621-6892


Assistant Professors Bruce J. Bayly, Moysey Brio, Kwok Chow, Marta Civil, Paul Fan, Brenten LeMesurier, Robert Maier, Doug-

Ias M. Pickrell, Yong-Quan Yin, Wayne M. Raskind, Marek Rychlík

Lecturers Robert C. Dillon, John L. Leonard, Stephen G. Tellman

Mathematics forms a foundation for all techni- cal disciplines and is an excellent preparation for a career or graduate study in many subjects. The department offers courses in pure mathe- matics, applied mathematics, probability and statistics, computational mathematics, engi- neering mathematics and mathematics educa- tion. Planned minors in numerous professional fields are available; interested persons should consult with a Mathematics Department advisor to help choose the option, minor, and additional course work that best prepares for their chosen career.

Mathematics is available as a major for the following degrees: Bachelor of Arts and Bach- elor of Science (College of Arts and Sciences), Bachelor of Science in Engineering Mathematica- lses (College of Engineering and Mines), Bach- elor of Arts in Education and Bachelor of Science in Education (College of Education), Master of Arts, Master of Science, Master of Education and Doctor of Philosophy.

The major for the B.A. and B.S. consists of a core of basic courses and one of six possible options. It must include 36 units in mathematics courses numbered 124 or above. The core courses are C.Sci. 115 or Engr. 101, Math. 124 or 125a, 125b, 223, 315, 352, and 323. Advanced students need not take lower numbered courses.

The comprehensive mathematics option: The core above and 413, 415, 424, and 425.

The industrial and applied mathematics option: One of the sequences 454-455, 454-456, 464-465a, or 475a-475b; either 424 or 425; one of 410, 413, or 415.

The computational science option: Either of the sequences 415, 416 or 475a, 475b; one of 443, 447, or 479; and one more of the above courses or 413.

The probability and statistics option: 425, 464, 466a, and either 413 or 415.

The economics and finance option: 425, 464, either 410 or 413, one of 426, 466a or 479. The minor must be in either economics or finance. The economics minor should consist of Econ. 200 or 210; 401 or 411; 300; and 12 additional upper-division units in economics. The finance minor should consist of Acc. 200 and 210; ei- ther Econ. 201a-201b or 210; Fin. 311 and 421; plus six additional upper-division units in finance.

The mathematics education option: 397, 405, either 305 or 415, and either 330 or 430.

The minor in mathematics with the College of Arts and Sciences: A minimum of 20 units in- cluding 124 or 125a, 125b, 215 and at least nine additional upper-division units.

The mathematics education minor: 124 or 125a, 125b, 215, and three of 323, 305, 330, 362, or 405.

The elementary education major area of specializa- tion: 412 plus 12 units selected in cons- ultation with a mathematics department advisor.

The engineering mathematics major: Re- quirements are given in the College of Engi- neering section.

Prerequisites: Because of the nature of mathematics, the department recommends that students refrain from enrolling in any course that carries prerequisites unless those prere- quisites have been completed with a grade of C+ or better. Students without university credit in the prerequisites for 101, 117R, 117S, 119, 123, 124, 125a will be required to have an appropriate score on the math readiness test to be enrolled in these courses. The department strongly recommends that students not enroll in any prerequisite for courses in which they have already received credit.

Students must have proof of having taken the math readiness test in order to register for mathematics courses numbered below 125b. Test scores are valid for one year.

The department participates in the honors program.


116R. Introduction to College Algebra (3) I II Lecture. Not applicable to the mathematics major or minor. Basic concepts of algebra, linear equations and inequalities, relations and functions, quadratic equations, system of equations. P, two entrance units in algebra or an acceptable score on the math readiness test.


117R. College Algebra (3) I II Lecture. Not applicable to the mathematics major or minor. Brief review and continuation of Math. 116R, functions, mathematical models, systems of equations and inequalities, exponential and logarithmic functions, polynomial and rational functions, sequences and series. Students with credit in 120 will obtain only one unit of graduation credit for 117R. P, 116R or 116S or an ac- ceptable score on the math readiness test.

117S. College Algebra (3) I II Self-Study. Identical to Math. 117R except taught in a self- study tutorial format. Not applicable to ma- thematics majors or minors. Students with credit in 120 will obtain only one unit of graduation credit for 117S. P, 116R or 116S or an acceptable score on the math readiness test.

118S. Plane Trigonometry (2) I II Not applica- ble to the mathematics major or minor. Stu- dents with credit in 120 will obtain one unit of graduation credit for 118. P, one entrance unit in geometry, and either 1 1/2 entrance units in algebra, or 116R/5.

119S. Finite Mathematics (3) I II Elements of set theory and counting techniques, probability theory, linear systems of equations, matrix al- gebra; linear programming with simplex method, Markov: P, 117R/S or an accept- able score on the math readiness test.

120S. Calculus Prep (3) I II S Reviews ma- nipulative algebra and trigonometry; covers uses of functional notation, partial fraction decom- position and analytic geometry. For stu- dents who have high school credit in college algebra and trigonometry but have not attained a sufficient score on the math readiness test to
121. Basic Mathematical Procedures (3) I II Evaluating mathematical expressions, introduction to basic programming, right triangle trigonometry, exponents and logarithms, probability and introduction to statistics. P, 116R/S.

123. Elements of Calculus (3) I II Introductory topics in differential and integral calculus. P, 117R/S or an acceptable score on the math readiness test.

124. Calculus with Applications (5) Differentiation and integration of elementary functions. Application to graphing, maximization, areas and volumes, physical problems. Course assumes a background in college algebra and trigonometry and will provide for some review of these topics. Credit allowed for 124 or 125a, but not both. P, 120, 117R/S and 118, or acceptable score on math readiness test.

125a. Calculus (3) An accelerated version of 124. Differentiation and integration of elementary functions. Application to graphing, maximization, areas and volumes, physical problems. Course assumes a background in college algebra and trigonometry. P, an acceptable score on math readiness test. Credit allowed for 124 or 125a, but not both.

200. Problem-Solving Laboratory (1) [Rpt./4] I II Development of creative, mathematical problem-solving skills, with challenging problems taken from calculus, elementary number theory and geometry. P, 125b.

202. Symbolic Logic (3) (Identical with Phil. 202)


301. Understanding Elementary Mathematics (4) I II Development of a basis for understanding the common processes in elementary mathematics related to the concepts of number, measurement, geometry and probability. 3R, 3L. Open to elementary education majors only. P, 117R/S, or 121, or an acceptable score on the math readiness test.

315. Introduction to Number Theory and Modern Algebra (3) I II Elementary number theory, complex numbers, field axioms, polynomial rings; techniques for solving polynomial equations with integer and real coefficients. P, 323.

322. Mathematical Analysis for Engineers (3) I II Complex functions and integration, line and surface integrals, Fourier series, partial differential equations. Credit allowed for this course or 422a, but not for both. P, 254 or 355.

323. Intermediate Analysis (3) I II Elementary manipulations with sets and functions, properties of real numbers, topology of the real line, continuity, differentiation, sequences and series of real valued functions of a real variable, with emphasis on proving theorems. P, 215. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

330. Geometry (3) I Topics to be selected from 2- and 3-dimensional combinatorial geometry, projective Euclidean geometry, Euclidean transformational geometry, symmetry, and 2-dimensional crystallography. P, 215.

344. Foundations of Computing (3) I II (Identical with C.Sc. 344)

355. Analysis of Ordinary Differential Equations (3) I II Basic solution techniques for linear systems, qualitative behavior of nonlinear systems, numerical methods, computer studies; applications drawn from physical, biological and social sciences. P, 215 and C.Sc. 115 or Engr. 101 or knowledge of FORTRAN, PASCAL, or another higher level computer language.

362. Introduction to Probability Theory (3) I II Sample spaces, random variables and their properties, with considerable emphasis on applications. P, 123 or 125b.


397. Workshop

302. Symbolic Logic (3) (Identical with Phil. 202)

402. Mathematical Logic (3) I 1991-92 Sentential calculus, predicate calculus; consistency, independence, completeness, and the decision problem. Designed to be of interest to majors in mathematics or philosophy. P, 124 or 125a or Phil. 325. (Identical with C.Sc. 402) May be convened with 502.

403. Foundations of Mathematics (3) I II 1992-93 Topics in set theory such as functions, relations, direct products, transfinite induction and recursion, cardinal and ordinal arithmetic; related topics such as axiomatic systems, the development of the real number system, recursive functions. P, 215. (Identical with Phil. 403) May be convened with 502.

404. History of Mathematics (3) I The development of mathematics from ancient times through the 17th century, with emphasis on problem solving. The study of selected topics from each field is extended to the 20th century. P, 125b. May be convened with 504.

405. Mathematics in the Secondary School (3) I II Not applicable to B.A. or B.S. degrees for math majors. (Identical with T.T.E. 405)


415. Introduction to Abstract Algebra (3) I Introduction to groups, rings, and fields. P, 323. May be convened with 515.

416. Applications of Algebra (3) I Various applications of abstract algebra, e.g. to coding theory, combinatorial designs, crystallography, etc. P, 415. May be convened with 516.


422a-422b. Advanced Analysis for Engineers (3-3) I Laplace transforms, Fourier series, partial differential equations, integral theorems, matrices, complex variables. Credit allowed for 422a or 322, but not both. P, 254 or 355. 422a is not prerequisite to 422b. Both 422a and 422b are offered each semester. May be convened with 522a-522b.

424. Elements of Complex Variables (3) I II Complex numbers and functions, conformal mapping, calculus of residues. P, 223. May be convened with 524.

**Credit will be allowed for only one of 424 or 422b. 422a-422b will not be considered a two-semester course at the 400 level in the Master of Arts degree program.

425. Advanced Calculus I (3) I Continuity and Riemann integration in one or two dimensions, improper integrals, uniform convergence, differentiation in n-space, inverse function theorem. P, 223 and 323. May be convened with 525.

426. Advanced Calculus II (3) I II Curves, surfaces, change of variables in multiple integrals; extremal properties; theorems of Green, Gauss, and Stokes; exact differentials. P, 425. May be convened with 526.

430. Second Course in Geometry (3) I II 1992-93 Topics to be selected from projective geometry, algebraic geometry, metric geometry or combinatorial topology. P, 215. May be convened with 530.

431. Calculus of Variations (3) I 1991-92 Euler equations and basic necessary conditions for extrema, sufficiency conditions, introduction to optimal control, direct methods. P, 254 or 355. May be convened with 531.

434. Introduction to Topology (3) I II Properties of metric and topological spaces and their maps; topics selected from geometric and algebraic topology, including the fundamental group. P, 323.

436. Metric Differential Geometry (3) I Differential geometry of surfaces; nontrivialic geometry: fundamental forms, Gaussian and
mean curvatures; intrinsic geometry: Theorema Egregium, geodesics, Gauss-Bonnet theorem.

433. Theory of Graphs and Networks (3) II Undirected and directed graphs, connectivity, circuits, trees, partitions, planarity, coloring problems, matrix methods, applications in diverse disciplines. P, 215 or 223 or 243. (Identical with C.Sc. 443) May be convened with 543.


447. Combinatorial Mathematics (3) II 1992-93 Enumeration and construction of arrangements or designs, theorems on existence and nonexistence of designs, applications to design of experiments and error correcting codes. P, 215 or 243. May be convened with 547.


*Credit allowed for only one from the following groups: 117/R or 120; 118 or 120; 123, 124 or 125a; 254 or 355, 455 or 456; 410 or 413.


473. Theory of Computation (3) I I (Identical with C.Sc. 473) May be convened with 573.

475a-475b. Mathematical Principles of Numerical Analysis (3-3) 475a: Analysis of errors in numerical computations, solution of linear algebraic systems of equations, matrix inversion; eigenvalues, roots of nonlinear equations, interpolation and approximation. P, 215; 254 or 355; and a knowledge of a scientific computer programming language. 475b: Numerical integration, solution of systems of ordinary differential equations, initial value and boundary value problems. (Identical with C.Sc. 475a-475b)


484. Operational Mathematics (3) I Basic concepts of systems analysis, Fourier and Laplace transforms, difference equations, stability criteria. P, 421 and 424 or 422a. May be convened with 584.

485. Mathematical Modelling (3) II Development, analysis, and evaluation of mathematical models for physical, biological, social, and technical problems; both analytical and numerical solution techniques are required. P, 421, CR 475b, S.I.E. 320a. May be convened with 585. Writing Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines of this catalog).

486. Seminar b. Mathematical Software (3) [Rpt.] I I P, 254 or 355, knowledge of "C" programming. May be convened with 596b.

502. Mathematical Logic (3) II 1991-92 For a description of course topics, see 402. Graduate-level requirements include more extensive problem sets or advanced projects. P, 124 or 125a or Phil. 325. (Identical with C.Sc. 502) May be convened with 402.

503. Foundations of Mathematics (3) II 1992-93 For a description of course topics, see 403. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215. (Identical with Phil. 503) May be convened with 403.

504. History of Mathematics (3) I I For a description of course topics, see 404. Graduate-level requirements include more extensive problem sets or advanced projects. Not applicable to M.A., M.S., or Ph.D. degrees for math majors. P, 125b. May be convened with 404.

511a-511b. Modern Algebra (3-3) Structure of rings, groups, modules, algebras; Galois theory. P, 415 and 416, or 413 and 415.

513. Linear Algebra (3) II For a description of course topics, see 413. Graduate-level requirements include more extensive problem sets or advanced projects. Not applicable to M.A., M.S., or Ph.D. degrees for math majors. P, 215. May be convened with 413.

514a-514b. Algebraic Number Theory (3-3) 1991-92 Dedekind domains, complete fields, class fields, abelian groups, operators on Hilbert spaces, applications. P, 254 or 355. May be convened with 413.

515. Introduction to Abstract Algebra (3) II For a description of course topics, see 415. Graduate-level requirements include more extensive problem sets or advanced projects. P, 323. May be convened with 415.

516. Applications of Algebra (3) II For a description of course topics, see 416. Graduate-level requirements include more extensive problem sets or advanced projects. P, 415. May be convened with 416.

517a-517b. Group Theory (3-3) 1992-93 Selections from such topics as finite groups, noncommutative groups, abelian groups, characters and representations. P, 511b.

518. Topics in Algebra (3) [Rpt./36 units] II Advanced topics in groups, rings, fields, algebras; content varies.

519. Topics in Number Theory and Combinatorics (3) [Rpt./36 units] II Advanced topics in algebraic number theory, analytic number theory, class fields, combinatorics content varies.


521. Fourier Series and Orthogonal Functions (3) I I For a description of course topics see 421. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 355. May be convened with 421.

522a-522b.** Advanced Analysis for Engineers (3-3) For a description of course topics, see 422a-422b. Graduate-level requirements include more extensive problem sets or advanced projects. Not applicable to M.A., M.S., or Ph.D degrees for math majors. P, 254 or 355. May be convened with 422a-422b.


524.** Elements of Complex Variables (3) I I For a description of course topics, see 424. Graduate-level requirements include more extensive problem sets or advanced projects. P, 223. May be convened with 424.

525. Advanced Calculus I (3) I I For a description of course topics, see 425. Graduate-level requirements include more extensive problem sets or advanced projects. P, 223 and 323. May be convened with 425.

526. Advanced Calculus II (3) II For a description of course topics, see 426. Graduate-level requirements include more extensive problem sets or advanced projects. P, 425. May be convened with 426.

527a-527b. Principles of Analysis (3-3) I I Advanced-level review of linear algebra and multivariable calculus; survey of real, complex and functional analysis, and differential geometry with emphasis on the needs of applied mathematics. P, 410, 424, and a differential equations course.


529. Topics in Modern Analysis (3) [Rpt./36 units] II Advanced topics in measure and integration, complex analysis in one and several complex variables, probability, functional analysis, operator theory; content varies.

530. Second Course in Geometry (3) I I 1992-93 For a description of course topics, see 430. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215. May be convened with 430.

531. Calculus of Variations (3) I I 1991-92 For a description of course topics, see 431. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215. May be convened with 431.

534a-534b. Topology (3-3) I I Point set topology, homotopy, homology. Applications, such as
536a - 536b. Calculus of Tensors and Exterior Differential Forms (3-3) 1992-93 Affine tensors, tensor analysis on differentiable manifolds, calculus of exterior differential forms; calculus of variations, Lagrangian geometry, applications to field theories. P, 323.


538. Topics in Geometry and Topology (3) [Rpt./36 units] I II Advanced topics in point set and algebraic topology, algebraic geometry, differential geometry; content varies.

539. Algebraic Coding Theory (3) I 1991-92 Construction and properties of error-correcting codes; encoding and decoding procedures and information rate for various codes. P, 415. (Identical with E.C.E. 539)

540. Theory of Graphs and Networks (3) II For a description of course topics, see 443. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215 or 223 or 243. (Identical with C.S.C. 543) May be convened with 443.

541. Theory of Numbers (3) I 1992-93 For a description of course topics, see 446. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215. May be convened with 446.

542. Combinatorial Mathematics (3) I 1992-93 For a description of course topics, see 447. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215 or 243. May be convened with 447.

543. Mathematical Population Dynamics (4) I (Identical with Ecol. 550)

553a - 553b. Partial Differential Equations (3-3) 1992-93 Theory and examples of linear equations; characteristics, well-posed problems, regularity, variational properties, asymptotics. Topics in nonlinear equations, such as shock waves, diffusion waves, and estimates in Sobolev spaces. P, 523b or 527b or 533b.

554. Intermediate Ordinary Differential Equations and Stability Theory (3) I For a description of course topics, see 454. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 355. May be convened with 454.

555. Elementary Partial Differential Equations (3) I For a description of course topics, see 455. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 355. May be convened with 455.

556. Applied Partial Differential Equations (3) I For a description of course topics, see 456. Graduate-level requirements include more extensive problem sets or advanced projects. P, 322 or 421 or 422a. May be convened with 456.

557a - 557b. Dynamical Systems and Chaos (3-3) 1992-93 Qualitative theory of dynamical systems, phase space analysis, bifurcation, period doubling, universal scaling, onset of chaos. Applications drawn from atmospheric physics, biology, ecology, fluid mechanics and optics. P, 422a and 422b or 454.


564. Theory of Probability (3) I For a description of course topics, see 464. Graduate-level requirements include more extensive problem sets or advanced projects. P, 223. (Identical with Stat. 564) May be convened with 464.


567a - 567b. Statistical Inference (3-3) 1991-92 (Identical with Stat. 567a-567b)

568. Applied Stochastic Processes (3) I For a description of course topics, see 468. Graduate-level requirements include more extensive problem sets or advanced projects. P, 464. (Identical with Stat. 568) May be convened with 468.

573. Theory of Computation (3) I I (Identical with C.S.C. 573) May be convened with 473.


577. Topics in Applied Mathematics (3) I [Rpt./36 units] I II Advanced topics in asymptotics, numerical analysis, approximation theory, mathematical theory of mechanics, dynamical systems, differential equations and inequalities, mathematical theory of statistics; content varies.

578. Computational Methods of Algebra (3) II Applications of machine computation to various aspects of algebra, such as matrix algorithms, character tables and conjugacy classes for finite groups, coset enumeration, integral matrices, crystallographic groups. P, 415 and a knowledge of scientific computer programming language. (Identical with C.S.C. 578)

579. Game Theory and Mathematical Programming (3) II 1991-92 For a description of course topics, see 479. Graduate-level requirements include more extensive problem sets or advanced projects. P, 410 or 413 or 415. (Identical with C.S.C. 579) May be convened with 479.

The department provides instructional programs designed to prepare students to assume leadership roles in the media arts as independent artists or as members of industries such as fine art television, and cable television. Course work focuses upon history, theory, criticism, production, and management of the media arts. The department offers courses leading to the Bachelor of Arts in Media Arts and Bachelor of Fine Arts in Media Arts degrees. Advanced students have opportunities to obtain preprofessional experience through the department's internship program, through work on various departmental projects, and through work at the University's Public Broadcasting stations KUAT-TV, KUAT-AM, and KUAT-FM.

The Bachelor of Arts is for students planning careers in electronic journalism or media management, or seeking a well-balanced liberal arts education in preparation for graduate study at the M.A. or Ph.D. level.

Requirements: In addition to the general education requirements for the Bachelor of Arts in Media Arts, as described in the Faculty of Fine Arts (College of Arts and Sciences) section of this catalog, students must complete Comm. 100 and 102 and one of the following English composition courses beyond the freshman requirement: Engl. 207, 307, or 308. Requirements in the major include 33 units of media arts courses, including 100, 101, 105, 209 or 214, 215, 250, 280, 321 or 322, and 320 or 362 or 380. At least 12 units must be upper-division courses. No more than 6 units of internship and independent study course work (493 and 499) may be counted toward the major; and no more than 6 units of production and practicum course work (210, 214, 215, 241, 302, 314, 315, 316, 413, 414, 415a, 415b, 497) may be counted toward the major. No more than 15 units in media arts may be counted toward the major. At least 18 units in the major must be completed in residence. The department recommends that students develop basic typing and computer skills prior to taking 200-level courses in Media Arts.

The Bachelor of Fine Arts prepares students for creative and managerial roles in the media arts professions. This program provides an appropriate basis for advanced study at the M.F.A. level.

Requirements: Including the general education requirements for the Bachelor of Fine Arts in Media Arts, as described in the Faculty of Fine Arts (College of Arts and Sciences) section of this catalog, all B.F.A. students must complete 45 units outside of Media Arts. One course must focus on gender, class, race, ethnicity, or non-western culture. This course must be approved by the major advisor and may be taken in Media Arts or in another department. Requirements in the major include 60 units of media arts courses, including 100, 101, 105, 200, 214 or 215, 308, 209 or 225, 321 or 322, one of 371, 372, 375, 472, or 478, and 320 or 362 or 380. An 18-unit emphasis must be selected by the student and approved by the major advisor. The remaining 15-16 units are electives selected from other courses in Media Arts.

At least 30 units in the major must be taken in residence. The department recommends that students develop basic typing and computer skills prior to taking 200-level courses in Media Arts.

The teaching minor: 101, 110 or 214, 209 or 225, 280, 321 or 322, and Media Arts electives for a minimum total of 24 units.

Basic production facilities and equipment are provided by the department. Students are responsible for the cost of film/tape stock, processing, and other necessary supplies.

The department participates in the honors program.

Advanced Standing Policy

Enrollment in upper-division courses (those numbered 300-499) taught by the Department of Media Arts is restricted by an Advanced Standing Policy. This policy restricts enrollment in all upper-division courses in the department to students who have met qualifying requirements and who have approved Applications for Advanced Standing on file in the department. The policy applies to all undergraduate students irrespective of the catalog in force when they entered the University.

All undergraduate students seeking to register for restricted upper-division courses must make application and have their eligibility established. Information and application forms are available in the Department Office, MLB 265.

In general, permission to enroll in the restricted courses is granted subsequent to receiving an offer of advanced standing. Evidence of completion of course requirements, of total units, of the attainment of the requisite grade-point average, of approved portfolio, and of an approved course of study is required before permission to register is granted. Conditional permission to register for restricted courses is granted only to Media Arts majors who are completing any outstanding requirements in residence and whose grade-point averages meet the current eligibility level.

Eligible students either erroneously or inadvertently enrolled in restricted courses will have their enrollments cancelled. All students are responsible for their own registrations and for having established their eligibility for the courses covered by the Advanced Standing Policy.

Students entering the major by intra-campus transfer are subject to all of the provisions of the Advanced Standing Policy in effect at the time of their acceptance to major status.

All students having been absent from the University for more than two consecutive semesters must reapply for Advanced Standing and meet all provisions of the Advanced Standing Policy in effect at the time of their return.

Advanced Standing Requirements

Eligibility requirements for advanced standing are as follows:

1. credit for a minimum of 56 units, including all lower-division core requirements:
   B.A.: 100, 101, 105, 200, 214 or 210;
   B.F.A.: 100, 101, 105, 200, 214 or 215;

2. taken a minimum of 12 regularly graded units of course work at the University of Arizona;
3. a grade-point average of not less than 2.25 overall and 2.5 in Media Arts courses;
4. passed appropriate portfolio (produced or written);
5. a course of study approved by a Media Arts advisor.

Students Other than Media Arts Majors: Applicants must have

1. credit for a minimum of 56 units, including Media Arts 100, 101, 105, 200, and 214 or 110;
2. taken a minimum of 12 regularly graded units of course work at the University of Arizona;
3. a grade-point average based on course work taken at the University of Arizona of not less than 2.25 overall and 2.5 in Media Arts courses;
4. passed appropriate portfolio (produced or written);
5. a course of study approved by the student's major advisor.

Transfer Students

Transfer students who otherwise would qualify except that they do not meet the requirements of having taken a minimum of 12 regularly graded units at the University of Arizona will be given provisional permission to enter upper-division courses until they have completed this minimum. Thereafter, they must meet all of the regular provisions of the policy.

All Media Arts majors wishing to enroll in upper-division courses should see a Media Arts faculty advisor for details of the Advanced Standing Policy. Other students should seek additional information in the Department Office, MLB 265.

100. Orientation to Study in Media Arts (1) I II Orientation to undergraduate programs, productive study methods, and use of professional literature and other resources in media arts.

105. Introduction to Writing in Media Arts (1) I II Introduction to writing with emphasis on script formats in media, televisions, and film.

106. Mass Media and Society (3) I II Survey of the relationships between mass media and society, effects of mass media on individuals, institutions, culture, social structure.

110. Beginning Film Techniques (3) I II Silent motion picture production techniques. Indi-
vidual and/or team projects to include completion of 3 short super-8 silent films. University provides camera, editing, and projection equipment; student provides film and pays all processing and lab charges.

200. Fundamentals of Theory and Aesthetics in Media Arts (3) I II Survey of the elements which make up video, film, and audio images: light, color, area, depth, movement, and sound in message design and structure.

205. Reporting the News (3) I II (Identical with Jour. 205)

208. Law of the Press (3) I (Identical with Jour. 208)

209. Survey of Film History (3) II A survey of the history of motion pictures. Films are chosen from a variety of nations and time periods to illustrate the diversity of film styles. 2R, 3L.

214. Beginning Video Production (4) I II Introduction to the elements of video production, including professional practices, production elements, and personnel in television stations and video centers. 3R, 3L. P, 101; CR, 200.

215. Introduction to Film Production (4) I II Basic principles of 16mm film production and examination of production techniques and practices; laboratory experience with film production equipment and production of several short films. 2R, 3L. P, CR, 200.

225. Survey of Broadcasting History (3) I Survey of American broadcasting; emphasis on economic history, technical innovation, networks and ratings.

239. Speaking in the Arts (3) I II (Identical with T.A.R. 239)

241. Beginning Photography (3) [Rpt.2] I II (Identical with Art 241)

280. Introduction to Electronic Journalism (3) I II Survey of the history, organization, and practice of electronic journalism.

296. Recording Studio Production (3) I II (Identical with Mus. 302)

303. Professional Practices (1) I II S Preparing students to meet the professional expectations of media work. Job search strategies (resume writing and interviewing) and professional concepts are studied. P. 100, 101, 105, 200, 214 or 215, and one Writing-Emphasis Course.

308. Survey of Media Law and Regulation (3) I II Introduction to the legal and regulatory framework of the electronic media and film; licensing, cross-ownership, public interest, self-regulation, consumer influence, and related topics.

311. Lighting for Media Production (2) I Function and quality of light; typical application in photography, television, motion pictures, architecture, and interior design. P. 200.

314. Intermediate Video Production (3) I II Production of various types of television programs, including techniques and theory of studio and field operations, use of equipment (studio and EFP) and personnel relationships, with emphasis on the role of the television producer. 2R, 3L. Open to majors and minors only. P, 105, 200, 214, and acceptance of portfolio by Portfolio Committee.

315. Intermediate Film Production (3) I II Production of films, with emphasis on sound, editing techniques, and visual design. Students will produce a short film. 2R, 3L. P, 200, 215 and acceptance of portfolio by Portfolio Committee.


320. Media Arts Criticism (3) I II Analysis of arguments in journalistic and academic criticism and application of critical approaches in written assignments. Writing-Emphasis Course. P, 200 and satisfaction of the upper-division writing-proficiency requirement (see “Writing-Emphasis Courses” in the Academic Guidelines section of this catalog).


322. Major American Broadcast Genres (3) I II Historical survey of major radio and television program types, with emphasis on serial and series forms: drama, melodrama, western, crime drama, comedy, and sports. 2R, 3L. P, 200.

350. Professional Media Interviewing (3) I The interview process and specific interview formats, including survey research, journalistic, and panel formats. Interviewer performance is stressed; practice provided.


364. Creative Advertising (3) I II Open only to students who meet the requirements for advanced standing as specified in the College of Business and Public Administration section of this catalog. (Identical with Mkgt. 364)

366. Public Relations (3) I II Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog. (Identical with Mkgt. 366)

371. Film/Video Production Financing (3) I II Strategies for production financing for independent film/video projects and ways to position a project in the marketplace. Students will develop a prospectus for their own project. P, 214 or 215.

372. Exhibition Management (3) I II Programming strategies, exhibition techniques, market- ing approaches, and management models for film and video series, guest artist presentations, video installations, conferences, and festivals.

376. Audience Measurement (3) I II Interpretation and utilization of broadcast ratings, surveys, polls and other measures of the attitudes, opinions and behaviors of media audiences; relationships to social and management concerns. P, 106.


381. Reporting for Broadcast News (3) I Advanced work in the production of documentary and public affairs programs; idea formulation, budgeting, writing, researching, with emphasis on organization of production team and practical production considerations. 2R, 3L. Open to majors only. P, 314, 380, or 381.

397. Workshop a. Writing and the Arts (3) I II (Identical with T.A.R. 397a, which is home)

414. Advanced Video Production (3) I II Production of video programs of various kinds, with emphasis on the role of the director. 2R, 3L. P, 314, and acceptance of portfolio by Portfolio Committee.

415A-415B. Advanced Film Production (3-3) Advanced studies and practice in motion picture production. Students will produce a feature-length 16mm sound release print of an original film concept developed during the class. The University provides camera and editing equipment. Students pay all film and lab costs. Open to majors only. P, 315.

423. Representation of Gender in the Media (3) I Investigation of gender as a social and cultural construct through the critical analysis of media products including television, film, and advertisements. P, 200, 320. (Identical with W.S. 423) May be convened with 523.

424. Film Theory and Criticism (3) I Advanced studies in current cinematic theory and criticism. Historical examination of major film theories, including formalism, realism, classical Hollywood, structuralism, semiotics, and psychoanalytic theories. May be convened with 524.

426. Sexuality in Media Narratives (3) I 1992-93 Analysis of sexual representation in popular and underground film, music video and avant-garde video art; issues of voyeurism, exhibitionism, taboo, displacement, transgression, aggression and gender. 2R, 2S.

450. Conducting Media Campaigns (3) I II Analysis of the development and distribution of information through the media. Press releases, fact sheets, public service announcements, interviews, press conferences, and public hearings are studied. P, 350 or 376.

470. The Press and Society (3) I II (Identical with Jour. 470)

472. Broadcast and Cable Management (3) I II Investigation of media management techniques, scheduling, organizational structure, networks and affiliates, ethics, legal constraints, syndication, personnel and related topics. P, 308.
Medical Technology

(See Health-Related Professions)

Medicine

(MED/ANES/FCM/IMED/NEUR/OBG/OPH/PATH/PEI/PSY/RONC/RADI/SURG)

Arizona Health Sciences Center
Room 2208
(602) 626-6518

Interdepartmental (MED)

495. Colloquium

y. Introduction to the Neurosciences I (2) 1991-92 P. Consult department before enrolling. (Identical with Neur. 495z, Phcl. 495z, Psio. 495z and Psy. 495z) May be convened with 595y.

595. Colloquium

y. Introduction to the Neurosciences I (2) 1991-92 P. Consult department before enrolling. (Identical with Anat. 595y, Neur. 595y, Phcl. 595y, and Psio. 595y) May be convened with 495y.

z. Introduction to the Neurosciences II (2) 1991-92 P. 595y or consult department before enrolling. (Identical with Neur. 595z, Phcl. 595z, Psio. 595z and Psy. 595z) May be convened with 495z.

596. Seminar

Many interdepartmental seminars are numbered at both the 500 and the 800 levels. See 896 below for a complete listing.

801. Preparation for Clinical Medicine (1-12)

II No grade is given until the full 12 units are completed.

805. Social and Behavioral Science

610. Clerkship

a. Anesthesiology (1-18)

815. Subspecialty

b. BNI Neuroanesthesiology (4) P, completion of basic sciences and 810a.

c. General Anesthesiology (4-6)

d. Obstetrical Anesthesiology (4) P, completion of basic sciences and 810a.

Biochemistry

See Biochemistry elsewhere in this catalog.

Cancer Biology

See Cancer Biology elsewhere in this catalog.

Family and Community Medicine (FCM)


Associate Professors Peter J. Attarian, Daniel O. Levinson, Ronald E. Pust, Catherine M. Shisslak

Assistant Professors Tamsen Bassford, Dar- ian H. Cordes, Antonio Estrada, Paul M. Gordon, Jennie Joe, Evan W. Kligman, Craig L. McClure, Arthur B. Sanders, Barry D. Weiss

Lecturers Jil Feldhausen, Bertha Leis, Karen E. Snow, Bernhardt E. Stein

Clinical Professors Pedro Luis Escobar, Augusto Ortiz

Research Professors Osman M. Galal, Ronald W. Watson

Clinical Associate Professor Lawrence Mohr

Research Associate Professors Frank A. Hale, Cheryl K. Ritenbaugh

Clinical Assistant Professors Kay A. Bauman, Myra M. Kerschb, Robert C. Rhodes

Research Assistant Professors George H. Adams, Renia J. Gordon, Barbara R. Hartmann, Lewis Mehl, Joel Meister, Denise Roe, Janet H. Senf, Lee Sennott-Miller, Louise H. Warnick

Clinical Lecturers Philip Eichling, Susan Mohr

487. Poverty and Health

(3) (Identical with Nurs. 487) May be convened with 587.

500. Research

(2-16) (Rpt./2). P, basic science courses.

515. Subspecialty

h. Cancer Epidemiology and Prevention (3) I P, none; studies helpful. (Identical with R.Onc. 515h)

i. Cancer Prevention and Control (3-15) II (Identical with R.Onc. 515i)
Internal Medicine (IMED)


Clinical Professors Robert O. Brandenburg, Pedro Luis Escobar

Research Professor Thomas E. Moon (Professor, Family and Community Medicine)

Clinical Associate Professors Edgar J. Desser, Kenneth B. Desser, Daniel S. Duick, James V. Felicetta, Yadda Kabadi, Peter P. Mckellar, Preston J. Taylor, R. Scott Cormack

Research Associate Professors Marilyn J. Halonen (Associate Professor, Pharmacology), Robert T. Dorr, Yei-Mei Peng, Duane L. Sherrill

Clinical Assistant Professors Catherine Azar, Thomas M. Bajo, Marlene Bluestein, Danetta A. Bronnimann, Anthony E. Camilli, Anthony Caruso, Michael Darragh, Clifford D. DeBenedetti (Pediatrics), Mindy J. Fain, Michael Grossman, Michael Habib, Lee J. Hixon, Richard F. Hoffman, Peter C. Kelly, Mary E. Klink, Lisa Kaufmann, Marcia G. Ko, Nathan Lauffer, Margaret M. Miller, Manual Modiano, Patrick S. Pasulka, David S. Shimim (Assistant Professor, Radiation Oncology), Paul E. Stander, Terence D. Valenzuela (Assistant Professor, Surgery), Barbara H. Warren (Family and Community Medicine), Pamela Davis, Carol A. Wolfe, Mark S. Siskind, Michael J. Maricic, Richard M. Mandel, Jerry Bangert, Gayle A. Traver (Associate Professor, Nursing), Kevin Welch

Research Assistant Professors Joseph J. Bahl, Marianne B. Brome-Powell, Brenda V. Dawson, Irwin L. Fink, Douglas A. Perednia

Clinical Instructor Sally B.L. Thompson

Research Instructor Steven B. Knoper

Senior Clinical Lecturers Bruce F. Bachus, Bruce A. Benthancourt, John A. Bruner, Benjamin Burbank, John R. Harlan, Philip Levy, Richard A. Manch, Frank L. Meykens, Jr., Ulrich F. Michael, James L. Parsons, Avery A. Sandberg, Michael M. Schreiber, Michael T. Shaw, David Wayne Smith (Professor, Rehabilitation), Martin Snyder (Surgery), Harold C. Tretbar


Research Lecturer Susan E. Wilson-Sanders

Molecular and Cellular Biology

See Molecular and Cellular Biology elsewhere in this catalog.

Neurology (NEUR)

Professors Alan B. Rubens, Head, Carol Barnes (Psychology), Peggy Ferry (Pediatrics), Mary I. Johnson (Anatomy, Pediatrics), William A. Sibley
Associate Professors Colin R. Bamford, Erwin B. Montgomery, Johan Van Dalen (Ophthalmology), Gary Wenk (Psychology)
Clinical Assistants Geoffrey L. Ahern (Psychiatry), William Feinberg, Nathaniel T. McMullen (Anatomy), Naomi E. Rance (Pathology)
Clinical Professors Harvey W. Buchsbaum, David D. Daly, Jose Laguna
Clinical Associate Professors Enrique L. Labadie, Eugenie A. Obbens, Kalarialkij J. Oommen
Adjunct Lecturer Jay B. Angevine (Professor, Anatomy)

Obstetrics and Gynecology (OBG)

Professors M. Wayne Heine, Head, John R. Davis (Pathology), Kenneth Hatch, Jack Pearson, John Seeds, Lewis Shenker, Louis Weinstein
Associate Professors Ponjola Conen, Diane S. Fordney (Psychiatry), Kathryn L. Reed
Assistant Professor Marcello Pietrantoni (Clinical), Jessica Byron (Clinical), Assistant Professor John V. Kelly (Clinical), Tawfik Rizkallah (Clinical)
Clinical Associate Professors William C. Scott (Clinical), Earl A. Surwit (Clinical)
Clinical Assistant Professors David Chaffin, Joel Childers, Allan Hartsough, Herbert E. Pollock, Sterling Ryerson
Research Assistant Professor David S. Grosso
Clinical Instructor Robert Samuelson
Clinical Lecturers Caroline Anderson, James Maciulla

Ophthalmology (OPH)

Professor Barton L. Hodes
Associate Professor Johan T.W. Van Dalen
Assistant Professor Robert W. Snyder, Acting Head
Clinical Professor Robert M. Dryden
Clinical Associate Professor Leonard Joffe
Clinical Assistant Professors Richard W. Allinson, Denis Carroll, George S. Novallis, Sam E. Sato
Assistant Clinical Lecturers Reid Schindler, Edmund H. Thall

Pathology (PATH)

Professors Ronald S. Weinstein, Head, Peter H. Bartels, John R. Davis (Ophthalmology, Pathology), Paul R. Finley, Lewis Gissler, Anna R. Graham, Thomas M. Grogan,
Clinical Instructor Victoria E. Lasala
Clinical Lecturer Jeryl K. Dansky

800. Research (1-18) (See College of Medicine Electives Manual)

803. Clinical Clerkship (6)

810. Clerkship
   b. Inpatient Pediatrics (6)

811. Subinternship
   a. Ambulatory Pediatrics (1-18)
   b. Behavioral and Developmental Pediatrics (1-18)

815. Subspecialty
   a. Advanced Neonatology (4-6)
   b. Pediatric Infectious Diseases (3-6)
   d. Cardiac Ultrasound Echo and Doppler (4-6)
   e. Pediatric Cardiology (4-6)
   f. Pediatric Neurology (4-6)
   g. Pediatric Hematology/Oncology (4-6)
   h. Poison Center (4-6) P, Ped. 803.
   i. Pediatric Pulmonary (4-6) I I P, 803.
   j. Clinical Allergy (1-6) (Identical with I.Med. 815f, which is home)
   k. Pediatric Endocrinology (4-6)
   l. Pediatric Clinical Research in a Cross-Cultural Setting (4-12) P, 803 or I.Med. 803.
   m. Clinical Genetics/Dysmorphology (4) P, completion of required clerkships.

817. Pediatrics (PED)

891. Preceptorship
   c. Chronic Illness in Childhood/Children's Rehabilitation Services (4) P, 803.
   e. Pulmonary (4) P, 803.
   g. Critical Care (4) P, 803.

897. Pharmacology

See Pharmacology elsewhere in this catalog. Toxicology courses are listed under Pharmacology and Toxicology.

899. Physiology

See Physiology elsewhere in this catalog.

Psychiatry (PSYI)

800. Research (1-18) (See College of Medicine Electives Manual)

803. Clinical Clerkship (6)

810. Clerkship
   b. Inpatient Psychiatry (6)

811. Subinternship
   a. Ambulatory Pediatrics (1-18)
   b. Behavioral and Developmental Pediatrics (1-18)

815. Subspecialty
   b. Child Psychiatry (1-18)

817. Pediatrics (PED)

891. Preceptorship

Radiation Oncology (RONC)

800. Research (1-18) (See College of Medicine Electives Manual)

803. Clinical Clerkship (6)

810. Clerkship
   a. Clinical and Community Psychiatry (1-18)
   b. Child Psychiatry (1-18)

817. Pediatrics (PED)

891. Preceptorship

Radiation Oncology (RONC)

Professors J. Robert Cassady, Head, G. Timothy Bowden, Thomas C. Cetas, Eugene W. Gerner, Robert B. Roemer, Associate Professors Anne E. Cress, Daniel L. McGee, David S. Shimm, Assistant Professors Kullervo H. Hynynen, Bruce Lulu, Wendell R. Lutz, Baldassarre D. Stea

Clinical Associate Professor Chee Wai Cheng
Research Associate Professor Helen L. Gennler

Clinical Assistant Professor Helen F. Sykes

Radiation Biology (3) II Basic principles of radiation effects in mammalian cell and tissue systems, with emphasis on biochemical aspects, such as DNA damage and DNA repair, and cellular responses, such as cell kinetics defects and radiation repair and recovery; radiation and chemical (especially radiomimetic drugs) carcinogenesis. P, introductory biology and chemistry.

515. Subspecialty
   a. Cancer Epidemiology and Prevention (3) I P, none; statistics helpful. (Identical with F.C.M. 515f, which is home)
   b. Cancer Prevention and Control (3-15) II (Identical with F.C.M. 515f, which is home)


595. Colloquium
   a. Special Topics in Cell Biology (2) [Rpt./6 units] II (Identical with C.Bio. 559d, which is home)
596. Seminar (1) (1) (Identical with C.Bio. 596h, which is home)

815. Subspecialty
  a. Introduction to Radiation Oncology (1-16)
  h. Cancer Epidemiology and Prevention (3) I P; none; statistics helpful. (Identical with C.Bio. 815h, which is home)
  i. Cancer Prevention and Control (3-15) II (Identical with C.Bio. 815i, which is home)


896. Seminar (1) (1) (Identical with C.Bio. 896h, which is home)

Radiology (RADI)

Professors M. Paul Capp, Head, George R. Barnes, Jr. (Clinical), Harrison H. Barrett (Optical Sciences), Theodore Bowen (Physics), William Dallas, Bruce J. Hillman, Tim B. Hunter, Theron W. Ovitt, Dennis D. Patton (Optical Sciences), Michael J. Pitt (Surgery), Gerald D. Pond, Joachim F. Seeger, William L. Wolfe, Jr. (Optical Sciences), Jack N. Hall, Brent W. Mockbee

Clinical Associate Professor James R. Standen
Clinical Assistant Professors Per Granstrom, Rebecca L. Hulett, Rebecca Hunt, Pamela M. Luckett, Steven Smyth, Cathy S. Tyma, Mark T. Yoshino

Clinical Instructor Jason L. Stemmer
Clinical Lecturer Linda L. Attarian
Research Professor Hans Roehrig
Research Associate Professor H. Bradford Barber

800. Research (1-6) [Rpt./1]

815. Subspecialty
  a. Diagnostic Radiology (4)
  b. Nuclear Medicine (1-6)

891. Preceptorship
  b. Diagnostic Radiology (4) P completion of basic sciences.

Surgery (SURG)

Professors Bruce E. Jarrell, Head, Victor M. Barrington, L. Philip Carter, Milos Chvapil, Jack G. Copeland, George W. Drach, Eric P. Gall (Family and Community Medicine, Internal Medicine), Theodore J. Glatke (Speech and Hearing Sciences), Noel D. Matkin (Speech and Hearing Sciences), Harvey W. Meinl, Michael J. Pitt (Radiology), Charles W. Putnam, Arthur B. Sanders, Guishan K. Sethi, Donald P. Speer, Robert F. Spetzler, Thomas H. Stanisic, Charles M. Tipton (Exercise and Sport Sciences), Hugo V. Villar, Robert G. Volz, Charles L. Witte, Marlys H. Witte, Charles F. Zukowski


Research Professors Clemond D. Eskelson, A. Norman Guthkelch


Research Assistants Janis M. Burt (Physiology), Donald W. DeYoung, Ronald L. Mistorowski


Research Assistants David W. Montgomery, Judith B. Ulereich

Clinical Instructor William J. Brooks, Riemke M. Braekema

Senior Clinical Lecturers Merril W. Brown, Mack L. Clayton, Herbert F. Freeman, Herbert J. Louis, Newton C. Collco, D. Philip Nelson, Clos C. Snyder, Martin Snyder, Richard A. Walsh, Julius Wilikon


Research Lecturers Floyd E. Anderson, Stephen Karrins, Ann Kerwin, Ruth D. Smothers


800. Research (1-12) P 803. (See College of Medicine Electives Manual)

803. Clinical Clerkship (6-9)

815. Subinternship
  b. BNI Neurological Surgery (4-6) P fourth year medical students.

815. Subspecialty
  a. Urinary Stone Disease (6)
  b. Cardiothoracic Surgery (6)
  c. Neurosurgery (6)
  d. Surgical and Medical Problems in Fluid and Electrolyte Balance (1-3) [Rpt./1]
  e. Urology (6)
  f. Orthopedics (3)
  g. Cardiovascular Physiology and Research (1-12)
  h. Lymphovascular System in Health and Disease (6 to 12)
  i. Otohygology and Rhinology (3)
  j. Sports Medicine (Section of Orthopedic Surgery) (1-6) [Rpt./1]
  k. Orthopedic Bioengineering (3-6) P. Nine weeks of surgery clerkship, 803 and/or 807.
  l. Trauma (3-6)
  m. Spinal Cord Injury (3) Open to majors only, P senior standing.
  n. Surgical Critical Care (3-6) [Rpt./1] P 803.
  o. Pediatric Orthopedic Surgery (3-6) [Rpt.6 units] P rotation in pediatrics and orthopedic surgery
  p. Plastic Surgery (3-4) I II P senior year in medical school.
  q. Clinical Experience in Rehabilitation Medicine (1-4)
  r. Vascular Clinical Management (4-8) [Rpt.8 units] P completion of junior and senior rotations in surgery.
  s. Emergency Medicine (3-12)
  t. Head and Neck Surgery (4-6) P completion of required clerkship.
  u. Clinics in Medical Ignorance (3-4) I II P junior standing.
  v. Pediatric Urology (3-4) I II P.

891. Preceptorship
  a. Surgery and Subspecialties (1-18) [Rpt./3]
MEDICINE—MEDIEVAL STUDIES—MEXICAN AMERICAN STUDIES—MICROBIOLOGY AND IMMUNOLOGY

c. General Surgery "B" (4-12) P, 803.
d. General Surgery "C" (4-12) P, 803.
e. Care of the Trauma Victim (4-8) P, fourth year medical students or completion of 803.
g. Research Techniques in Orthopedic Surgery (4-8) P, 803.
h. Vascular Surgery (4-8) P, fourth year medical students or completion of 803.
i. Burn Care (4-8) P, fourth year medical students or completion of 803.
j. Pediatric Orthopaedic Surgery/Children's Rehabilitative Services (4-6) P, completion of basic sciences.

86b. Seminar
a. Medical Ignorance (2) [Rpt./1] II

Medieval Studies
Social Sciences Building, Room 121
(602) 621-1586

Committee on Medieval Studies (Graduate)

Professors Jonathan Beck (French and Italian), John Boe (Music), Sigmund Eisner (English)

Associate Professors Alan E. Bernstein, Chair

(602) 621-1586

Douglass Building, Room 315
(602) 621-7551

Mexican American Studies (MAS)

Mexican American Studies and Research Center

Professors Macario Saldate IV (Educational Foundations and Administration), Director,

Jose D. Garcia (Physics), Linan A. Gyurko (Spanish and Portuguese), Miguel M. Mendez (Spanish and Portuguese), Michael C. Meyer (History), Eliana S. Rivero (Spanish and Portuguese), Cecil Robinson (Emeritus, English), Renato I. Rosaldo (Emeritus), Charles M. Tatum (Spanish and Portuguese), Carlos Velez (Anthropology), Thomas Weaver (Anthropology)

Associate Professors Celestino Fernandez (Sociology), John J. Garcia (Political Science), Juan R. Garcia (History), Rosanne Gonzalez (English), William Velez (Mathematics)

Assistant Professors Frances Apancio (Spanish and Portuguese), Roberto Fernandez (Sociology), Ana Perchez (Spanish and Portuguese), Antonio Rios-Bustamante (Mexican American Studies), Joaquin Ruiz (Geosciences), Kathleen C. Schwartzman (Sociology)

Lecturers Adalberto M. Guerrero (Spanish and Portuguese), Raquel R. Goldsmith

Under the auspices of the Mexican American Studies and Research Center, the Mexican American Studies curriculum is an interdisciplinary exploration of the Mexican American experience. Its general goal is to provide a socially pertinent education with humanistic and practical content which will enrich the total university curriculum as well as prepare students to serve the total community.

The major: 30 units in M.A.S., including 180a-180b and nine units chosen from 161, 233, 332, and 443, or 485. At least 15 units must be in upper-division courses. Group III requirement must be fulfilled in Spanish.

The minor: A supportive minor in Mexican American studies to augment other academic areas or majors is encouraged. The minor requires 21 units, including 180a-180b and 6 units chosen from 161, 233, 332, and 443, or 485.

160. Minority Relations and Urban Society (3) II (Identical with Soc. 160)

761. The Chicano in American Society (3) II (Identical with Soc. 161)

180a-180b. Introduction to Mexican American Studies (3-3) Introduction to Mexican American studies from various perspectives. 180a: The human sciences. 180b: Research issues and interpretation in the field; public policy and Mexican origin populations; and social sciences and the professions and impact on the Mexican American community.

203. Oral Communication in Spanish (4) I (Identical with Span. 203)

233. History of the Mexican American (3) I (Identical with Hist. 233)

303a-303b. Comprehensive Spanish for the Native Speaker of Spanish (3-3) I (Identical with Span. 303a-303b)

319. Mexican American Culture (3) I (Identical with Anth. 319)

325. Foundations of Bilingual Education (3) I (Identical with L.R.C. 325)

330. Minority Groups and American Politics (3) II (Identical with Pol. 330)

352. Politics of the Mexican American Community (3) II (Identical with Pol. 332)

361. The U.S.-Mexico Border Region (3) I (Identical with Hist. 361)

368. Colonial Mexico (3) I (Identical with Hist. 368)

369. Mexico Since Independence (3) II (Identical with Hist. 369)

404. Sociology of the Southwest (3) I (Identical with Soc. 404)

406. Foundations of Reading Instruction in Spanish (3) II Student must be registered in the College of Education. (Identical with L.R.C. 406)

411.* Public Administration and the Mexican American (3) I (Identical with M.A.P. 411)

*Open only to students who meet the requirements for advanced standing as specified in the College of Business and Public Administration section of the catalog.

423. Peoples of Mexico (3) II (Identical with Anth. 423)

432. Pre-Columbian Culture and Myths (3) II 1992-93 (Identical with Span. 432)

434. Cultural and Literary Origins of Hispanic Southwest (3) I 1991-92 (Identical with Span. 434)

441. Children's Literature in Spanish (3) I (Identical with Span. 441)

442. Mexican-American Poetry (3) I 1992-93 (Identical with Span. 442)

443. Mexican-American Literature (3) II (Identical with Span. 443)

444. Mexican-American Narrative (3) I 1990-91 (Identical with Span. 444)

446. Mexican-American Theatre (3) I 1991-92 (Identical with Span. 446)

447. Contemporary Mexican Literature (3) II S (Identical with Span. 447)

448. Government and Politics of Mexico (3) I (Identical with Pol. 448)

449. Mexican and Mexican-American Film (3) II 1991-92 (Identical with Span. 449)

453a-453b. Mesoamerican Archaeology (3-3) I (Identical with Anth. 453a-453b)

467. Race and Ethnic Relations (3) II I (Identical with Soc. 467)

473. Spanish for the Native Speaker of Spanish Classroom Teacher (3) II (Identical with Span. 473)

489. Mexicanas/Chicanas Women's History (3) I CDT Historical survey and sociological analysis of past and present experiences of Mexicanas and Chicanas in the United States (Identical with W.S. 485) Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

596. Seminar
m. Mexican-American Heritage Bibliography - A Library Seminar (3) [Rpt./6 units] I (Identical with Hist. 596m, Port. 596m, and Span. 596m)

695. Colloquium
r. Bilingualism in the United States (3) [Rpt./3] S

Microbiology and Immunology (MICR)

Undergraduate Program
Pharmacy-Microbiology Building
Room 201
(602) 621-6903

Graduate Program
Arizona Health Sciences Center
Room 6103
(602) 626-6061

Professors John J. Marchalonic, Head, Harris Bernstein, Charles P. Gerba (Nutrition and Food Science), Evan M. Hersh (Internal Medicine), Junetsu Ito, Wayburn S. Jeter (Pharmacology and Toxicology, Emeritus), Marguerite M.B. Kay, Rein Kilkson
The Department of Microbiology and Immunology offers a course of study applicable to general and applied sciences in agriculture, allied health, biology and medicine. The major provides a strong foundation for graduate study in microbiology, immunology, molecular biology and genetics, as well as a professional program for students seeking admission to schools of medicine and dentistry.

The department offers the Bachelor of Science with a major in microbiology, and the Master of Science and Doctor of Philosophy degrees with majors in microbiology and immunology. For graduate admission and degree requirements, consult the Graduate Catalog.

The major: 35 units, including 205, 317R, 419R, 427R, 495a. The remaining units must be chosen from the following and must include at least four laboratory courses (designated **): 317L, 403R, 403L, 410, 419L, 419R, 420L, 420R, 420L, 423R, 423L, 425, 427L, 428R, 428L, 429, 430, 435, 438, 450R, 450L, 451, 470, 471, and 473. Minor: 18 units of mathematics to include Math. 324 or 125a are also required.

The Minor: The department has a structured minor in chemistry. The department participates in the honors program.

181. Introductory Biology I (4) (Identical with M.C.B. 181)

182. Introductory Biology II (4) (Identical with M.C.B. 182)

205. Microbiology (5) (2) (Identical with M.C.B. 205) Introduction to general, applied, and pathogenic microbiology and immunology. 4R, 4L.

317R. General Microbiology and Microbial Physiology (3) (Identical with M.C.B. 317R) I Microbial cell structure and function; physiology and metabolism; growth; characterization of major microbial groups. P, 205, CR, Chem. 241b, 243b.

317L. Laboratory Techniques in General Microbiology and Microbial Physiology (2) (Identical with M.C.B. 317L) I Instrumementation and technology in general microbiology and microbial physiology. P, 317R or CR.

357. Communicable Diseases (3) (Identical with M.C.B. 357) I The nature and prevention of communicable diseases. Open to nonmajors only.

396H. Honors Proseminar (3) (Identical with M.C.B. 396H) I

403R. Biology of Animal Parasites (3) (Identical with M.C.B. 403R) May be convened with 503R.

403L. Parasitology Laboratory (1) (Identical with M.C.B. 403L) May be convened with 503L.

410. Cell Biology (3) (Identical with M.C.B. 410)

419R. General Immunology (3) (Identical with M.C.B. 419R) I Basic concepts of the immune system. Presentation of the roles antigen, immunoglobulins, complement, lymphokines and types of immune cells play in humoral and cell-mediated immunity. P, 317R, Chem. 241b, 243b. (Identical with V.Sc. 420R) May be convened with 502R.


420L. Pathogenic Bacteriology Laboratory (2) (Identical with V.Sc. 420L) I Laboratory and identification of pathogenic bacteria; techniques in pathogenic bacteriology. P, 420R or CR. (Identical with V.Sc. 420L) May be convened with 520L.

423R. General Pathology (3) (Identical with V.Sc. 423R) May be convened with 523R.

423L. General Pathology Laboratory (1) (Identical with V.Sc. 423L) May be convened with 523L.


427R. General Mycology (3) I General mycology, with emphasis on the microfungi. P, 205. May be convened with 527R.

427L. General Mycology Laboratory (2) I General mycology laboratory, with emphasis on the microfungi. P, 427R or CR. May be convened with 527L.

428R. Advanced Microbial Genetics (3) (Identical with M.C.B. 428R) May be convened with 528R.

428L. Advanced Microbial Genetics Laboratory (2) I (Identical with M.C.B. 428L) May be convened with 528L.

429. Introductory Virology (3) I Essential features of viruses, and their relationships to the diseases of humans, other animals, plants and microorganisms. P, 205, Chem. 241b, 243b. May be convened with 529.

430. Introduction to Biophysics (2) I (Identical with M.C.B. 430) May be convened with 530.

435. Soil Microbiology (3) I (Identical with M.C.B. 435) May be convened with 535.

438. Ecology of Infectious Disease (3) I (Identical with M.C.B. 438) May be convened with 538.

443. Research Animal Methods (3) I (Identical with M.C.B. 443) May be convened with 543.

450R. Medical Mycology (2) I The isolation and identification of fungi of medical importance. P, 205. (Identical with V.Sc. 450R) May be convened with 550R.

450L. Medical Mycology Laboratory (2) I Laboratory experiments dealing with isolation and identification of fungi of medical importance. 6L, P, 450R or CR. (Identical with V.Sc. 450L) May be convened with 550L.

528R. Advanced Microbial Genetics (3) II (Identical with M.C.B. 528R) May be convened with 428R.

528L. Advanced Microbial Genetics Laboratory (2) I (Identical with M.C.B. 528L) May be convened with 428L.

529. Introductory Virology (3) I For a description of course topics, see 429. Graduate-level requirements include an in-depth research paper on a selected topic in general or medical virology. P, 205, Chem. 241b, 243b. May be convened with 429.

530. Introduction to Biophysics (2) I (Identical with Phys. 530) May be convened with 430.

531. Biophysical Theory (2) II (Identical with Phys. 531)

535. Soil Microbiology (3) I (Identical with V.Sc. 535) May be convened with 435.

538. Ecology of Infectious Disease (3) II (Identical with V.Sc. 538) May be convened with 438.

543. Research Animal Methods (3) I (Identical with V.Sc. 543) May be convened with 443.

545. Advanced Soil Microbiology (2) II 1990-91 (Identical with S.W. 545)

550R. Medical Mycology (2) II For a description of course topics, see 450R. Graduate-level requirements include additional experience in dermatophyte identification. P, 205. (Identical with V.Sc. 550R) May be convened with 450R.

550L. Medical Mycology Laboratory (2) II For a description of course topics, see 450L. Graduate-level requirements include an average of one hour per week working in the dermatophyte laboratory. P, 205. (Identical with V.Sc. 550L) May be convened with 450L.


552. Molecular Mechanisms of Microbial Pathogenesis (3) I 1992-93 Review of current concepts in specific areas of microbial pathogenesis, including action of exo- and endotoxins, cell surface interactions, phagocytosis and host microbicidal functions. P, 460.


570. Molecular Genetics (3) I 1991-92 Molecular genetics and biology of the bacterial viruses; molecular mechanisms of gene regulation, DNA replication, DNA repair, mutation and genetic recombination; current research in bacterial genetics (lysogeny, transformation, conjugation, use of transposons and gene fusions in genetic analysis and transformation); introduction to gene cloning and its uses in analysis of gene structure and regulation. (Identical with Gene. 570)


582. Immunotoxicology (2) I (Identical with Tox. 582)


595. Colloquium 
- a. Special Topics in Cell Biology (2) [Rpt./6 units] II (Identical with C.Bio. 595d, which is home)
- b. Seminar 
  a. Current Problems in Molecular Biophysics (1) II (Identical with Phys. 596a, which is home)

630. Experimental Methods for Research (4) II Hands-on techniques necessary for pursuing a research career in Microbiology and Immunology. 12L. P, 419, 501, 560 or 561, Bioic. 460. Consult department before enrolling. (Identical with V.Sc. 630)

672. Food Safety (2) I 1991-92 (Identical with N.F.S. 672)

695. Colloquium 
- a. Readings in Microbiology (1) [Rpt.] I II
- b. Immunopathology (1) I
- c. Molecular Genetics of Microorganisms (1) III
- d. Molecular and Cellular Immunology (1) III
- e. Tumor Virology (1) II
- f. Host-Parasite Interactions (1) [Rpt.] II

696. Seminar 
- a. Research (1) [Rpt.] I II

801. Medical Microbiology (6) I


891. Preceptorship (1) [Rpt.]
- a. Microbiology and Immunology (3-12) [Rpt./12 units]

**Middle Eastern Studies**

Franklin Building, Room 204 (602) 621-5450

**Center for Middle Eastern Studies**

**Middle Eastern Studies**

Professors Ludwig W. Adamec (Near Eastern Studies), Michael E. Bonine (Geography and Regional Development), Nathan Buras (Hydrology and Water Resources), Kenneth Clark (Architecture), William Dever (Near Eastern Studies), Osman Galal (Family and Community Medicine), Adel S. Gamal (Near Eastern Studies), John C. Racy (Psychiatry), David Soren (Classics), Soroosh Sorooshian (Hydrology and Water Resources), Anthony Vuturo (Family and Community Medicine), Donald A. Wells (Economics)

Associate Professors Jerrold D. Green, Director (Political Science), Ford Burkhardt (Journalism), Constance Cronin (Anthropology), Richard M. Eaton (History), Esther Fuchs (Near Eastern Studies/Judaic Studies), Gail G. Harrison (Family and Community Medicine), Richard C. Martin (Religious Studies), Daniel Swetschinski (Judaic Studies), William J. Wilson (Near Eastern Studies), Norman Yoffee (Anthropology)

Assistant Professors Linda T. Darling (History), Chris Demchak (Public Administration and Policy), Tamara Pearson d'Estree (Communication/Psychology), David Gibbs (Political Science), Simin Karimi (Near Eastern Studies), Senzil Nawid (Near Eastern Studies), Thomas K. Park (Anthropology)

Lecturers Jean F. Goetinck (French and Italian), Shoshana Green (Near Eastern Studies/Judaic Studies), Helen Henderson (Bureau of Applied Research in Anthropology)

Adjunct Professor Lou Silberman (Judaic Studies)

Adjunct Assistant Professors Anne Betteridge, Amy Newhall

The Center for Middle Eastern Studies coordinates a concentration in Middle Eastern studies for students majoring in a variety of other disciplines, including anthropology, agriculture, architecture, economics, French, journalism, Judaic studies, medicine, Near Eastern studies, and political science. Areas of particular strength include Afghanistan, Iran, Iraq, Israel, the Fertile Crescent, and Egypt. Faculty members are available to counsel students on planning their programs.

For students interested in majoring in Middle Eastern languages, programs are available through the Department of Near Eastern Studies and the Committee on Judaic Studies.

The center participates in the honors program.

**Military Science, Naval Science and Military Aerospace Studies (MLS/NS/MLA)**

Military science (Army), naval science (Navy and Marine Corps) and aerospace studies (Air Force) are open to male and female students seeking a commission. ROTC courses can be counted as elective credit toward graduation in most academic majors. Lower-division courses carry no service commitment. Veterans may receive credit for the first two years of the four-year ROTC program. Textbooks and uniforms are provided by the departments. For further information about the four-year ROTC programs, the special two-year ROTC programs, entry requirements for upper-division courses, and ROTC scholarships, see the catalog section on School of Military Sciences, Naval Science and Aerospace Studies under General Divisions of the University or contact the department.

See the following page for course listings for Military Science, Naval Science, and Military Aerospace Studies.
Military Science (MLS)
South Hall, Room 101
(602) 1609

Professor Michael P. Merz, Head
Assistant Professors Ronald Boykins, Jeffery Enloe, John Russo, William Lackenbury
Instructors Gary L. Anderson, Donald Briere, Brian Stephenson

100. Introduction to Leadership (3) I Organization of the Army; principles and techniques of applied leadership; customs, traditions and military courtesy; basic marksmanship; first aid, land navigation; small-unit tactics; practicum. 2R, 1L. Course is open to all registered students.

101. Leadership Principles (3) II Organization of the Army; principles and techniques of applied leadership; customs, traditions and military courtesy; basic marksmanship; first aid, land navigation; small-unit tactics; practicum. 2R, 1L. Course is open to all registered students.

110. Physical Fitness Training (1) [Rpt./2 units] I II Activity course based on the Army physical fitness training program. 3L.

200. Army Composition/Functions and Leadership Development I (3) Military staff organization and operation; procedures and conduct of military planning; principles of war through historical examples; leadership development for today and tomorrow in small units and organizations; practicum. 2R, 1L. Open to all registered students.

201. Army Composition/Functions and Leadership Development II (3) Continues the development of leadership training for the individual in small unit levels; orientation to Soviet Military power, practical experiences in land navigation, first aid and rifle marksmanship. 2R, 1L. Open to all registered students.

210. Tactics (2) [Rpt./4 units] I II GRD Development of tactical planning skills and small unit operations.

300.a-300.b. Fundamentals and Dynamics of Military Operations (3-3) Topographical map interpretation; fundamentals of small-unit operations; communication media, motivation and behavior in the military environment; military planning and execution; practicum. 3R, 1L. Consult department before enrolling.

301. Army ROTC Advanced Camp (4) S Six-week summer camp at Ft. Lewis, Washington, required for commissioning as an officer in U.S. Army. Open only to Advanced Course Army ROTC cadets.

400.a-400.b. Military Administration and Preparation for Service (3-3) Development of skills required to function as a manager; motivation and behavior in a military environment; highlights personal integrity, honor and professional ethics; military legal system; unit management; practicum. 3R, 1L. Consult department before enrolling.

Naval Science (NS)
South Hall, Room 109
(602) 621-1281

Professor R. F. Walters, Head
Associate Professor R. A. Offerle
Assistant Professors Jerry Deville, John Ikeda, Dan Nichols, Edi Spencer, Tom Stanley
Instructors Nevin Hambarger, Edward Shields

100a-100b. Naval Laboratory I (1-1) I II Various topics such as drill and ceremonies, physical fitness, crew training, safety awareness, personal finances, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.

101. Introduction to Naval Science (3) I Introduction to the naval profession and to concepts of seapower, with emphasis on mission, organization, processes of detection, evaluation of the threat and Marine Corps; naval courtesy and customs, military justice, shipboard damage control and safety.

102. Naval Ship Systems I: Engineering (3) II Ship characteristics and types including ship design, hydrodynamic forces, stability, compartmentation, propulsion, electrical and auxiliary systems, interior communications, ship control, and damage control; basic concepts of the theory and design of steam, gas, turbo, and nuclear propulsion.

200a-200b. Naval Laboratory II (1-1) I II Various topics such as drill and ceremonies, physical fitness, crew training, safety awareness, personal finances, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.


202. Seapower and Maritime Affairs (3) II U.S. Naval history from the American Revolution to the present. Discussion of the theories of Mahan, political issues of merchant marine commerce, and a comparison of U.S. and Soviet naval strategies.

300.a-300.b. Naval Laboratory III (1-1) I II Various topics such as drill and ceremonies, physical fitness, crew training, safety awareness, personal finances, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.

301. Navigation and Naval Operations I (3) I Theory, principles, and procedures of navigation. Students learn piloting navigation including the use of charts, visual and electronic aids, the theory and operation of magnetic and gyro compasses, and celestial navigation.

302. Navigation and Naval Operations II (3) II International and inland rules of the road, relative-motion vector-analysis, formation tactics, and ship employment. Introduction to naval operations and ship handling. P. N.S. 301

310. Evolution of Warfare (3) I The development of warfare to present, focusing on theorists, strategists, tacticians, and technological developments. Student acquires sense of strategy and impact of precedent on military actions.

400a-400b. Naval Laboratory IV (1-1) [Rpt./1] I II Various topics such as drill and ceremonies, physical fitness, crew preparation, sail training, safety awareness, personal finances, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.

401. Leadership and Management I (2) I Organizational behavior and management in the context of the naval organization. A survey of management functions of planning, organizing, and controlling; and introduction to individual and group behavior in organizations; motivation and leadership.

402. Leadership Management II (2) II Naval officer responsibilities in naval administration: counseling methods, military justice administration, naval human resources management, directives and correspondence, naval personnel administration, material management and maintenance. P. N.S. 401 or M.A.P. 305.

410. Amphibious Warfare (3) II Historical survey of the development of amphibious doctrine and amphibious operations, with emphasis on the evolution of amphibious warfare in the 20th century; present day potential and limitations on amphibious operations, including the rapid deployment force concept.

Military Aerospace Studies (MLA)
South Hall, Room 104
(602) 621-3521

Professor Roger L. Jacks, Head
Assistant Professors Janet L. Dougherty, Jeffery K. Little, Douglas E. Smith

101a-101b. First Year GMC*, History of Aviation (2-2) Survey of the development of aviation from the advent of the air age to the present, with emphasis on military aviation and its relationship with political and economic aspects of historical world situations. 1R, 1L. 101a is not prerequisite to 101b.

201a-201b. Second Year GMC*, Air Force History (2-2) Survey of the doctrine, mission, and organization of the U.S.A.F.; U.S. strategic offensive and defensive forces; U.S. general purpose and aerospace support forces. 1R, 1L. 201a is not prerequisite to 201b.

300.a-300.b. Third Year POC**, Leadership and Management (3-3) Theory and application of leadership and management, with emphasis on human relations, motivation, communication for managers, organizational behavior, and management processes. 3R, 1L. Consult department before enrolling.

400a-400b. Fourth Year POC**, American Defense Policy (3-3) Critical analysis of various aspects of the military in American society and its application and effects on the world political and economic environment. 3R, 1L. Consult department before enrolling.

*General Military Course
**Professional Officer Course
Geological Engineering (GEN)

Geological engineering involves the application of engineering principles to the design and specification of earth structures and the exploration and development of natural resources.

The department offers the Bachelor of Science in Geological Engineering, and Master of Science and Doctor of Philosophy degrees with a major in geological engineering. Undergraduate degree requirements are listed in the College of Engineering and Mines section of this catalog.

120. Mineral Resources, Geotechnology and the Environment (3) I II (Identical with Mn.E. 120)

330. Introduction to Remote Sensing (3) I (Identical with Geog. 330)


415. Rock Excavation (3) II (Identical with Mn.E. 415) May be convened with 515.

416. Field Studies in Geophysics (3) III S Seismic, magnetic, electrical, and gravity exploration techniques. Field trips. Special fee may be required. 3 R, 4.5 L. 4.5 ES, 1 ED. P, Geos. 416. (Identical with Geos. 416) May be convened with 516. Sternberg


425. Geotechnical Investigations (3) II Investigation and analysis of geologic factors in the design and construction of engineering projects. 3 R, 3 L. 3.5 ES, 1 ED. P, Geos. 416. (Identical with Geos. 416) May be convened with 524. Kulatilake

426. Health and Safety in Mining (1-1) I (Identical with Mn.E. 426a-426b) May be convened with 526a-526b.

427. Geomechanics (4) I (Identical with Mn.E. 427) May be convened with 527.


448. Geophysical Exploration and Engineering (4) I Principles of gravity, magnetic, and electrical exploration; acquisition and interpretation of data to define geologic structure and evaluate resources. 3 R, 2 L. 2 ES, 2 ED. P, Phys. 110, 116, Math. 223. (Identical with Geos. 448) May be convened with 548. Poulton


461. Accident Prevention (2) II (Identical with Mn.E. 461) May be convened with 561.

470. Computer Methods in Geological Engineering (3) II Use of computers to solve problems in geological engineering, including data bases, computer contouring, map filtering and enhancement, and multivariate analysis of geologic data. 3 ED. P, introductory courses in computer programming, math, and earth science. May be convened with 570. Poulton/Sternberg

487. Design of Exploration Programs (3) II Geologic and economic principles applied to the design of mineral exploration programs and the evaluation and development of prospects. P, 449. (Identical with Geos. 487) May be convened with 587. Poulton


505. Applied Multispectral Imaging (3) II Application of image processing to mineral exploration, engineering geology, groundwater location, and pollution monitoring. P, 407. (Identical with Geos. 505) Glass

507. Photogeology (3) I For a description of course topics, see 407. Graduate-level requirements include completion of an advanced project involving photo interpretation and field mapping. P, Geos. 321. (Identical with Geos. 507) May be convened with 407. Kulatilake

515. Rock Excavation (3) II (Identical with Mn.E. 515) May be convened with 415.

516. Field Studies in Geophysics (3) III S For a description of course topics, see 416. Graduate-level requirements include additional project work requiring a more in-depth analysis. Field trips. Special fee may be required. 3 R, 4.5 L. 4.5 ES, 1 ED. P, Geos. 516. (Identical with Geos. 516) May be convened with 416. Sternberg

521. Geophysical Engineering (4) I For a description of course topics, see 421. Graduate-level requirements include the design and submission of a research report. May be convened with 421.

522. Well Logging Interpretation (3) II Basic well logging theory. Fundamentals of quantitative formation evaluation. Detailed investigation of aspects of well logging applicable to student's research interests. P, consult department before enrolling. (Identical with Geos. 522 and H.W.R.) Sternberg

524. Fundamentals of Geotechnics (3) II For a description of course topics, see 424. Graduate-level requirements include an in-depth research paper on an assigned topic. P, C.E. 340. May be convened with 424. Kulatilake

527. Geomechanics (4) I (Identical with Mn.E. 527) May be convened with 427.

537. Developments in Rock Mechanics (2) I (Identical with Mn.E. 537)


548. Geophysical Exploration and Engineering (4) I For a description of course topics, see 448. Graduate-level requirements include a special research project collecting and interpreting geophysical field data. P, Phys. 110, 116, Math. 223. (Identical with Geos. 448) May be convened with 448. Poulton/Sternberg

549. Mineral Exploration (3) I For a description of course topics, see 449. Graduate-level requirements include a research report. P, Geos. 446. (Identical with Geos. 549) May be convened with 449. Poulton

550. Earthquake Engineering (3) I Applied course in earthquake causes and effects, integrating the fields of seismology, engineering, and seismic geology. P, Math. 254. Glass

557. Fundamentals of Geomechanics (4) II (Identical with Mn.E. 527)


570. Computer Methods in Geological Engineering (3) II For a description of course topics, see 470. Graduate-level requirements include an additional advanced research project. P, introductory courses in computer programming, math, and earth science. May be convened with 470. Poulton/Sternberg

580. The Mechanics of Fracture in Rock and Other Brittle Materials (3) I (Identical with Mn.E. 580)

587. Design of Exploration Programs (3) II For a description of course topics, see 487. Graduate-level requirements include a research
report. P. 449. (Identical with Geos. 587) May be convened with 487. Poulton

649. Probabilistic Methods in Geotechnical Engineering (3) II (Identical with C.E. 649)

660a-660b. Estimation of Mineral Resources by Quantitative Methods (3-3) 1991-92 Estimation of mineral resource potential; life cycle models; crustal abundance models; grade-tonnage relationships, spatial and multivariate models, and subjective probability. P. Stat. 660, or Econ. 518, or S.I.E. 420. (Identical with G.En. 660a-660b)

656. Forecasting for Mineral Industries (4) II Methods for short- and long-term forecasting applied to mineral industries: trend analysis, simple econometric models, exponential smoothing, and input-output analysis; case studies. P. Econ. 361; Stat. 560, or Econ. 518.

666. Seminar a. Research (1-3) [Rpt.] I II (Identical with M.En. 696a and M.En. 696a)

Mineral Economics (MNEC)

Mineral economics interfaces minerals engineering and earth sciences with applied economics. It involves mineral investment analysis, planning and forecasting, and statistical analysis of the mineral industry.

Master of Science and Doctor of Philosophy degrees are offered with a major in mineral economics. For admission and degree requirements, please see the Graduate Catalog.

418. Mine Investment Analysis (3) II (Identical with M.En. 418) May be convened with 518.

500. Economics of Mineral Resource Development and Production (4) I Concepts and methods of mineral economics; analyses of selected mineral and energy commodities; current economic and political issues and investment strategies in selected mineral industries. P. Econ. 361. (Identical with M.En. 500)

518. Mine Investment Analysis (3) II (Identical with M.En. 518) May be convened with 418.

550. Economics of the Nonfuel Mineral Industries (3) II Reserves, resources, and major deposits, production technologies, pricing, market structure and practices, industrial organization, consumption trends, recycling, and foreign trade. P. A.Ec. 504.

584. Economics of Fossil, Fissile and Alternative Energy Sources (3) I Reserves and resources; economics of production, utilization and conversion; externalities, market structure, technical change, pricing and competitive behavior, interfuel substitution. P. A.Ec. 504.


600. Readings in Mineral Economics (3) II Selected readings in the economics of mineral resource exploration and exploitation, environmental protection, national mineral policy, world mineral development, and international trade. P. Econ. 361.

650a-650b. Advanced Principles of Mineral Economics (3-3) Risk analysis; optimum production, depletion and exhaustion; productivity and technical change; imperfect competition in mineral markets; resource distribution, trade and mineral policy. P. Econ. 501a or A.Ec. 504.


660a-660b. Estimation of Mineral Resources by Quantitative Methods (3-3) 1991-92 Estimation of mineral resource potential; life cycle models; crustal abundance models; grade-tonnage relationships, spatial and multivariate models, and subjective probability. P. Stat. 660, or Econ. 518, or S.I.E. 420. (Identical with G.En. 660a-660b)

656. Forecasting for Mineral Industries (4) II Methods for short- and long-term forecasting applied to mineral industries: trend analysis, simple econometric models, exponential smoothing, and input-output analysis; case studies. P. Econ. 361; Stat. 560, or Econ. 518.


Mining Engineering (MNE)

Mining engineering involves the planning, design, development and operation of underground and surface mines and other subsurface facilities. The department offers the Bachelor of Science in Mining Engineering, and Master of Science and Doctor of Philosophy degrees with a major in mining engineering.

Undergraduate degree requirements are listed in the College of Engineering and Mines section of this catalog.

120. Mineral Resources, Geotechnology and the Environment (3) II The history and recent advances in locating and extracting the earth's mineral resources; the principles of developing and managing earth's resources and hazards; environmental concerns such as acid rain and hazardous waste. 2R, 3L. (Identical with Engr. 120 and G.En. 120) Kemeny/Poulton

220. Mining Methods (3) II Introduction to the techniques, unit operations, and systems involved in underground and surface mining of minerals and coal. Field trips. 2R, 3L. 2ED. P, C.E. 217, Geos. 321. (Identical with G.En. 402) May be convened with 506. Harpalani

401. Analysis of Mine Operations (3) I Use of operations research principles and techniques to analyze various problems in mine operations. 2ES, 1ED. P. 402. May be convened with 501. Harpalani


410. Mine Surveying (1) II Mine surveying problems and practices; closed traverse underground mine; shaft plumbing, stope and raise surveying. 1ED. P. C.E. 217. C.E. 251.

411. Mineral Processing (3) I Physical and chemical unit operations used to separate and recover the economic minerals and metals from their ores. The modern scientific and engineering background for the operations are presented as well as economic aspects. Includes field trips to major mining operations in Tucson area. 2ES. 1ED. (Identical with M.S.E. 411) May be convened with 511.

415. Rock Excavation (3) II Methods of excavation of rock in surface and underground mines and construction, ranging from the empiricism of conventional blasting practice to the application of the fundamental mechanics of rock fracture. 2R, 3L. 2ES, 1ED. Field trips. P. C.E. 217. (Identical with G.En. 415) May be convened with 515. Writing-Emphasis Course. P. satisfaction of the upper-division writing-proiciency requirement (see "Writing Emphasis Courses" in the Academic Guidelines section of this catalog.)

418. Mine Investment Analysis (3) II Economic factors, including taxation, mineral depletion allowance, and finance in the mining industry: includes fundamentals of engineering economics, capital budgeting, and risk analysis. 1ES, 2ED. P. 430. (Identical with M.En. 418) May be convened with 518. Harris

426a-426b. Health and Safety in Mining (1-3) I Fundamental concepts in the recognition, evaluation and control of health and safety hazards encountered in industrial operations; includes a review of engineering and plant management responsibilities to control accidents, a review of federal regulations and standards affecting the industrial workplace, and instruction regarding the interaction of industrial hygiene, safety, fire protection and workers' compensation to control losses resulting from industrial accidents. 1ES, 2ES. 1ED. Kemeny /Poulton May be convened with 526a-526b.


430. Mine Examination and Valuation (3) I Principles and procedures in mineral property valuation, geostatistical ore reserve estimation, engineering, economy, investment analysis; use of a microcomputer. 1ES, 2ED. P. 402. 220. May be convened with 530. Kim

433. Elements of Coal Mining (3) Coal geology, properties and use. Surface and underground methods and equipment: strip mining; continuous, conventional, longwall mining; ground control; ventilation; haulage; electrical power; drainage. Preparation and reclamation. 3ES. P. 220, 406, C.E. 207. May be convened with 533.
Molecular and Cellular Biology (MCB)
Life Sciences South Building, Room 444 (602) 621-7560

Professors Samuel Ward, Head, H. Vasken Aposhian, George T. Bowden (Radiation Oncology), Robert P. Erickson (Pediatrics), Wayne R. Ferris (Emeritus), William J. Grimes (Biochemistry), Mac E. Hadley (Anatomy), Richard B. Hallick (Biochemistry), John Hildebrand (Arizona Research Laboratory), Konrad Keck (Emeritus), Henry Koffler (Biochemistry, Microbiology and Immunology), Brian Larkins (Plant Sciences), Neil H. Mendelson, David W. Mount, Peter E. Pursley, Nobuyoshi Shimizu

Associate Professors Hans J. Bohnert (Professor, Biochemistry), Don P. Bourque (Biochemistry), Danny L. Brower, Jennifer D. Hall, Martinez J. Hewlett, Thomas J. Lindell, John W. Little (Biochemistry), Kaoru Matsuda (Emeritus)

Assistant Professors Alison Adams, Gail Burd, James F. Deatherage (Biochemistry), Carol L. Diekmann (Associate Professor, Biochemistry), Martha Hawes (Plant Pathology), Lynn Manseau, Roger L. Miesfeld (Biochemistry), Karen Oishi, Roy Parker, Mary Rykowski, Elizabeth Vierling (Biochemistry), Ted Weiner

The University Department of Molecular and Cellular Biology offers the Bachelor of Science, Master of Science, and Doctor of Philosophy degrees in Molecular and Cellular Biology. Except in unusual circumstances, however, the department will only admit graduate students whose stated objective is the Doctor of Philosophy degree.
460. Plant Physiology (4) with 557.


443. Insect Neurobiology (3) II (Identical with Ecol. 437)


428R. Advanced Microbial Genetics (3) II Modern concepts of microbial genetics: basic genetic theory, the molecular architecture, bio-synthesis, and genetic regulation of bacterial cell structure, control of growth and cell division. P, 181, Ecol. 320 or 321. (Identical with Ecol. 428R, Gene. 428R, and Micr. 428R) May be convened with 526R.

437. Vertebrate Physiology (4) I (Identical with Ecol. 437)

443. Insect Neurobiology (3) II (Identical with Ento. 443) May be convened with 543.


460. Plant Physiology (4) I (Identical with P.S. 460) May be convened with 560.

461. Introduction to Neurobiology (3) I Physiology and anatomy of invertebrate and vertebrate nervous systems. P, 8 units of biology.

462b. Biochemistry (3) II (Identical with Bioc. 462b)

463. Neurobiology Laboratory (1) I Techniques in neurobiology. P, CR.

465. Neuroethology (2) II Selected topics in studies of the neural basis for natural behavior. P, in advance department before enrolling.

466. Physiology Laboratory (2) II (Identical with Ecol. 466) May be convened with 566.

467R. Endocrinology (3) II (Identical with Anat. 467R) May be convened with 567R.

467L. Endocrinology Laboratory (1) II (Identical with Anat. 467L) May be convened with 567L.

469. Developmental Neurobiology (2) II Development of the nervous systems of invertebrates and vertebrates from embryonic stages to the adult. P, 8 units of biology.

471. Human Embryology (4) II (Identical with Anat. 471) May be convened with 571.

473. Recombinant DNA Methods and Applications (4) II Relevant techniques for the isolation, purification and cloning of genes in E. Coli hosts. Eucaryotic lambda genomic DNA clones will be characterized by restriction mapping, hybridization analysis, and sequence analysis. 2R, 6L. Consult department before enrolling. P, 410, Bioc. 462a. (Identical with Bioc. 473, Gene. 473, and Micr. 473)

495. Colloquium a. Current Subjects in Molecular and Cell Biology (1) I Open to majors only. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

505. Eukaryotic DNA Replication (3) [Rpt. /1] I 1992-93 (Identical with C.Bio. 505)

510. Plant Molecular Biology (3) II 1990-91 (Identical with Bioc. 510)

513. Somatic Cell and Molecular Genetics Laboratory (2) I For a description of course topics, see 413. Graduate-level requirements include reading, writing, and oral presentations. P, 181. (Identical with Bioc. 513, Gene. 513 and Micr. 513)

515. Somatic Cell and Molecular Genetics (2) II For a description of course topics, see 415. Graduate-level requirements include reading papers from the current literature. P, 181. (Identical with Gene. 515) May be convened with 415.


528R. Advanced Microbial Genetics (3) II For a description of course topics, see 428R. Graduate-level requirements include reading papers from the current literature, coupled with oral presentations. P, 181. Ecol. 320 or 321. (Identical with Ecol. 528R, Gene. 528R, and Micr. 528R) May be convened with 428R.

543. Insect Neurobiology (3) II (Identical with Ento. 543) May be convened with 443.

545. Concepts in Genetic Analysis (3) I Methods of genetic analysis including mutant isolation, genetic and physical mapping, re-
Molecular and Cellular Biology—Music 233


590. Colloquium
a. Topics in Molecular Biology (1) [Rpt./1] II Open to majors only.
c. Special Topics in Cell Biology (2) [Rpt./6 units] II (Identical with C.Bio. 595d, which is home)

621. Molecular, Plant, Microbe Interactions (3) II 1992-93 (Identical with P.P. 621)

696. Seminar
a. Recent Research (1) [Rpt./3] II

761. Laboratory Rotation (3) III II Current techniques for qualitative and quantitative studies. 9L Open to majors only.

801. Molecular and Cellular Biology (4) I Freshman medical students only.

Molecular and Medical Microbiology
(See Microbiology and Immunology)

Molecular Biology
(See Molecular and Cellular Biology)

Music (MUS/MUSI)

Music Building, Room 109
(602) 621-1655


Associate Professors Daniel I. Asia, Eric Becher, Gary D. Cook, Elizabeth Thompson Erwin, Thomas Erwin, Paula Fan, Nancy Ferguson, John R. Fitch, Jeffrey Haskell, Grayson Hirst, Keith M. Johnson, Jerry Kirkbride, Josef Knott, Timothy Kolosick, Carroll McLaughlin, Rodney M. Mercado, Thomas Patterson, Faye Robinson, Jeffrey Showell

Assistant Professors John T. Brobeck, William Dietz, Noehama Fernandez, Patrick Neher, Gary B. Wilson, Rex A. Woods

Adjunct Instructor Armando Tranquillo

The School of Music, a division of the Faculty of Fine Arts, offers course work leading to the following degrees: Bachelor of Music with majors in jazz studies, music education, performance, and composition; Bachelor of Arts in Music; Master of Music; Doctor of Musical Arts; and Doctor of Philosophy. The School of Music participates with the Committee on Dance in providing course work for the drama-musical theatre major offered by the Department of Drama for the Bachelor of Fine Arts degree. The school is a member of the National Association of Schools of Music, and the requirements for entrance and graduation as set forth in this catalog are in accordance with the published standards of that association.

Entrance Requirements: Entrance examinations in musicianship and the major performance area are required. All freshmen and transfer music majors (except piano and organ performance majors) must audition for placement in class or group piano instruction. These courses should be taken concurrently with Mus. 120a-120b and 220a-220b. Students desiring the B.A. in Music or the B.M. with a major other than performance music must meet the requirements for registration in Mus. 181. Those in the major performance area. B.M. students majoring in performance must meet the requirements for registration in Mus. 185 in their major performance area. Admission to the 181 level requires minimum performance skill equivalent to at least two years of recent private study and/or four years of recent membership in school or community organizations. Admission to the 185 level requires a minimum of five years of private study or ensemble/solo experience resulting in sufficient advancement that the student shows promise of being at a professional level after completion of four years of undergraduate study. Detailed information regarding entrance and degree requirements is available from the Director of the School of Music.

Residency Requirements: Majors must complete a minimum number of units in residence, as specified in the following schedule: performance—21 units in the major; jazz studies—22 units in the major; music education—19 units in the major, plus T.T.E. 493b; and theory and composition—23 units in the major.

Ensemble Participation: All students enrolled in performance studies are required to participate in a conducted ensemble (Mus. 200, 400, 500) unless excused by the Director of the School of Music. Students enrolled in school or community ensembles may fulfill this requirement for keyboard majors per the degree requirements.)

Special Regulations: Credit for private or group instruction is granted only to students who are eligible to register for regular University credit. Students registered for performance studies may be assigned to private or group instruction and required to attend master classes and recitals as arranged by the instructor. Students may, at the discretion of their major adviser or performance instructor, be required to register for Mus. 201 and to appear in and attend performances as arranged by their instructor. Lessons missed by the student will not be rescheduled unless the instructor has been notified by the student 24 hours before the regular time of the lesson. Lessons missed by the instructor will be rescheduled within the semester. Lessons falling on a legal holiday will not be rescheduled.

Degree Programs: The curricula for all music programs include a common core of studies which is intended to coordinate all aspects of musical training in a program of comprehensive musicianship.

The Music major for B.A., B.F.A., or B.S. degree: A minimum of 20 units, or more (as specified by the major area), to include: Performance—a minimum of 6 units, including at least 2 units of Mus. 181 or above and at least 2 units of Mus. 200 (400); Theory area—a minimum of two courses selected from Mus. 100, 120a-120b, or (when available) Theory for the General Student; History and Literature area— a minimum of two courses selected from Mus. 130a, 130b, 330a, 330b, 331 or 434. Additional courses may be selected from other School of Music offerings and Phys. 107, but excluding Mus. 101, 107, 108 and 360. A music minor advisor in the School of Music should be contacted for further information or assistance with course selection.

The teaching minor for secondary education: 25 units, including Mus. 110a-110b, 120a-120b, 130a-130b, 338m, 370, 371 or 372, 2 units of conducted ensemble, 4 units of Mus. 181 or above.

Bachelor of Music

Basic Requirements: All candidates for the B.M. must complete the following basic requirements (1) general education requirements, as outlined under the Bachelor of Music degree in the Faculty of Fine Arts section of this catalog. (2) Mus. 110a-110b, 120a-120b, 130a-130b, 210a-210b (except for voice and guitar performance majors), Mus. 220a-220b, 320, 330a-330b. (3) One of the majors outlined below. B.M. students are required to complete at least one 3-unit course focusing specifically on gender, race, ethnicity or non-Western civilization. This course can be part of the major, general education, or elective course work and must be approved by a departmental advisor.

First Year Curriculum: Music majors should enroll, in consultation with an academic advisor, in the following courses during the freshman year: Mus. 110a-110b (except keyboard majors), 120a-120b, 130a-130b, one unit of Mus. 200 each semester, two to four units per semester in the major instrument or voice, Engl. 101-102, and six units of general education requirements as outlined under the Bachelor of Music degree in the Faculty of Fine Arts section of the catalog.

The MAJOR IN PERFORMANCE includes the following five areas of specialization:

Keyboard Instrument—major instrument, 31 units (minimum entrance level: Mus. 185. Graduation requirement: 7 units of Mus. 485); *ensemble: one semester of conducted, four semesters of accompanying, two semesters of coached, one semester of elective; Mus. 370, 410a-410b, 420a-420b, 421, 426a-426b, and a senior recital. (Mus. 425) Minimum total units: 131.

String Instrument/Harp—major instrument, 31 units (minimum entrance level: Mus. 185. Graduation requirement: seven units of Mus. 485); *ensemble: eight semesters of conducted, six semesters of coached; Mus. 370, 410a, 421; three units of music electives; a senior recital (Mus. 425). At least four units of the general studies courses or music electives must be at the upper-division level. Minimum total units: 130-129.

Guitar—major instrument, 31 units (minimum entrance level: Mus. 185. Graduation require-
ment: seven units of Musi. 485) and a senior recital (Mus. 425) of one unit, *ensemble: seven semesters of conducted; seven semesters of instrumental, e.g., guitar ensemble, Mus. 370, 410a-410b, 420a-420b, 434. Minimum total units: 128.

Voice—voice, 31 units (minimum entrance level: Musi. 185. Graduation requirement: seven units of Musi. 485); *ensemble: eight semesters of conducted (minimum: three orchestra, three band, two jazz—if appropriate instrument), six semesters of coached; Mus. 370, 410a, 421, four units of music electives; a senior recital (Mus. 425). At least four units of the general studies courses of music electives must be at the upper-division level. Minimum total units: 130.

The MAJOR IN JAZZ STUDIES: Major instrument, 16 units of two units/semester (minimum entrance level: Musi. 181. Graduation requirement: four units of Musi. 385); *ensemble: six semesters of conducted (minimum entrance level: Musi. 185) and four semesters of ensemble* (including two semesters of Collegium Musicum). A 20-unit minor is also required (see Faculty of Fine Arts section of this catalog). To meet the general education requirements in a foreign language, German or French is recommended. Minimum total units: 128.

In all music degrees the term "semester" in the ensemble requirement indicates that the student is required to register for the number of successive semesters of ensemble listed.

The MAJOR IN MUSIC EDUCATION (Voice): seven semesters of two units per semester (minimum entrance level: Musi. 181. Graduation requirement: two units of Musi. 285 and a half recital); keyboard: Mus. 310a-310b, Musi. 181P; *ensemble: seven semesters of conducted (minimum entrance level: Musi. 185) and four semesters of ensemble*; minor instrument or voice, six units of one unit/semester; *ensemble: six semesters of 200r/400r, four semesters of Mus. 200r/400r (excluding Mus. 200r/400r), two semesters of 201e/401e, two semesters of coached ensemble electives; Mus. 302, 321a-321b, 331, 422, 6 units of music electives. At least six units of the general studies course or music electives must be at the upper-division level. Minimum total units: 128.

The MAJOR IN MUSIC EDUCATION (Instrumental): Major instrument: seven semesters of 2 units per semester (minimum entrance level: Musi. 181. Graduation requirement: 2 units of Musi. 285 and a half recital); *ensemble: seven semesters of conducted (including one unit of Mus. 200r, if appropriate instrument), one semester of coached; Mus. 111, 153, 250, 350a-350b, 351a-351b, 352, 370, 371, 421, 439, 450; Edu. 350; Ed.P. 310; L.R.C. 435, 439b; T.T.E. 300, 339m, 435, 439b. Minimum total units: 132.

All Music Education Majors: After completion of Mus. 250, all music education majors must pass the Pre-Professional Skills Test (PPST), and should have a 2.8 grade-point average in all music courses other than ensembles and a 2.5 grade-point average in all courses before being admitted to the junior level Teacher Education Program. The Music Education Advisory Review (MEAR) and professional music education courses—methods, conducting, and techniques—must be completed before student teaching.

The MAJOR IN COMPOSITION: Major instrument or voice, seven semesters of 2 units/semester (minimum entrance level: Musi. 181. Graduation requirement: 6 units of Musi. 185); *ensemble: six semesters of conducted, two semesters of coached; Mus. 240, 340, 370, 420a-420b, 421, 425, 440 (6 units), 441, 442. Minimum total units: 132.

Bachelor of Arts in Music

This degree program is designed for students interested in music history who may wish to pursue a graduate degree in musicology or for those whose interest in music is essentially avocational.

The major: In addition to the general education requirements, as described under the Bachelor of Arts in the College of Arts and Sciences section of this catalog, the following course work is required: 110a-110b, 120a-120b, 130a-130b, 210a-210b, 220a-220b, 320, 330a-330b, 420a-420b; three units of music electives. The student also must complete six semesters of work in a major instrument or voice (minimum entrance level: Musi. 185. Graduation requirement: two units of Musi. 185) and four semesters of ensemble* (including two semesters of Collegium Musicum). A 20-unit minor is also required (see Faculty of Fine Arts section of this catalog). To meet the general education requirements in a foreign language, German or French is recommended. Minimum total units: 128.

101a-101b. Exploring Music through Piano for General Students (3-1) 101a: Introduces and develops basic concepts of music as a creative process in studying piano. Includes music fundamentals, beginning improvisation, playing by ear, chording to melodies, music reading, and repertory. 101b: [Rpt./2] Studying piano pieces and music basics. P, 101a or by audition, interview.

102a-102b. Basic Musicianship (3) I II Continuation of 101a and develops basic concepts of music as a creative process in studying piano. Includes music fundamentals, beginning improvisation, playing by ear, chording to melodies, music reading, and repertory. P, 101b.

103a-103b. Introduction to Music Literature (3-3) CDT Study of rhythm, melody, harmony, texture, timbre, and form in music. Students work in analysis, composition, music reading, ear training, conducting and class performance. P, 100.

150. General Survey of Music (1-3) CDT Survey of music, including materials and procedures for teaching these instruments in the schools.

175. Theatre Dance (1) I II 5 (Identical with Dnc. 175 which is home)

207. Western Civilization and the Arts: The Twentieth Century (3) I II (Identical with F.A. 207, which is home)

210a-210b. Piano Class II (1-1) Continuation of 210a, with additional sight-reading, score-reading, and accompanying. Open to mus. majors and minors only. P, 110b.

211a-211b. Diction for Singers (2-2) Training in diction for singers in English, French, German, Italian, Spanish and Ecclesiastical Latin.

220a-220b. Musical Skills and Structure II (3-3) CDT Continuation of 210a-210b, dealing with music from the late medieval period through early 20th-century art music in chronological order. 2R, 3L. P, 120b.

250. Introduction to Music Education (3) I Observation of and practical field experience in public schools; video-taped class presentations. Field trips. Open to music majors only.

302. Recording Studio Production (3) I II Recording studio procedures including the recording chain and pre-post and actual recording production techniques. P, with permission of the School of Music. (Identical with M.A. 302)

307. Western Civilization and the Arts: Paleolithic through Renaissance (3) I II (Identical with F.A. 307, which is home)

310a-310b. Functional Piano for Music Education Majors (1-1) 310a: Development of functional piano skills needed for public-school music teaching, with emphasis on improvising, harmonizing, transposing, and accompanying. 310b: Continuation of 310a with materials of increasing difficulty; open-score part-reading and rehearsal techniques. P, 210b.
306. (Identical with Ar.E. 362) Arts instruction. 3R, 1L. P, 360 and Ar.E.

370. Introduction to Conducting (2) I Conducting choral as well as instrumental ensembles; includes basic beat patterns, transpositions and clefs, and introduction to score study. P, CR, 220a.

371. Intermediate Instrumental Conducting (2) II Conducting techniques for instrumental ensembles of varying sizes; instrumental rehearsal techniques, score reading, and score study. P, CR, 250a.

372. Intermediate Choral Conducting (2) II Conducting techniques for choral ensembles; training the chorus, choral musicianship, continuing work in score reading, basic choral literature and program planning. P, CR, 370.

396H. Honors Proseminar (3) III Writing and the Arts (II) (Identical with T.A.R. 397a, which is home)

410a-410b. Counterpoint (3-3) Practical study of the counterpoint of the 16th (in 420a) and 18th (in 420b) centuries. P, CR, 420a. May be convened with 520a-520b.

421. Orchestration (3) I CDT Instruments of the orchestra together with practical study of the art of symphonic scoring; original work and arrangements. P, 220b.

422. Jazz Arranging (2) II Class instruction and practice in arranging for small jazz combos, rock groups, stage bands, and pop-vocal combinations; detailed study of jazz instrumental practices and procedures. Open to majors only or consult department prior to enrollment. P, CR, 422a.

423. History and Literature of Guitar (3) I History and literature of the guitar, lute, and vihuela, including repertoire, style periods, and composers. Open to majors only. May be convened with 523a-523b.

424. History and Literature of the Wind Band (3) I Intensive study of posttonal music, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

520a-520b. Counterpoint (3-3) For a description of course topics, see 420a-420b. Graduate-level requirements include a major research project in pedagogy. May be convened with 420a-420b.

521. Introduction to Graduate Music Theory (3) I Introduction to graduate analysis with emphasis on the survey of analytical systems as applied to a number of stylistic periods. Both cognitive and aural procedures will be investigated. This course may not be used to fulfill doctoral requirements in music. Open to majors only.

522a-522b. Art Song Repertory (2-2) 1992-93 CDT Detailed study of the standard repertory of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.

523a-523b. History of the Opera (3-3) 1991-92 Detailed study of the course of opera from its inception by the Florentine Camerata through Berlioz, Menotti, Stravinsky, Ginastera, Penderecki, Britten and others. Open to majors only.

524. History and Literature of Guitar (3) I 1992-93 For a description of course topics, see 423a-423b. Graduate-level requirements include a major research project.

525. History and Literature of the Wind Band (3) I A research-oriented study of wind band history and literature from the Renaissance to the present.

526a-526b. Piano Literature (3-3) For a description of course topics, see 426a-426b. Graduate-level requirements include a major
research paper and a special class presentation. P. 285-P. 526a is not prerequisite to 526b. May be con­vened with 426a-426b.

528. American Pop Music: Sinatra Era (3) S For a description of course topics, see 428. Graduate-level requirements include a term paper of at least 35 pages in detail songwriters and/or Sinatra career. May be con­vened with 428.

530. Music in the Renaissance (3) II 1992-93 Vocal and instrumental genres from Dufay through Palestina. Open to majors only.

531. Music in the Baroque (3) II 1991-92 The age of the basso-continuo; instrumental and vocal genres from Monteverdi through J. S. Bach. Open to majors only.

532. Music in the Classical Period (3) I 1992-93 The Viennese classical tradition from its origins to Beethoven. Open to majors only.

533. Music of the Twentieth Century (3) II 1992-93 Contemporary idioms in music; study of genres, styles, and techniques from post-Romanticism to the present. Open to majors only.

534. Music in World Cultures (3) II S CDT For a description of course topics, see 434. Graduate-level requirements include a major research project in ethnomusicology.


537. Survey of Early Music (3) II S Intensive survey of music history from Gregorian chant to the late Baroque. This course may not be used to fulfill doctoral requirements in music. Open to majors only.

541. Electro-Acoustic Music (3) I For a description of course topics, see 441. Graduate-level requirements include a major research paper and special class presentation. May be convened with 441.

542. Electro-Acoustic Studio Resources (3) II For a description of course topics, see 442. Graduate-level requirements include a major research paper and special class presentation. May be convened with 442.

550. Advanced Studies in Music Teaching (3) II S Contemporary practices in planning, organizing and evaluating learning experiences in music for K-12 students.

551. Behavioral Research in Music (3) I S 1991-92 Research methodologies as they apply to musical behavior; emphasis on analyzing the results of existing studies to practice and conducting original research.

555. Music and German Literature (3) I 1992-93 (Identical with Ger. 555) May be con­vened with 455.

560. Aesthetics of Music (3) I Exploration of the problems of musical meanings, including a panoramic examination of what philosophers, philosophic musicians and artists, and others of critical intelligence have contributed to comprehen­sive theory.

570. Advanced Conducting (3) [Rpt.] II Styles of choral, band, and orchestral literature, as they pertain to the problems of the conductor; references to the styles of all periods, with emphasis on the contemporary and modern.

600. Introduction to Graduate Study in Music (3) I Bibliographical materials; research resources, techniques, and problems directed toward grad. study in music. Required of all doctoral candidates in music. (Identical with LiS. 600.)


621a-621b. Analysis of Music of the 18th and 19th Centuries (3-3) Intensive analysis of written works in the larger forms. 621a: 18th century. 621b: 19th century. Open to majors only. 621a is not prerequisite to 621b.

622. Theory Pedagogy (3) I 1992-93 Study of the philosophies, procedures, techniques, and materials used in teaching theory at the college level.


630. The Music of Bach (3) II 1992-93

631. The Music of Mozart (3) S 1991

635. Choral Literature and Techniques (3) [Rpt./J] I A research-oriented study of choral literature from all stylistic periods and genre from the Renaissance to the present, together with appropriate conducting techniques. 2R, 3L. Open to majors only. P. graduate standing in choral conducting or choral music education. No more than 12 units of this course may be applied to a graduate degree program.

650. Foundations and Principles of Music Education (3) II S 1992-93 History and philosophy of music education in the public schools, with emphasis on the basic concepts needed for effective teaching in the field of music, curriculum development and evaluation of the music program.


652. Management Techniques in Music (3) I 1992-93 The management of music at all levels of education, industry, and performance.

654. Psychology of Music (3) II S 1991-92 Music perception, physiological and psychological responses to music, basic acoustics, music pedagogy, and evaluation/measurement of music behaviors.

672. Teaching Music in Higher Education (3) II Contemporary practices in planning, organizing, and evaluating learning experiences in music for college and university students. Open to music majors only.

696. Seminar a. Music Education (1-6) [Rpt./9 units] I II b. Musicology (1-6) [Rpt./9 units] I II c. Music Theory (1-6) [Rpt./9 units] I II d. Composition (2) [Rpt./8 units] I II Open to majors only.

Ensembles

All courses listed below are offered both first and second semesters and may be repeated. Prerequisite for entrance to all ensembles is by audition or by permission of the School of Music.

Large Conducted Ensembles (200, 400, 500)


Coached Ensembles (201, 401, 501) I Offering chamber music experience; designed to develop musical independence.


Small Conducted Ensembles (202, 402, 502)


Opera Theatre (205, 405, 605) (1-4) Training in all aspects of operatic production, including major singing roles, minor roles, opera chorus, opera scenes and chamber operas; technical training in set construction, makeup, costumes and lighting. 605 may also include operatic staging techniques. P. for 405, 2 units of 205; P. for 605, 4 units of 405 or permission of the School of Music.

Composition Studies: Individual and Group Instruction

240. Introduction to Composition (3) II [Rpt./1] Introduction to the basics of music composition, stressing fundamental forms, techniques and procedures. P. 120b or permission of the School of Music.

340. Composition (3) I II [Rpt./1] Pursuit of the more sophisticated aspects of music composition in regard to form; handling of original ideas and seeking for a broader and more practical view of music composition as a profession. P. 6 units of 240 or permission of the School of Music.

440. Compositional Techniques (3) II [Rpt./15 units] Creative techniques in the fields of modern harmony, counterpoint, orchestration, electronic music, or specific projects in commercial-type composition and arranging. P.
Performance Studies: Individual and Group Instruction* (MUSI)

All of the courses listed below are offered both first and second semester. Please see "Entrance Requirements" at the beginning of this section for information regarding prerequisites for Musi. 181 and 185.

1. See schedule of fees below.

<table>
<thead>
<tr>
<th>Instrument</th>
<th>Fee Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Piano</strong></td>
<td><strong>Group lesson or one-half hour private lesson:</strong> $60.</td>
</tr>
<tr>
<td></td>
<td>A music major registering for more than one weekly lesson will pay a maximum fee of $60.</td>
</tr>
</tbody>
</table>

**Rentals**

Instruments are rented as available for use in regularly scheduled music activities according to the following schedule. Any damage beyond normal wear and tear will be paid for by the renter of the instrument. All rental instruments must be returned by the end of the semester or on demand.

**Practice Room and Piano Rental:** Pianos will be rented only to those enrolled in group, private instruction or keyboard class. $5 for one hour practice per day. $10 for two hours practice per day. $15 for three hours practice per day.

**Organs, Harpsichords, and Synthesizers:** $10 for one hour practice per day. $15 for two hours practice per day. $20 for three hours practice per day.

**Harps:** $20 for one hour practice per day. $25 for two hours practice per day. $30 for three hours practice per day.

**Band and Orchestra Instruments:** Rented only to those enrolled in ensembles or technique and literature classes. $10 per semester.

Refunds will be made according to the refund schedule. No refund will be made on rental charges of $5 or less.

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Near Eastern Studies (NES)

Franklin Building, Room 403  
(602) 621-9113

Professors William G. Dover, Head, Ludwig A. Adamec, Michael E. Bonine, Adel S. Gamal, J. Michael Mahar, Hamdi A. Qafisheh  
Associate Professors: Esther Fuchs (Judaic Studies), William J. Wilson  
Assistant Professors: Simin Karimi, Senzil Nawid  
Lecturer: Shoshana Green (Judaic Studies)

The Department of Near Eastern Studies provides undergraduate and graduate programs of study in the history, cultures, languages, and geography of the geopolitical region of the world currently referred to as the Middle East or the Near East in antiquity.

The department offers a major in Near Eastern studies for the Bachelor of Arts degree, Master of Arts, and Doctor of Philosophy degrees. For graduate admission and degree requirements, consult the Graduate Catalog.

The major for the Bachelor of Arts degree requires a minimum of 35 units plus two years or the equivalent of Arabic, Persian, Hebrew, Akkadian or other appropriate language. All courses are chosen in consultation with and approved by a departmental advisor.

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103a-103b. Elementary Modern Hebrew (5-5) CDT (Identical with Ju.S. 103a-103b)

104a-104b. Elementary Arabic (5-5) CDT  
Conversation and readings in modern standard Arabic.

105a-105b. Elementary Persian (5-5) CDT  
Conversation, reading, and composition in modern Persian.
140. South Asian and Middle Eastern Humanities (3) Major trends and traditions in the arts, literatures and languages, religions and philosophies of the Middle East, India and Pakistan. (Identical with Anth. 140)

170. Indian Civilizations (3) Survey of traditional and contemporary social, political and thought patterns of India. (Identical with Hist. 170)

171. Ancient Civilizations of the Near East (3) I Survey of pre-Islamic cultures of Persia, Mesopotamia, Syria-Palestine, Anatolia and Egypt, with emphasis on unifying themes and institutions. (Identical with Anth. 171 and Hist. 171)

172. Islamic Civilization: Traditional and Modern Middle East (3) II Survey of the traditional and contemporary social, political, and economic institutions of Islamic civilizations in the Middle East. (Identical with Anth. 172 and Hist. 172)

372a-372b. History and Religion of Israel in Ancient Times (3-3) (Identical with Ju.S. 372a-372b)

382. Archaeology and the Bible (3) II (Identical with Ju.S. 382)

396H. Honors Proseminar

403a-403b. Intermediate Modern Hebrew (5-5) CDT (Identical with Ju.S. 403a-403b)


405a-405b. Intermediate Persian (4-4) CDT Conversation in the dialect of contemporary Iran; extensive readings in classical and modern literature. P. 105b.


414a-414b. Advanced Arabic (3-3) Continuation of 404b, with emphasis on oral and written comprehension and expression. P. 404b. 414a is not prerequisite to 414b. May be convened with 514a-514b.

415a-415b. Advanced Persian (4-4) CDT Readings in Persian, with the objective of preparing the student for independent research. 415a: Contemporary prose. 415b: Poetry and prose. P. two yrs. of Persian. 415a is not prerequisite to 415b. May be convened with 515a-515b.

424a-424b. Conversational Levantine Arabic (3-3) 1992-93 Extensive oral drill, with emphasis on the acquisition of facility in normal conversation and comprehension. P. 104a. May be convened with 524a-524b.

425a-425b. Conversational Gulf Arabic (3-3) Extensive oral drill, with emphasis on the acquisition of facility in normal conversation and comprehension. P. 104a. May be convened with 525a-525b.

426. Introduction to Arabic Linguistics (3) II History and structure of the Arabic language in its various forms. P. 104b, Ling. 101. (Identical with Ling. 426) May be convened with 526.

434. Islamic Thought (3) II Traditional ideological systems of Islamic countries and their evolutionary transformations. (Identical with Rel. 434) May be convened with 534.

439a-439b. Egyptian Arabic (3-3) Introduction to the Cairene dialect. Phonology, common greetings, basic vocabulary and grammar. P. one year of Standard Arabic. May be convened with 539a-539b.

441. Arab-Israeli Conflict (3) I II S (Identical with Pol. 441)

442. Transformation of Agrarian Societies in the Middle East (3) II Dynamics, processes, and implications of rural change in the Middle East; focus on changes in peasant communities, nomadic pastoralists, rural-urban relations, and planned change. (Identical with A.Ec. 442, Pol. 442, and Soc. 442) May be convened with 542.

448. Arabic Literature in English (3) Historical survey of Arabic literature of the Middle East and Mediterranean world, with readings in English translations. May be convened with 548.

449. Persian Literature in English (3) II Historical survey of Persian literary traditions, with readings in English translations. May be convened with 549.

457. Prehistoric Mesopotamia (3) I (Identical with Anth. 457) May be convened with 557.

467. Population and Development in the Middle East (3) I Review of theories and research in population, resources and socioeconomic development, with emphasis on determinants and consequences of population growth and migration in contemporary Middle East. (Identical with A.Ec. 467 and Pol. 467) May be convened with 567.

468a-468b. Asia and the West (3-3) 1991-92 (Identical with Hist. 468a-468b) May be convened with 568a-568b.

469. Geography of the Middle East (3) I (Identical with Geog. 469)

470. Religious History of India (3) (Identical with Hist. 470) May be convened with 570.

472. History of Medieval India (3) I 1989-90 (Identical with Hist. 472) May be convened with 572.


477a-477b. History of the Middle East (3-3) History of civilization in the Middle East from the rise of Islam to the 18th century. 477a: Period of Arab dominance. 477b: Period of Turkish dominance. 477a is not prerequisite to 477b. (Identical with Hist. 477a-477b) May be convened with 577a-577b. 477a is a Writing-Emphasis Course* for Middle East specialization.

478. Modern History of the Middle East (3) I Near and Middle Eastern history since the late 18th century, with special emphasis on Egypt and areas to the east. (Identical with Hist. 478) May be convened with 578. Writing-Emphasis Course* for Middle East specialization.

481a-481b. Archaeology of Syria-Palestine in the Bronze and Iron Ages (3-3) Survey of the Bronze and Iron Age cultures of Syria-Palestine, ca. 3500-500 B.C., with emphasis on the use of archaeological materials in historical reconstruction. May be convened with 581a-581b.

484a-484b. Akkadian Linguistics (3-3) (Identical with Anth. 484a-484b) May be convened with 584a-584b.

485. Social Organization of India and Pakistan (3) I Survey of family, kin, and caste in the peasant societies of India and Pakistan. (Identical with Anth. 485) May be convened with 585.

486. Political Systems of India and Pakistan (3) II Survey of post-independence political developments in Pakistan and India. (Identical with Pol. 486) May be convened with 586.

490. Women in Middle Eastern Society (3) I (Identical with Anth. 490) May be convened with 590.

492. History of Sufism (3) II (Identical with Hist. 492) May be convened with 592.


503b. Introduction to Comparative Literature and Literary Theory (3) II (Identical with Cpl.T. 503b)

509a-509b. Biblical Hebrew (3 to 4 — 3 to 4) 1992-93 CDT For a description of course topics, see 409a-409b. Graduate-level requirements include extra extensive readings. May be convened with 409a-409b.

514a-514b. Advanced Arabic (3-3) For a description of course topics, see 414a-414b. Graduate-level requirements include more assignments in Vol. II of the text and additional outside readings. P. 404b. 514a is not prerequisite to 514b. May be convened with 414a-414b.

515a-515b. Advanced Persian (4-4) CDT For a description of course topics, see 415a-415b. Graduate-level requirements include additional readings and translations. P. two years of Persian. 515a is not prerequisite to 515b. May be convened with 415a-415b.

524a-524b. Conversational Levantine Arabic (3-3) 1992-93 For a description of course topics, see 424a-424b. Graduate-level requirements include the ability to speak with sufficient structural vocabulary to participate in most formal and informal conversations, requiring a mastery of at least 120 additional vocabulary items. P. 104a. May be convened with 424a-424b.

525a-525b. Conversational Gulf Arabic (3-3) For a description of course topics, see 425a-425b. Graduate-level requirements in-
Graduate-level requirements include a research paper or book report on a subject or book approved by the instructor. May be convened with 434.

537a-537b. Readings in Akkadian (3-3) (Identical with Anth. 537a-537b)

539a-539b. Egyptian Arabic (3-3) For a description of course topics, see 439a-439b. Graduate-level requirements include a picture description, summary of taped dialogues, and short reports on Egyptian movies. May be convened with 439a-439b.

540. Linguistic Change and Diachronic Theory (3) (Identical with Ling. 540)

542. Transformation of Agrarian Societies in the Middle East (3) II For a description of course topics, see 442. Graduate-level requirements include the submission of an expanded research paper. (Identical with A.Ec. 542, Pol. 542, and Soc. 542) May be convened with 442.

548. Arabic Literature in English (3) For a description of course topics, see 448. Graduate-level requirements include two papers on two of the major literary periods covered by this course. May be convened with 448.

549. Persian Literature in English (3) II For a description of course topics, see 449. Graduate-level requirements include a term paper and additional book reviews. May be convened with 449.

550. Prehistoric Mesopotamia (3) I (Identical with Anth. 557) May be convened with 457.

557. Population and Development in the Middle East (3) I For a description of course topics, see 457. Graduate-level requirements include submission of an expanded research paper. (Identical with A.Ec. 556 and Pol. 557) May be convened with 457.

568a-568b. Asia and the West (3-3) 1989-90 (Identical with Hist. 568a-568b) May be convened with 468a-468b.

570. Religious History of India (3) (Identical with Hist. 570) May be convened with 470.

577a-577b. History of the Middle East (3-3) For a description of course topics, see 477a-477b. Graduate-level requirements include a research paper or book report on a subject or book approved by the instructor. May be convened with 477a-477b.

581a-581b. Archaeology of Syria-Palestine in the Bronze and Iron Ages (3-3) For a description of course topics, see 481a-481b. Graduate-level requirements include a full-length research paper. P, consult department before enrolling. May be convened with 481a-481b.

584a-584b. Akkadian Linguistics (3-3) (Identical with Anth. 584a-584b) May be convened with 484a-484b.

585. Social Organization of India and Pakistan (3) I For a description of course topics, see 485. Graduate-level requirements include a research paper based on original source material. (Identical with Anth. 585) May be convened with 485.

586. Political Systems of India and Pakistan (3) II For a description of course topics, see 486. Graduate-level requirements include a research paper based on original source material. (Identical with Pol. 586) May be convened with 486.

590. Women in Middle Eastern Society (3) I (Identical with Anth. 590) May be convened with 490.

592. History of Sufism (3) II (Identical with Hist. 592) May be convened with 492.

595. Colloquium d. Middle East (3) [Rpt.] I I f. Ancient Near East (3) [Rpt./4] Consult department before enrolling. May be convened with 495f.

596. Seminar a. Special Topics in Near Eastern Studies (3) [Rpt./4] May be convened with 496b. m. Middle East: Topics in History and Civilization (3) [Rpt.] I II q. Near Eastern Archaeology (3) [Rpt.] I II (Identical with Anth. 596c)

696. Seminar a. Cultural Anthropology (1-3) I II (Identical with Anth. 696b, which is home) i. International Water Resource Management (1-3) [Rpt./2] I (Identical with H.W.R. 696, which is home)
the Doctor of Philosophy degree with a major in neuroscience, as well as a graduate minor in neuroscience. A Master of Science degree is offered only in rare instances when students who have already passed the M.S. evaluation requirement are unable to continue in the doctoral program. The committee comprises faculty members from several departments in the College of Arts and Sciences, Engineering and Mines, Medicine, Nursing, and Pharmacy, as well as the Arizona Research Laboratories. The members of the Committee on Neuroscience are the principal faculty of the graduate program and thus may serve as major advisors for students majoring in neuroscience. In addition, the committee fosters research and communication in interdisciplinary neuroscience throughout the University. Research interests of the faculty range from molecular mechanisms of synaptic transmission to human neurological disorders. Particularly strong clusters of faculty focus upon cognitive neuroscience, developmental neurobiology, human speech and hearing, insect neurobiology, peptides, neurotranspharmacology, and motor control. Information about the research interests of the faculty can be obtained from the program office.

Prospective students should consult the Graduate Catalog for further details.

443. Insect Neurobiology (3) II (Identical with Ento. 443) May be convened with 543.

543. Insect Neurobiology (3) II (Identical with Ento. 543) May be convened with 443.

582. Topics in Neural Development (2) II 1991-92 An in-depth analysis of the cellular and molecular basis of neural development. Students will read and discuss journal articles dealing with the development of neurons and their synaptic connections. P, consult program office before enrollment. (Identical with Anat. 582, M.C.B. 582 and Psio. 582)

583. Topics in Neural Plasticity (2) I 1990-91 (Identical with M.C.B. 583)

584. Cellular Neurobiology (2) II 1989-90 (Identical with Anat. 584)


700. Methods in Neuroscience (3) I II S [Rpt.] Research rotations in the laboratories of faculty members within the neuroscience program. Consult department before enrolling.

701. Communication in Neuroscience (1) I II S Preparation of an essay, and instruction in scientific writing. Open to majors only. P, consult committee before enrolling.

Nuclear and Energy Engineering (NEE)

Engineering Building, Room 200
(602) 621-2551

Professors Steven C. Crow, Acting Head, William Filippone, Barry D. Ganapol, David L. Hetrick, Robert L. Seale, Roy G. Post (Emeritus), Morton E. Wacks

Associate Professors Rocco Fazzolari

The department offers the Bachelor of Science in Nuclear Engineering, Bachelor of Science in Energy Engineering, Master of Science, and Doctor of Philosophy degrees with a major in nuclear engineering.

For undergraduate degree requirements, please see the College of Engineering and Mines section of this catalog. For graduate degree requirements, please see the Graduate Catalog.

NOTE TO ALL NUCLEAR ENGINEERING STUDENTS: You will receive credit toward the completion of your major program for the following courses: E.C.E. 466, "Power Plant Electrical Design"; Phys. 450, "Introductory Nuclear Physics"; A.B.E. 563, "Energy from Biomass"; Phys. 550, "Introductory Nuclear Physics."

*The program in energy engineering was under review at the time of catalog revision. Consult the department or College of Engineering and Mines for current status.

109. History of Technology and Society (3) I Significant developments in human history emphasizing the role of technology as an agent for social change; particular attention to the use of energy resources. (Identical with Engr. 109)

200. Radiation Detection and Isotopes Laboratory (3) II Introduction to the principles and practices of radiation measurement, experimental techniques and data reduction methods. 1.5ES, 1.5ED. P, 280.


380. Elements of Reactor Theory (4) I Neutron diffusion and slowing down theory, as applied to bare and reflected reactors; the effects of core inhomogeneity on neutron behavior. 2ES, 1ED. P, 280, S.I.E. 270.

381. Introduction to Nuclear Reactor Engineering (3) II The analysis and design of nuclear power stations, with emphasis on central station systems. 0.5ES, 2.5ED. P, 380.

382. Introduction to Fusion (3) II Science and technology of fusion. 0.5ES, P, Phys. 330, Math. 254.

402. Senior Energy Laboratory (3) II Basic measurements of energy quality, quantity, flow, and conversion. Includes active and passive solar as well as other alternative energy sources. 2R, 3L. 2ES, P, 445 or CR. (Identical with A.M.E. 402) Writing-Emphasis Course for energy engineering students. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

406. Nuclear Engineering Laboratory (3) II Experimental techniques for determining various parameters in nuclear systems; experiments using the critical and subcritical reactors. 2ES, 1ED. P, 380. Writing-Emphasis Course for nuclear engineering students. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

May be convened with 506.

414. Energy System Design (3) II Modern engineering design methods to effectively use thermal energy and power. Covers: economic analysis and modeling of thermal equipment; optimization techniques; steady state and dynamic simulation of energy systems. Comprehensive project. 3ED. CR. A.M.E. 432. May be convened with 514.

440. Energy Utilization and Management (3) I Methods for evaluating the technical and economic aspects of energy conversion and usage directed toward the effective utilization of resources, including economics, HVAC systems, electric power, lighting and industrial processes. 2ES, 1ED. May be convened with 540.

441. Air Conditioning Engineering (3) I (Identical with A.M.E. 441)

442. HVAC System Design (3) II Analysis and design of air conditioning systems for commercial and industrial buildings, including equipment and component selection. Energy-efficient concepts, controls and computer analysis will be emphasized. 1ES, 2ED. P, 442 (Identical with A.M.E. 442) May be convened with 542.

445. Solar Energy Engineering (3) I Energy analyses of active and passive solar collectors; solar cells, including energy conversion systems for solar heating and cooling; mechanical and electrical power; perspective. 2ES, 1ED. P, A.M.E. 230. (Identical with A.M.E. 445) May be convened with 545.

446. Photovoltaic Systems Engineering (3) I Presents system performance prediction methods, load estimation, power conditioners, battery storage principles, system design, and qualitative semiconductor device physics. 2ES, 1ED. May be convened with 546.

447. Direct Energy Conversion (3) II Engineering requirements for achieving direct conversion of energy to electrical power; the engineering of thermoelectric and thermionic converters, fuel cells, magnetohydrodynamic, and photovoltaic systems. 1ES, 1ED. P, Math. 254; A.M.E. 230; or Phys. 121. (Identical with A.M.E. 447 and E.C.E. 447) May be convened with 547.

456. Engineering System Simulation (3) II Dynamic modeling and simulation of engineering systems, including energy conversion systems, nuclear and chemical reactors, and control systems, using digital continuous-system simulation languages. 1ES, 1ED. P, A.M.E. 230 or Ch.E. 306a; Math. 254. May be convened with 556.


482. Contemporary Nuclear Power Systems (3) I Analysis of present nuclear power plants with emphasis on design decisions as they affect performance of individual systems; advanced design concepts; proposed standards.
542. HVAC System Design (3) II For a description of course topics, see 442. Graduate-level requirements include a comprehensive design project. (Identical with A.M.E. 542) May be convened with 442.

543. Power Plant Engineering (3) II The application of fluid dynamic heat transfer and mechanical interaction principles to the engineering design of a power plant. P. 582, 588.

544. Solar Energy Engineering (3) I For a description of course topics, see 445. Graduate-level requirements include an in-depth research paper. May be convened with 445.

545. Photovoltaic Systems Engineering (3) I For a description of course topics, see 446. Graduate-level requirements include an in-depth design and/or systems analysis project. May be convened with 446.

546. Nuclear Energy and Power (3) I Fundamentals of nuclear energy and radiation; engineering applications; the basic concepts of nuclear reactors and power systems. Designed for nonmajors. 2ES, 1ED. May be convened with 585.

547. Direct Energy Conversion (3) II For a description of course topics, see 447. Graduate-level requirements include an in-depth research paper. P. Math. 254; A.M.E. 230; or Phys. 121. (Identical with A.M.E. 547 and E.C.E. 547) May be convened with 447.

548. Energy from Biomass (3) II (Identical with A.B.E. 563)


552. Nuclear Engineering Laboratory (3) II For a description of course topics, see 406. Graduate-level requirements include an in-depth research paper. P. 380 or 588. May be convened with 406.

553. Nuclear Energy and Power (3) I Fundamentals of nuclear energy and radiation; engineering applications; the basic concepts of nuclear reactors and power systems. Designed for nonmajors. 2ES, 1ED. May be convened with 585.

554. Radiation Effects (3) II Radiation effects on solids and radioactivity of gases and liquids, with emphasis on effects encountered in nuclear reactor, detector, and dosimeter systems. 1.5ES, 1ED. P. 380, CR, M.S.E. 331R. May be convened with 585.

555. Engineering System Simulation (3) II For a description of course topics, see 456. Graduate-level requirements include an in-depth research paper. P. A.E. 230 or E.C.E. 306A; Math. 254. May be convened with 456.

556. Nonlinear Reactor Dynamics (3) II Nonlinear dynamics of nuclear reactors; shut-down mechanisms, inertial effects, nonlinear stability criteria, time-dependent neutron transport, neutron waves, and applications to pulsed reactors, start-up transients, reactor stability, and reactor safety. P. 583.

557. Reactor Theory II (3) II Fundamental theory of heterogeneous reactors, integral transport, blackness theory, perturbation theory, and applications; temperature coefficient, changes in reactivity due to fission product accumulation, fuel consumption, and conversion. P. 588.

558. Technology of Radioactive Waste Storage and Disposal (3) II Detailed technology of nuclear waste streams, their processing and waste collection, segregation, reduction methods and storage and disposal alternatives for high-level and low-level waste. P. 487 or 587.

559. Reactor Theory II (3) II Fundamental theory of heterogeneous reactors, integral transport, blackness theory, perturbation theory, and applications; temperature coefficient, changes in reactivity due to fission product accumulation, fuel consumption, and conversion. P. 588.

560. Nuclear Fuel Cycles (3) I For a description of course topics, see 481. Graduate-level requirements include an in-depth research paper. P. 280, A.M.E. 230, or Phys. 230. May be convened with 481.

561. Nuclear Fuel Cycles (3) I For a description of course topics, see 481. Graduate-level requirements include an in-depth research paper. P. 280, A.M.E. 230, or Phys. 230. May be convened with 481.

562. Contemporary Nuclear Power Systems (3) I For a description of course topics, see 482. Graduate-level requirements include an in-depth research paper. P. 380 or 588. May be convened with 482.

563. Dynamics of Nuclear Systems (3) I For a description of course topics, see 483. Graduate-level requirements include an in-depth research paper. P. 380 or 588. May be convened with 483.

564. Radiation Effects (3) II For a description of course topics, see 484. Graduate-level requirements include an in-depth research paper. P. 380; CR, M.S.E. 331R. May be convened with 484.

565. Radiation Health Physics and Safety (3) I Study of health physics practices and safety responsibilities; analysis of radiation environments and applications of basic shielding methods to provide understanding of accepted working practices. 2ES, 1ED. May be convened with 585.

566. Nuclear Energy and Power (3) I Fundamentals of nuclear energy and radiation; engineering applications; the basic concepts of nuclear reactors and power systems. Designed for nonmajors. 2ES, 1ED. May be convened with 585.

567. Introduction to Radioactive Waste Management (3) I Background in the technology of the management of all types of radioactive wastes from the nuclear fuel cycle, institutions, and industry. 1.5ES, 1.5ED. May be convened with 585.

568. Nuclear Safety (3) I For a description of course topics, see 485. Graduate-level requirements include an in-depth research paper. May be convened with 485.

569. Nuclear Energy and Power (3) I Fundamentals of nuclear energy and radiation; engineering applications; the basic concepts of nuclear reactors and power systems. Designed for nonmajors. 2ES, 1ED. May be convened with 585.

Nursing (NURS)

Nursing Building, Room 103
(602) 626-6161

Professors L. Claire Parsons, Dean, Agnes M. Aamodt (Emerita), Eleanor E. Bauwens (Emerita), Pearl P. Coulter (Emerita), Ada Sue Hinshaw, Margarita A. Kay, Alice J. Longman, Beverly A. McCord (Emerita), Carolyn Murdaugh, Linda R. Phillips, Arlene M. Putt (Emerita), Gladys E. Sorenson (Emerita)

Associate Professors Evelyn M. DeWalt, Sandra Ferketich, Rose Gerber, Mary E.
250. Pathophysiology (3) I II Provides a concept-ual integrative approach to selected pathophysiological phenomena and human responses to illness. Nonmajors who wish to enroll should consult the college. P, Chem. 101a-101b, 102a-102b, Ecol. 159a-159b, 160a-160b, and 181.

352. Nursing Skills for Care Provider (6) I I Provide student with basic nursing skills for the care provider. Includes selection of psychosocial and psychomotor skills used in assisting individuals, families and groups in meeting their health care needs. 2R, 12L. P, 263, 279, CR, 350, 372.


378. Nursing Care in Death and Dying (3) I Designed to provide students the opportunity to explore feelings regarding death, to consider needs and perceptions of the patient and the family, and to develop the ability to provide nursing care. Open to majors only, or consult college before enrolling. Writing-Emphasis Course*.

380. Nurse as Family Care Provider (3) I I Family structure, developmental tasks and family dynamics across life span; health promotion, illness prevention, acute and continuing care with adults. Open to registered nurse students only. P, 280.


396H. Honors Seminar (3) I

420. Health Assessment of the School Age Child (5) I Health maintenance, health promotion, physical and developmental assessment, screening, management and referral of the school age child. Open to majors only. P, 481, or consult college before enrolling.

421. Nursing Care of the Child with a Handicap or Chronic Illness (3) I S Overview of congenital and acquired handicaps or chronic conditions in school age children. Assessment and management in the school setting of these children and their families. Open to majors only. P, 481, or consult college before enrolling. May be convened with 521.

422. School Nursing Practice (3) I I Analysis and application of nursing in school systems. Program development and evaluation, health curriculum development, and principles of epidemiology for identification of high risk groups. Open to majors only. P, 481, or consult college before enrolling. May be convened with 522.


475. Nurse as Care Provider with Critically Ill (5) I I Concepts, principles and techniques for providing care to critically ill individuals in diverse settings. Open to majors only. 2R, 9L. P, 383, 384, CR, 472, 481.

480. Principles of Physiology in Health Care (4) S Selected physiologic functions and adaptive changes which occur in health and illness. Cellular physiology, the immune system, neurophysiology, cardiovascular, pulmonary, renal, and endocrine physiology. P, undergraduate physiology. May be convened with 580.


483. Perspectives of Cancer Care for Health Professionals (3) S Current methods of care for individuals with cancer and for their families. Open to nonmajors; consult before enrolling. May be convened with 6R, 9L. Not accepted in doctoral program of study in nursing. P, enrollment in baccalaureate or graduate programs in nursing or pharmacy. (Identical with Ph.Pr. 483) May be convened with 583.

485. Nurse in Clinical Selective (2) I I Directed nursing practice in an area of clinical interest. Open to majors only. 6L. P, 472, 475, 481, CR, 486, 488.


487. Poverty and Health (3) I I Study of the relationship between poverty and health. Concepts and theories from anthropology, psychology and sociology will be used to analyze problems associated with poverty. Advanced degree credit available for non-Ph.D. majors only. P, six units of social science. (Identical with Anth. 497 and F.C.M. 487) May be convened with 587. Writing-Emphasis Course*.


495. Colloquium a. Bilingual Health Communication (3) I I (Identical with Anth. 495a, which is home.) May be convened with 595a.

*Writing-Emphasis Courses, P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).
over the life span and their relationship to nursing phenomena. Different models or views of development are explored and applied to nursing theory development, research, and practice. Open to majors only.

605. Issues in Family Relations (3) II Examination of issues in providing care to families using theory and research from nursing and related fields. Concepts included will apply to the young, developing, and mature family. Open to majors only.

606. Social, Psychological Problems in Nursing (3) II Focus on concepts of stress and training with emphasis on health-related outcomes. Nursing research on addictions, depression, abuse, and violence will be explored. Open to majors only.

607. Cross-Cultural Nursing (3) S Focus on a synthesis of theories from nursing and related fields to explore cultural variations in response to actual or potential problems of health or illness. The methods for caring and treating culturally influenced responses will be examined. Open to majors only.

608. Cognitive Alterations (3) S Client problems related to the processing of sensory information, including etiological factors. Research-based nursing interventions for clients with cognitive alterations are examined. Open to majors only.

609. Health Assessment (3) I Focuses on synthesis of physical and psychosocial data by using current research and theoretical models in geriatric nursing. Emphasizes physiology, physical, cultural, and psychosocial assessment. Open to majors only. P, 580.

621. Educational Process (3) I Theoretical and practical application of teaching-learning process in classroom and clinical settings. Principles of teaching, learning, instructional design, testing, Microteaching included. 2R, 3L. Open to majors only.

622. Nurse Educator Role (3) II Theoretical and practical application of curriculum development and process. Use of teaching-learning process. Preparation for nurse educator role. Directed practice teaching included. 1R, 6L. Open to majors only. P, 621.

623. Clinical Agency Administration (3) II Practical application of administrative processes in a nursing care delivery setting. Focuses on the use of selected skills essential to effective administration. Open to majors only. P, 624.

624. The Administrative Process (3) I Theoretical background for nursing administration in care settings. Emphasizes on accountability, budgeting, management skills, constraints and influences as related to nursing administration. Open to majors only.

625. Geriatric Nurse Practitioner Role (3) I Exploration of models of advanced nursing practice role in health care system. Emphasizes factors that influence process of defining and implementing geriatric nurse practitioner role. Open to majors only. P, 580.

626. Geriatric Nurse Practitioner Role Development (3) II Focuses on concepts and skills needed to manage therapeutically the common acute and chronic health problems prevalent in older adults. Emphasizes clinical decision-making in abnormal aging. Open to majors only. P, 625.

632. Research Utilization (3) S Development and use of models and tools for facilitating the use of research in science-based nursing practice within organizational settings. 2R, 3L. P, 530.

633. Evaluation Research (3) I Development and use of models and tools for assessing nursing processes, programs, and performances. Approaches to and psychological reactants of evaluation are explored. Issues and development of market packages with cost consideration are discussed along with program grant preparation.

705. Nursing Metathiology (3) I Logical testing of theories in practice; history of nursing theory development related to basic epistemology, history, and philosophy of science; alternate metatheoretical structures, clinical theory development strategies; provision for an exercise in theory construction. Laboratory is required. P. 6 units of clinical specialty or clinical selective, 3 units of advanced human physiology, 3 units of social science at an advanced level.

706. Middle Range Theory (3) III Introduction to ways of knowing, focus on middle range theories in nursing and related sciences. Emphasis on critique, elaboration and theory testing strategies. Open to majors only. P, 705.

724a-724b-724c. Professional Role Development (1-1-1) I II Assist student socialization into the role of nurse scientist. Ethics of research, development of grant proposals, dissemination of scholarly work through publication and presentation, balancing roles of scholar, educator and clinician. Open to majors only. P, admission to Ph.D. program.

725. Study of Social Influences (3) S In-depth examination of social forces affecting the health care system. Open to majors only. P, admission to Ph.D. program.

730. Quantitative Methods in Clinical Nursing Research (3) I Investigation of selected quantitative strategies appropriate to research problems in clinical nursing. Open to majors only. P, 530, 633, admission to Ph.D. program.

731. Qualitative Methods in Clinical Nursing Research (3) I Application of selected qualitative research methods from the social sciences to clinical nursing. Open to majors only. P, 530, admission to Ph.D. program.

781a-781b. Instrument Construction (3-3) S Deductive and inductive processes for constructing/testing instruments to measure nursing care interventions/patient outcomes. 781a: Instrumentation for behavior and objective phenomena. 781b: Instrumentation for subjective phenomena. Includes instrument strategies; experience developing a pilot measure. 2R, 3L. Open to majors and minors only. P, 705, 730, graduate level statistics. 781a is not prerequisite to 781b. (781a and 781b offered alternate summers.)

782a-782b-782c. Field Work in Nursing Research (3-3-3) S I Individualized course of study incorporating research and clinical knowledge in a selected area of nursing practice in the laboratory and field setting. P, 530, 600a-600b, 633, 705, 730.
Nutrition Specialization: Course requirements in the nutritional sciences major with the specialization in nutrition are Phys. 102b, 180b; Math. 119, 124 or 125a; Chem. 322, 323; 6 units from Individuals, Societies, and Institutions. Students preparing for graduate studies are urged to conduct a research project under N.F.S. 499. Specialization in nutrition provides an excellent background for graduate study in nutrition, biochemistry, or other health-related fields. It is not intended as a terminal degree.

The major in nutritional sciences is a viable preparation for professional schools in medicine, dentistry, nursing, physical therapy or veterinary medicine.

II. Majors

A. The major in food science: This major is currently under review. Please consult department.

B. The major in nutritional sciences: This major is currently under review. Please consult department.

II. Minors

The department offers students the opportunity to minor in food science or nutritional sciences. For admission and degree requirements, please see the Graduate Catalog.

*The food science major will be deleted in May 1993. For further information regarding the status of this program, contact the department.

I. Curricular Requirements:

Undergraduate majors must complete the general education requirements as described in the College of Agriculture section of this catalog. Courses in four of the five required study areas must be selected from a departmentally approved list. Consult a departmental advisor for details.

II. Majors:

A. The major in food science: This major is currently under review. Please consult department.

B. The major in nutritional sciences: This major is currently under review. Please consult department.

II. Minors:

The department offers students the opportunity to minor in food science or nutritional sciences. For admission and degree requirements, please see the Graduate Catalog.

*The food science major will be deleted in May 1993. For further information regarding the status of this program, contact the department.

I. Curricular Requirements:

Undergraduate majors must complete the general education requirements as described in the College of Agriculture section of this catalog. Courses in four of the five required study areas must be selected from a departmentally approved list. Consult a departmental advisor for details.

II. Majors:

A. The major in food science: This major is currently under review. Please consult department.

B. The major in nutritional sciences: This major is currently under review. Please consult department.

II. Minors:

The department offers students the opportunity to minor in food science or nutritional sciences. For admission and degree requirements, please see the Graduate Catalog.

*The food science major will be deleted in May 1993. For further information regarding the status of this program, contact the department.

I. Curricular Requirements:

Undergraduate majors must complete the general education requirements as described in the College of Agriculture section of this catalog. Courses in four of the five required study areas must be selected from a departmentally approved list. Consult a departmental advisor for details.

II. Majors:

A. The major in food science: This major is currently under review. Please consult department.

B. The major in nutritional sciences: This major is currently under review. Please consult department.

II. Minors:

The department offers students the opportunity to minor in food science or nutritional sciences. For admission and degree requirements, please see the Graduate Catalog.

*The food science major will be deleted in May 1993. For further information regarding the status of this program, contact the department.

463a-468b. Food Processing (3-3) I II 1991-92 Refrigeration, freezing, dehydration, heating, fermentation and pickling, irradiation and addition of chemicals, as they apply to food preservation and processing, retention of nutritive value, flavor, appearance and safety. P, Chem. 241b, Micr. 205. Writing-Emphasis Course* for food technology specialization within the food science major.

470. Food Microbiology and Sanitation (3) II 1992-93 Microbiology in processing and handling of foods; relation of microorganisms, insects, and rodents to design and function of processing and handling equipment. P, Micr. 317. (Identical with Micr. 470) May be convened with 570.

471. Food Microbiology and Sanitation Laboratory (2) II 1992-93 Laboratory procedures for assessment of sanitary quality of foods. P, 470 or CR. (Identical with Micr. 471) May be convened with 571.

472. Food Microbiology and Sanitation (3) II 1992-93 Microbiology in processing and handling of foods; relation of microorganisms, insects, and rodents to design and function of processing and handling equipment. P, Micr. 317. (Identical with Micr. 470) May be convened with 570.

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

500. Advanced Nutritional Science (3) I Advanced physiology and biochemistry of nutrients with emphasis on present knowledge and current research topics in nutritional sciences. P, Bioc. 460 or 462a.

508. Problems in the Biochemistry of Aging (2) I 1991-92 Current topics in the biochemistry of mammalian aging; examination of the metabolic, hormonal, immunologic and neural aspects of aging in lower mammals and humans. P, one year biochemistry. (Identical with Gero. 538)


511. Metabolic Integration (3) II 1992-93 Food intake, transport, protein and amino acid utilization in higher animals. P, 408.

512. Nutritional Biochemistry Techniques (3) II Biochemical methods for evaluating metabolic functions of nutrients. P, 324 or 325, and 323 or 326. (Identical with An.S. 609)

513. Textual requirements include an in-depth research paper on a current topic. P, 408. (Identical with An.S. 609)

514. Chemistry and Metabolism of Lipids (3) II 1991-92 Chemistry and structure of lipids and their digestion, adsorption, transport and utilization; current research in lipid metabolism and the role of lipids in certain disease states. (Identical with An.S. 615)


517. Steroid and Lipoprotein Chemistry and Metabolism (2) II 1991-92 Chemistry and metabolism of mammalian sterols and lipoproteins; biosynthesis and metabolism of sterols and lipoproteins in health and disease; the role of diet in treating abnormalities of sterol and lipoprotein metabolism; sterols and disease. P, 408.

518. Developmental Nutrition (3) II 1992-93 Role of nutrients in development and growth; changes in maternal and child nutritional requirements due to development and growth; current research in developmental nutrition. P, 408.

519. Field Methods in Human Nutrition (3) II 1991-92 Case-oriented approach to nutritional assessment, diagnosis, prescription, plan and prognosis; application of dietary, clinical and biochemical methods. 2R, 3L. Open to majors in nutrition and foods science and other health sciences areas only.

520. Chemistry of Food Carbohydrates (2) II 1992-93 Chemical and physical properties of carbohydrates important to their presence in food. P, Bioc. 460, 462a.

521. Chemistry of Food Proteins (3) II 1991-92 (Identical with An.S. 665)


523. Internship a. Dietetic Internship, ADA Accredited (1-6) [Rpt./2 units] I II Field trips. Begins Mid-August and continues for 46 weeks. Consult dept. before enrolling. Open to majors only. P, Course work equivalent to American Dietetic Association Plan IV.

524. Seminar b. Nutrition (1) [Rpt./6 units] I II (Identical with Nu.Sc. 696b)

c. Food Science (1) [Rpt./6 units] I II

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Nutritional Sciences (NUSC)

Shantz Building, Room 309
(602) 621-5630

Committee on Nutritional Sciences (Graduate)

Professors Bobby L. Reid, Chair (Nutrition and Food Science), David S. Alberts (Internal Medicine), Harris Bernstein (Microbiology and Immunology), Milos Chavpil (Surgery), David L. Earnest (Internal Medicine), Charles Gerba (Microbiology and Immunology), Gail G. Harrison (Family and Community Medicine), Chris Gloster (Nutrition and Food Science), J. Tal Huber (Animal Sciences), Mary Ann Kight (Nutrition and Food Science), Otakar Koldovsky (Pediatrics, Physiology, K.Y. Lei (Nutrition and Food Science), Timothy Lohman (Exercise and Sport Sciences), W.F. McCaughey (Nutrition and Food Science), Donald J. McNamara (Nutrition and Food Science), Thomas D. Moon (Family and Community Medicine), George Olson (Microbiology and Immunology), Anthony F. Phillips (Pediatrics), Frank D. Rollins (Nutrition and Food Science), William A. Stini (Anthropology, Family and Community Medicine), C. Brent Theuer (Animal Sciences), Marc E. Tischler (Biochemistry), Ronald R. Watson (Family and Community Medicine), Charles W. Weber (Nutrition and Food Science)

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NUTRITION AND FOOD SCIENCE—NUTRITIONAL SCIENCES 245
Associate Professors Ronald E. Allen (Animal Sciences), Allen D. Bedrick (Pediatrics), Patsy M. Brannon (Nutrition and Food Science), Louise Canfield (Biochemistry), Harinder Garewal (Internal Medicine), Donald V. Lightner (Veterinary Science), Douglas L. Park (Nutrition and Food Science), Ralph L. Price (Nutrition and Food Science), Ronald E. Pust (Family and Community Medicine), Cheryl K. Ritenbaugh (Family and Community Medicine), Edward T. Sheehan (Nutrition and Food Science), Spencer Swingle (Animal Sciences), Ann M. Tinsley (Nutrition and Food Science), John Udall, Jr. (Pediatrics)
Assistant Professors Iris R. Bell (Psychiatry), Larry C. Clark (Family and Community Medicine), Linda Houtkeeper (Nutrition and Food Science)

The interdisciplinary Committee on Nutritional Sciences administers a campus-wide, interdisciplinary program. It includes faculty members from the colleges of Agriculture, Arts and Sciences, and Medicine. The committee offers graduate work leading to the Doctor of Philosophy degree with a major in nutritional sciences. Options in nutritional biochemistry, human nutrition (clinical or community), or animal nutrition may be selected within this major. For admission and degree requirements, please see the Graduate Catalog.

605. Methods in Nutritional Research (3) I Survey of experimental approaches to nutrition research in the areas of food science, animal nutrition, nutritional biochemistry and human nutrition.
696. Seminar
b. Nutrition (1) I II (Identical with N.F.S. 696b, which is home)

Optical Sciences (OPTI)
Optical Sciences Center, Room 401
(602) 621-4111

Committee on Optical Sciences (Graduate)
Assistant Professors Katherine Creath, Raymond K. Kostuk (Electrical and Computer Engineering), Thomas D. Milster, Ewan M. Wright
Lecturer James M. Palmer
Adjunct Lecturer Robert E. Parks

Qualified applicants holding undergraduate degrees in engineering, mathematics or physics are admitted to undertake graduate programs in optical sciences. Current active research areas include electro-optics, image formation, image processing, laser physics, materials, medical optics, non-linear optics, optical bistability, optical design, optical fabrication and testing, optical properties of materials, pattern recognition, quantum optics, remote sensing, spectroscopy, surface physics, and thin-film technology. Interdisciplinary programs in progress involve the departments of Astronomy, Chemistry, Civil Engineering and Engineering Mechanics, Electrical and Computer Engineering, Physics, and Radiology, as well as the Arizona Research Laboratory, the Optical Circuity Cooperative and the Optical Data Storage Center.

The degrees of Master of Science and Doctor of Philosophy are offered with a major in optical sciences. For admission and degree requirements, please see the Graduate Catalog. A related program in which the Optical Sciences Center plays a major role is the undergraduate optical engineering program administered by the Department of Electrical and Computer Engineering in the College of Engineering and Mines. (See the College of Engineering and Mines section of this catalog for specific information and requirements related to this program.)

210. Geometrical Optics (3) I Basic principles of light, refraction, reflection, paraxial optics, pupils and stops, properties of optical glass, visual and other instruments, aberrations, measurement and testing. 2R, 3L. P. Math. 125a. (Identical with E.C.E. 210)
226. Physical Optics (3) II Fundamentals of electromagnetic waves; plane harmonic waves; light as a vector wave, plane refraction and reflection, interference, diffraction, 2R, 3L. P. 210, Phys. 116. (Identical with E.C.E. 226)
350. Radiometry, Sources and Detectors (3) I Symbols, units and nomenclature; geometrical radiation transfer, radiometric measurements, blackbody radiation; sources, noise, detectors, source-detector interfaces. P. 226, Phys. 121. (Identical with E.C.E. 350)
412. Optical Instrumentation (3) I Microscopes, telescopes, cameras, high-speed photography, diffraction gratings, fiber optics, ophthalmic instruments; medical optical instruments, adaptive optics, optical scanners. P. 370. (Identical with E.C.E. 412)
416. Optical Design, Fabrication and Testing (3) II Optical design, optical fabrication and testing, optical materials and coatings, lens mounting and centering. P. 412. (Identical with E.C.E. 416)
434. Electrical and Optical Properties of Semiconducting Materials (3) I (Identical with M.S.E. 334) May be convened with 534.
440A-440B. Atomic and Molecular Spectroscopy for Experimentalists (3-3) (Identical with Phys. 440A-440B) May be convened with 540A-540B.
487. Fiber Optics Laboratory (3) II Fiber characteristics; fiber preparation; single and multimode fibers; sources; coupling; communication systems; multiplexing techniques; fiber-optic sensors. P. E.C.E. 456. (Identical with E.C.E. 487) May be convened with 587.
501. Electromagnetic Foundations of Optics (3) I Gauss' law; Coulomb's law; dipole moment; polarizability; Faraday's law; Maxwell's equations; the wave equations; plane waves; spherical waves; Fresnel's formulas; dipole radiation; magneto-optic effects; electro-optic effects. P. Phys. 116, Math. 422b.
502. Introduction to Fourier Optics (3) I Harmonic analysis; linear systems; impulse response; convolution; Fourier transform; transfer function; diffraction; image formation; holography; optical data processing. P, Math. 223.

503. First-Order Optical Design (3) I Rays and wavefronts; Fermat's principle; Snell's law; dispersion; systems of plane mirrors; Gaussian imagery; paraxial imagery; paraxial design methods; Delano diagram; introduction to aberrations.

503L. First-Order Optical Design Laboratory (1) I Laboratory in support of 503. P, CR, 503.

504. Introduction to Quantum Optics (3) I Quantum background; interaction of radiation with matter; dipole moments; line broadening; quantization of radiation fields; spontaneous emission; stimulated emission; lasers. P, 501, Phys. 330. (Identical with Phys. 504)

505. Interference and Interferometry (3) II Wave equations; energy flow; polarization; interference; coherence; interferometers; optical testing; holograms; primary interferometry; holography; speckle interferometry. P, 501, 502.

505L. Interference and Interferometry Laboratory (1) I Laboratory in support of 505. P, CR, 505.

506. Principles of Optical Systems Design (3) II Sources of aberrations; aberration control; aberrations in simple systems; vision; color; mechanical design principles. P, 503, 503L.

507. Introduction to Solid-State Optics (3) I Solid-state background; lattice vibrations; energy bands; energy gaps; optical properties of metals, insulators and semiconductors; measurement techniques; modulators; light-emitting diodes. P, 504.

508. Probability and Statistics in Optics (3) II Probability; random variables; stochastic processes; autocorrelation; Wiener spectrum; noise; applications in photography; atmosphere induced turbulence; analysis of random data. P, 502.

509. Radiometry, Sources, Materials and Detectors (3) I Radiometry; sources; materials and components for optical systems; imaging and non-imaging detectors. P, 503, 503L.

510. Optical Testing (3) I 1989-90 Metrology of components; aspheric surface testing; assembly and alignment of systems; system evaluation. P, 505.


514. Aberration Theory (3) II 1992-93 Aberration theory; geometrical image formation; diffraction; pupil, spread, and transfer functions; random wavefront perturbations; system effects; image evaluation; image processing. P, 506.

517. Lens Design (4) I Fundamentals of optical system layout and design; exact and paraxial ray tracing; aberration theory; chromatic and monochromatic aberrations; 2R, 6L, P, 506.

524. Optical Data Processing (3) II 1991-92 Inverse filtering; matched filtering; frequency-domain synthesis; the Vander Lugt filter; shadow-casting correlators; OTF synthesis; coded-aperture imaging. P, 505.

527. Holography (3) II 1992-93 Historical background; the Gabor hologram; the hologram as a zone plate; Fresnel, image, Fourier-transform, and reflection holograms; practical holography; limitations. P, 505. (Identical with E.E. 527)


531. Image Processing Laboratory for Remote Sensing (3) I (Identical with E.E. 531)

532. Computer Vision (3) II (Identical with E.E. 532)


534. Electrical and Optical Properties of Semiconducting Materials (3) I (Identical with M.S.E. 534) May be convened with 434.


540a-540b. Atomic and Molecular Spectroscopy for Experimentalists (3-3) (Identical with Phys. 540a-540b) May be convened with 440a-440b.

541. Introduction to Lasers (3) I Laser theory; properties of lasers; stimulated emission; dispersion theory; gain saturation and rate equation; optical resonators; survey of laser types and mechanisms. P, Phys. 103b.

541L. Introduction to Lasers Laboratory (1) I Laboratory in support of 541. P, CR, 541.

543. Laser Physics (3) I Density matrix formulation of interaction of radiation with matter; semiclassical laser theory; single and multimode scalar fields; moving atoms; ring and Zeeman lasers; pressure effects. P, 504. (Identical with Phys. 543)


545. Nonlinear Optics (3) II 1991-92 Scattering of light; parametric amplification; Brillouin, Raman, Rayleigh scattering; stimulated and spontaneous interactions; frequency multiplication; intense field effects; materials damage theory. P, 501.

550. Fundamentals of Remote Sensing (3) I Physics and methodology of remote sensing; radiometry; data collection systems; photo-interpretation; photogrammetry; image enhancement and classification; applications in the earth sciences.

558. Radiometry (3) I 1991-92 Units and nomenclature; Planck's law; black bodies; gray bodies; spectral emitters; Kirchoff's law; flux concepts; axial and off-axis irradiance; radiative transfer; normalization; coherent illumination; radiometric instruments. P, 501.

559. Infrared Techniques (3) I 1992-93 The radiant environment; atmospheric properties; optical materials and systems; detector description and use; data processing; displays, systems design and analysis. P, 558.

561. Physics of the Solid State (3) II (Identical with Phys. 561)


568. Solid-State Imaging Devices (2) I 1992-93 Charge transfer devices; monolithic and hybrid focal planes, figures of merit; time delay integration; fast zero; transfer efficiency; double-correlated sampling; buried-channel and surface-channel devices. P, 507.

570. Advanced Optics Laboratory (2) I Hands-on experience in current optics research areas. Emphasis is device-oriented. Guided waves; acousto-optics; optical bistability; diode lasers; nonlinear optics; optical phase conjugation. 1R. 3L. P, Phys. 121.


577. Optics of Thin Films (3) I Dielectric interference films; semiconductor and metallic films; planar wave guide films; design methods for multilayer interference filter coatings; thin film components for integrated optical circuits. P, 505.

587. Fiber Optics Laboratory (3) II For a description of course topics, see 487. Graduate-level requirements include performance of a more advanced set of experiments and demonstration of a deeper knowledge of the subject. (Identical with E.E. 587) May be convened with 487.

595. Colloquium a. Current Subjects in Optical Sciences (1) I


Oriental Studies
(See East Asian Studies, Near Eastern Studies, and Judaic Studies)

Pharmaceutical Sciences (PHSC)
Pharmacy Building, Room 408
(602) 626-4531


Associate Professors Joseph J. Hoffmann (Arid Lands Resource Sciences), Neil E. MacKenzie (Biochemistry), Barbara N. Timmermann (Arid Lands Resource Sciences)

The Department of Pharmaceutical Sciences includes the academic disciplines of pharmaceutical chemistry, biopharmaceutics, pharmacokinetics, pharmaceutics, and pharmacognosy. Courses pertinent to the Doctor of Pharmacy are offered. Please consult the College of Pharmacy section of this catalog for undergraduate admission and degree requirements.

The Master of Science and Doctor of Philosophy degrees with a major in pharmaceutics, biopharmaceutics, pharmacokinetics, pharmacognosy (3-4) For a description of course topics, see 437a-437b. Graduate-level requirements include extensive use of the current literature, case studies, and original research projects. P, 307, Chem, 241b, 243b. May be convened with 537a-537b.

437a-437b. Medicinal Chemistry and Pharmacognosy (4-4) Relationships between the chemical structure and physiological activity, incompatibilities and stability of the organic and inorganic compounds obtained from natural and synthetic sources; essentials of pharmacognosy, including biologicals; P, 307, Chem, 241b, 243b. May be convened with 537a-537b.


485. Advanced Clinical Pharmacokinetics (3) II (Identical with Ph.Pr. 485)


508a-508b. Pharmacokinetics Discussion (1-1) I For a description of course topics, see 408a-408b. Graduate-level requirements include an in-depth analysis of a pharmacokinetic problem. CR, 407 for 408a, 885 for 408b. (Identical with Ph.Pr. 508a-508b)

512. Quantitative Structure-Activity Relationships (3) 1991-92 Approaches to the quantification of pharmacological actions of drugs on the basis of chemical structure.

527. Antineoplastic Drugs (2) II Discovery and development of natural and synthetic anti-neoplastic drugs; preclinical screening and toxicity evaluation; phase II, III, and IV clinical studies in humans. P, 437b or CR.

537a-537b. Medicinal Chemistry and Pharmacognosy (4-4) For a description of course topics, see 437a-437b. Graduate-level requirements include extensive use of the current literature and emphasis on drug design principles. P, 307, Chem, 241b, 243b. May be convened with 437a-437b.

596. Seminar
a. Pharmaceutical Chemistry (1) [Rpt/5 units] I II
b. Pharmaceutical Chemistry Research (1) [Rpt/5 units] I

c. Pharmaceutics Research (1 to 2) [Rpt/5 units] I II (Open to majors only)

d. Pharmaceutics Research (1 to 5 units) I II

601. Advanced Physical Pharmacy (3) II 1992-93 Applications of physical pharmacy to pharmaceutical science.


630a-630b. Advanced Organic Medicinals (3-3) 1992-93 Rational drug design, receptor site theories, mechanism of drug action, and metabolic pathways of medicinal agents; chemical and enzymatic synthesis of important pharmacognosy, P, 437b, Pcol, 471b.


815. Pharmacy Subspecialty (3-10) I II S 15-30L. P, or CR, 10 units of Ph.Pr. 810. (Identical with Ph.Pr. 815L, which is home.)

Pharmacology (PHCL)
College of Medicine, Room 5103
(602) 626-6400

(Complete, College of Medicine)

Professors John D. Palmer, Acting Head (Assistant Professor, Internal Medicine), David S. Alberts (Internal Medicine), H. Vasken Aposhian (Molecular and Cellular Biology), Klaus Brendel, Rubin Bressler (Internal Medicine), Burrell B. Brown, Jr. (Anesthesiology), Ryan J. Huxtable, David G. Johnson (Internal Medicine), Eugene Morkin (Internal Medicine, Physiology), Charles W. Putnam (Surgery), William R. Roeske (Internal Medicine), I. Glenn Sipes (Anesthesiology, Pharmacology and Toxicology), Henry I. Yamamura (Biochemistry, Associate Professor, Psychiatry)

Associate Professors Dean E. Carter (Pharmacology and Toxicology), Thomas P. Davis, Laurel A. Frelix, Edward French, A. Jay Gandolfi (Anesthesiology), Marilyn J. Halonen, David L. Kreulen, Thomas J. Lindell (Molecular and Cellular Biology), Frank Porreca

Assistant Professors Timothy C. Fagan (Internal Medicine), Josephine Lai, Douglas F. Larson, Ronald Lynch
Instructor Alan D. Barreuther
Research Professor Richard Herman
Research Associate Professor Thomas L. Smith
Research Assistant Professor Thomas Kramer, Ronald J. Lukas

Pharmacology is a broad discipline involving the investigation of the actions of drugs and chemicals upon living material at all levels of organization. The discipline occupies an important interface between the basic medical sciences and the clinical sciences, drawing strongly upon the former for its contribution to the latter. Research in pharmacology utilizes all appropriate techniques of modern biology from the molecular to the cellular levels. In the health professions, pharmacologic knowledge is applied to the diagnosis, prevention, cure or relief of symptoms of disease, and in the promotion of optimal health. The basic pharmacologic principles are emphasized in both medical and graduate student teaching. This will permit the student to develop techniques of problem solving to keep abreast of advances in pharmacology through his/her professional career.

In conjunction with other departments in the University, the department participates in an interdisciplinary graduate program leading to the Doctor of Philosophy degree in pharmacology and toxicology. The department also offers a program of instruction leading to the Master of Science degree with a major in pharmacology. See the Committee on Pharmacology and Toxicology Research (1-1) Introduction to Pharmacology and Toxicology (Graduate).

495. Colloquium
y. Introduction to the Neurosciences I (2) 1991-92 P Consult department before enrolling. (Identical with Med. 595y, which is home) May be convened with 595y.
z. Introduction to the Neurosciences II (2) 1991-92 P 595y or consult department before enrolling. (Identical with Med. 595z, which is home) May be convened with 495z.

501. The Pharmacological Basis of Therapeutics (6) II Actions of chemical agents upon living material at all levels of organization, with emphasis on mechanisms of action of prototype drugs; foundation for a rational approach to human therapeutics and toxicology. P. Psio. 601, Bioc. 501. (Identical with Tox. 501).

520. Clinical Pharmacology (2) I Effects of drugs on natural history of disease; drug-drug interactions; drug testing designs; drug abuse; drug literature evaluation; aspects of clinical toxicology. P. 501.

550. Drug Disposition and Metabolism (2) II Principles of absorption, distribution and excretion of drugs, with emphasis on mechanisms of drug metabolism and pharmacokinetics. P. 501; Bioc. 501, Tox. 602b. (Identical with Tox. 550).


576. Environmental Toxicology (3) I (Identical with Tox. 576)

582. Immunotoxicology (2) I (Identical with Tox. 582)

588a-588b. Introduction to Pharmacology and Toxicology Research (1-1) Introduction to basic research techniques in pharmacology and toxicology through supervised laboratory rotations; student-initiated and faculty-structured lab. exercises in modern pharmacological and toxicological techniques. P, CR, 501, Bioc. 565, Psio. 601.

595. Colloquium
y. Introduction to the Neurosciences I (2) 1991-92 P Consult department before enrolling. (Identical with Med. 595y, which is home) May be convened with 495y.
z. Introduction to the Neurosciences II (2) 1991-92 P 595y or consult department before enrolling. (Identical with Med. 595z, which is home) May be convened with 495z.

569. Seminar
a. Advanced Graduate Research (1 to 3) [Rpt./3] II P 561b. (Identical with Pcol. 596a)

601. Analytical Instrumentation and Techniques (4) I (Identical with Tox. 601)

602a-602b. Biotoxicology (3-1) (Identical with Tox. 602a-602b)

605a-605b. Human Neurosciences (3-3) (Identical with Anat. 605a-605b)

620. Principles of Pharmacology (3) I Basic principles of the actions of drugs and of intercellular communication; drug-receptor theory; principles of laboratory investigation in pharmacology and toxicology; historical and philosophical foundations of pharmacology and toxicology. (Identical with Pcol. 620 and Tox. 620)

653. Neuropharmacology (3-4) II (Identical with Pcol. 653)

695. Colloquium
a. Cellular/Molecular Pharmacology (1-3) [Rpt./4 units] I P, II, Bioc. 462a-462b; 568a-568b and/or Phcl. 551.

696. Seminar
a. Student Research (1) I (Identical with Pcol. 696a and Tox. 696a)

800. Research (1-6)

801. The Pharmacological Basis of Therapeutics (6) II

805. Human Neurosciences (6) I II (Identical with Anat. 805)

815. Subspecialty
a. Clinical Pharmacology (3-6) P 801.

891. Preceptorship
a. Pharmacology (3-12) [Rpt./12 units]

Pharmacology and Toxicology (PCOL/TOX)
Pharmacy Building, Room 236 (602) 626-2823

(Department, College of Pharmacy)
Professors I. Glenn Sipes, Head, Timothy Bowden (Radiation Oncology), Dean E. Carter, Lincoln Chin (Emeritus), Paul F. Consroe, Wayburn S. Jeter (Emeritus), Albert L. Picchioni (Emeritus), Findlay E. Russell, Theodore Tong (Pharmacy Practice)

Associate Professors James R. Halpert, Hugh E. Laird II, Charlene McQueen
Assistant Professors Clif D. Crutchfield (Family and Community Medicine), William S. Dalton (Internal Medicine), Robert T. Dorr (Internal Medicine), Daniel C. Liebler, John Regan, Sandra Rossie, John Sullivan (Emergency Medicine and Pharmacology), Mark Van Eri (Family and Community Medicine)

Pharmacology is the science concerned with all aspects of the actions of drugs and other chemicals on living systems. Its primary aim is the discovery of chemical mechanisms by which cellular and molecular functions are regulated for the purpose of understanding how existing drugs act and to develop new drugs for treatment of diseases. The broad scope of interest of pharmacology ranges from the study of intermolecular reactions of chemical constituents of cells with drugs to the effects of chemicals on our environment on entire populations. In conjunction with other departments in the University, the department participates in an interdisciplinary graduate program leading to the Doctor of Philosophy degree with a major in pharmacology and toxicology. See Committee on Pharmacology and Toxicology. For admission and degree requirements, please see the Graduate Catalog. The toxicology program concerned with the harmful effects of chemicals (including drugs) on living systems. The toxicology program offers a curriculum leading to the Master of Science degree with a major in toxicology. The program prepares students for careers in hospital laboratories, police crime laboratories, medical examiners’ offices, industrial hygiene laboratories, and toxicology laboratories in industry, government, and universities. The broad scope of interests in toxicology ranges from determining the mechanisms by which chemicals produce adverse biological effects to identification, and quantification of hazards resulting from occupational and/or environmental exposure to chemicals. For admission and degree requirements, please see the Graduate Catalog.

Industrial hygiene is the applied science concerned with the anticipation, recognition, evaluation, and control of chemical and physical agents that can affect health status in occupational and environmental settings. An industrial hygiene concentration is offered within the M.S. toxicology program. The concentration prepares students for professional practice in a wide range of both private and public sector organizations. For admission and degree requirements, please see the Graduate Catalog.

The department participates in the honors program.

Pharmacology (PCOL)

401. Human Gross Anatomy (3) II (Identical with Anat. 401)

471a-471b. Fundamentals of Pharmacology (4-4) Comprehensive study of the biochemical, physiological, and therapeutic effects of drugs, including mechanisms of drug action, drug toxicity, and drug literature evaluation. 3R, 3L, P. Anat. 401, Bioc. 460, Psio. 480, 481; Ph.Sc.
437a-437b. (Identical with Tox. 471a-471b) May be convened with 571a-571b.

472. Nursing Pharmacology (3) I II Pharmacodynamics, pharmacology, and adverse effects of commonly used drugs, with emphasis on clinical applications. Not available for elective credit in the College of Pharmacy or graduate credit in pharmacology-toxicology doctoral programs. P, Ecol. 159b. May be convened with 572.

474. Clinical Toxicology (2) I Prevention, characteristics, diagnosis and rational management of diseases caused by drug overdose, toxic household products, poisonous plants, venomous animals, environmental and industrial toxicants. P, 472 or 471b, Ph.Sc. 407. (Identical with Tox. 474) May be convened with 574.

571a-571b. Fundamentals of Pharmacology (4-4) For a description of course topics, see 471a-471b. Graduate-level requirements include a term paper on a current subject to the description of course topics, see 472. Graduate -level requirements include a term paper on a current subject to the description of course topics, see 571a-571b. May be convened with 471a-471b.

572. Nursing Pharmacology (3) I II For a description of course topics, see 472. Graduate -level requirements include a term paper on nursing pharmacology. P, Ecol. 159b. May be convened with 472.

574. Clinical Toxicology (2) I For a description of course topics, see 474. Graduate -level requirements include an in-depth research paper on a current subject in toxicology and/or a format presentation on a current subject to the description of course topics, see 474. May be convened with 474.

596. Seminar a. Advanced Graduate Research (1-3) [Rpt./3] I II (Identical with Phcl. 596a, which is home)

620. Principles of Pharmacology (3) I (Identical with Phcl. 620)

653. Neuropharmacology (3-4) II Role of various neurochemicals in the peripheral and central nervous systems and the effects of drugs on the nervous system, including their actions at receptors and their influence on synthesis, storage, and release of neurotransmitters. P, Phcl. 501 or Pcol. 471b, 561a, 596. (Identical with Phcl. 653 and Tox. 653)

695. Colloquium a. Research Conference (1-4)[Rpt.] I II

696. Seminar a. Student Research (1) I II (Identical with Phcl. 696a, which is home)

815. Pharmacy Subspecialty I Research (3-10) I II S 15-30L. P or CR, 10 units of 810. (Identical with Ph.Pr. 815), which is home.)

Toxicology (TOX)

408. Insecticide Toxicology (3) I II 1991-92 (Identical with Ento. 508) May be convened with 508.

410. Physical Chemical Exposures (3) I II (Identical with O.S.H. 410) May be convened with 410.

423R. General Pathology (3) I II 1992-93 (Identical with Phcl. 423R) May be convened with 523R.

423L. General Pathology Laboratory (1) I II 1992-93 (Identical with V.Sc. 423L) May be convened with 523L.

437. Vertebrate Physiology (4) I (Identical with Ecol. 437)

462a-462b. Biochemistry (4-3) (Identical with Bioc. 462a-462b) May be convened with 562a-562b.

466. Physiology Laboratory (2) I II (Identical with Ecol. 466) May be convened with 566.

571a-571b. Fundamentals of Pharmacology (4-4) (Identical with Pcol. 471a-471b) May be convened with 571a-571b.

574. Clinical Toxicology (2) I (Identical with Pcol. 474) May be convened with 574.

580. Human Physiology (4) I II (Identical with Pso. 580) May be convened with 480.

581. Industrial Ventilation (3) I II Design and evaluation of industrial ventilation systems. Emphasis is on level evaluation of industrial contaminants. Five laboratory exercises and course design project. 3R, 1L.

582. Immunotoxicology (2) I Broad overview of the immune system, with emphasis on how chemicals affect the immune system (immunomodulation) and the role of the immune system in chemical-induced tissue injury/allergic responses. P, 602, Micr. 419R, 567. (Identical with Micr. 582 and Phcl. 582)

586. Fundamentals of Industrial Hygiene (3) I (Identical with O.S.H. 586) May be convened with 486.

587. Advanced Industrial Hygiene and Safety (3) II (Identical with O.S.H. 587) May be convened with 487.

596. Seminar a. Advanced Toxicology (1-2) [Rpt./3] I II b. Current Concepts in Toxicology (1-2) [Rpt./3] II

601. Analytical Instrumentation and Techniques (2-4) I Lecture and laboratory in the qualitative and quantitative determination of toxic substances in the environment and body fluids. Modern instrumental techniques will be employed whenever appropriate. Lecture may be taken separately by non-majors. 2R, 6L. P, Chem. 325, 326. (Identical with Phcl. 601)


610. Topics in Advanced Toxicology (1-3) I II Current developments in toxicology including: chemical carcinogenesis, mutagenesis and teratogenesis; behavioral toxicology; inhalation toxicology; toxicokinetics; metabolism and environmental toxicology. P, 601, 602a-602b.

620. Principles of Pharmacology (3) I (Identical with Phcl. 620)

653. Neuropharmacology (3-4) II (Identical with Pcol. 653)

696. Seminar a. Student Research (1) I II (Identical with Phcl. 696a, which is home).

Pharmacology and Toxicology

Committee on Pharmacology and Toxicology (Graduate)

Professors David S. Alberts (Cancer Center), H. Vasken Aposhian (Molecular and Cellular Biology), G. Tim Bowden (Radiation Oncology), Klaus Brendel (Pharmacology), Rubin Bressler (Internal Medicine), Burnell R.
Brown (Anesthesiology), Dean E. Carter (Pharmacology and Toxicology), Paul F. Consroe (Pharmacology and Toxicology), A. Jay Gandoni (Anesthesiology), Ryan J. Huxtable (Pharmacology), Wayburn S. Jet- ter, (Pharmacology and Toxicology), David G. Johnson (Internal Medicine), Eugene Morkin (Heart Center), John D. Palmer (Pharmacology), Charles W. Pulnham (Surgery), William R. Roese (Internal Medi- cine), Findlay E. Russell (Pharmacology and Toxicology), I. Glenn Sipes (Pharmacol- ogy and Toxicology), Henry I. Yamamura (Pharmacology)

Associate Professors David L. Kreulen, Chair, cancer chemotherapy, cardiovascular phar- zona Research Laboratory. Faculty members pharmacology, Surgery, Internal Medicine, and the Ari- Molecular and Cellular Biology, Radiation On- pharmacology and toxicology. The program is Doctor of Philosophy degree with a major in pharmacy. The program offers a graduate program leading to the Doctor of Pharmacy degree. A Master of Science with a major in pharmacy is also available in the areas of institutional pharmacy administration and pharmacy administration, is offered through the Graduate College. Graduate study in pharmacy administration leading to a Doctor of Philoso- phy degree with a major in pharmacy is also available. For information on graduate programs, please consult the College of Pharmacy sec- tion needed to evaluate biomedical literature. P, 303.

The Department of Pharmacy Practice offers courses leading to the Doctor of Pharmacy degree. A Master of Science with a major in pharmacy, with concentrations available in the areas of institutional pharmacy administration and pharmacy administration, is offered through the Graduate College. Graduate study in pharmacy administration leading to a Doctor of Philoso- phy degree with a major in pharmacy is also available. For information on graduate programs, please consult the College of Pharmacy sec- tion needed to evaluate biomedical literature. P, 303.

For course descriptions, please see entries in this catalog for Pharmacology (Department, College of Medicine) and Pharmacology and Toxicology (Department, College of Phar- macy). For information on graduate programs and admission requirements, please see the Graduate Catalog.

Pharmacy Practice (PHPR)
Pharmacy Building, Room 318 (602) 626-5730


Adjunct Professors Donald C. Brodie
Adjunct Associate Professor William F. Fritz, James R. Guidry, G. Richard Hall, Carl E. Trinca

Adjunct Assistant Professors William N. Jones, Robert J. Lipsy, Michael Noel, James Pax- inos, Sharon Peplar, Joseph P. Rindon, Carol J. Rollins, Michael I. Smith, Marion Slack, Marjorie Wray

The Department of Pharmacy Practice offers courses leading to the Doctor of Pharmacy degree. A Master of Science with a major in pharmacy, with concentrations available in the areas of institutional pharmacy administration and pharmacy administration, is offered through the Graduate College. Graduate study in pharmacy administration leading to a Doctor of Philosophy degree with a major in pharmacy is also available. For information on graduate programs and admission requirements, please consult the College of Pharmacy section needed to evaluate biomedical literature. P, 303.

300. Pharmaceutical Calculations (2) I Ph- farmaceutical calculations pertinent to the selec- tion, formulation, preparation, dosage and ad- ministration of drugs and their dosage forms. (Identical with Ph.Sc. 300)

301. Introduction to Medications and Their Use for the Consumer (3) II Therapeutic uses of medications, emphasizing non-prescription products and common prescription drugs. For non-pharmacy majors only.

303. Introduction to Pharmacy Practice (1) I
304. Interviewing and Counseling Skills (1) I
305. Patient Counseling and Medical De- vices (1) II

343. Pharmacy Laws (2) I Legal concepts covering professionalism, negligence, liability, legal processes and semantics; pertinent federal, state and local statutes and regula- tions.

345. Drug Information and Drug Literature Evaluation (2) I Skills and principles of drug information, biostatistics, and literature evaluation needed to evaluate biomedical literature. P, 303.

407. Pharmacokinetics (4) I (Identical with Ph.Sc. 407) May be convened with 507.

408a-408b. Pharmacokinetics Discussion (1-1) I II (Identical with Ph.Sc. 408a-408b) May be convened with 508a-508b.

412. Nonprescription Drugs (2) I Presenta- tion on nonprescription drugs, remedies sold over-the-counter (O.T.C.), designed to guide the pharmacist in providing better professional ad- vice to the self-medicating public. P, 305.


414. Dispensing Practice (1) II

419. Parenteral Preparations (2) Principles and procedures in the preparation, stability, and administration of parenteral products. 1R, 3L, Ph.Sc. 307 or CR.


440. Perspectives in Health Care Services (3) I Consumers, providers, financiers, and regu- lators of health care and medicines in the U.S. and exploration of controversies in relation to these components.

442. Professional Practice Management (3) I Management of professional situations and the interaction among patients, colleagues, and other health-care providers, with application to institutional, community, and clinical pharmacy practice. P, 445.

445. Psychosocial Aspects of the Drug Use Process (3) I An overview of the drug-use pro- cess, including an examination of social, behav- ioral, and economic factors associated with the prescribing, dispensing, and use of drugs.


448. Perspectives in Geriatrics (2) II Multi- disciplinary approach to the health-care needs of the elderly, including medication use, nutrition, health care agencies and roles of individual health care professionals. Open to non- majors. P, CR, 447 for nonmajors. (Identical with Gero. 448 and N.F.S. 448) May be convened with 548.


483. Perspectives of Cancer Care for Health Professionals (3) S (Identical with Nurs. 483) May be convened with 583.
485. Advanced Clinical Pharmacokinetics
(3) II Advanced pharmacokinetic principles emphasizing the application of mathematical relationships to patient care situations. P, Ph.Sc. 407, 409, or consult department before enrolling. (Identical with Ph.Sc. 485)

489. Clinical Pharmacotherapy of Mental Disorders (2) II A multidisciplinary approach to clinical psychopharmacology, therapeutics, and diagnosis of mental disorders for health professionals. May be convened with 589.

507. Pharmacokinetics (4) I (Identical with Ph.Sc. 507) May be convened with 407.

508a-508b. Pharmacokinetics Discussion
(1-1) II (Identical with Ph.Sc. 508a-508b) May be convened with 408a-408b.

511. Pharmacy Management (3) I History, organization and administration of pharmaceutical services within the institutional environment.

512. Advanced Pharmacy Management (3) II Application of management principles to problem-solving and decision-making techniques in the provision of pharmaceutical services within the institutional environment. Field trips. Open to majors only. P. 511.

547. Perspectives in Geriatrics Laboratory (1) II P, CR. (Identical with Gero. 547 and N.F.S. 547) May be convened with 447.

548. Perspectives in Geriatrics (2) II For a description of course topics, see 448. Graduate-level requirements include one in-depth research paper on a single topic to geriatric care. Open to nonmajors. P, CR. 447 for nonmajors. (Identical with Gero. 548) May be convened with 448.

583. Perspectives of Cancer Care for Health Professionals (3) S (Identical with Nurs. 583) May be convened with 483.

589. Clinical Pharmacotherapy of Mental Disorders (2) II For a description of course topics, see 489. Graduate-level requirements include a research paper on a single topic of psychopharmacology. May be convened with 489.

596. Seminar
a. Pharmacy Administration (1) [Rpt./5] II
b. Pharmacy Administration Research (1) [Rpt./5] II

611a-611b. Pharmacy and Its Environment (3-5) 1991-92 Cultural, social, behavioral, and organizational foundations of pharmacy, including the development of the present state of practice.

612a-612b. Issues in Pharmacy Practice Research (3-3) 1992-93 Survey of research methodology for studying social and behavioral aspects of health care and pharmacy practice; strategy for selecting and modifying existing research tools for particular purposes.

621. Pharmaceutical Marketing (3) II Socioeconomic factors in the development, production, and distribution of drugs.

694. Practicum
a. Clinical Clerkship (1-15) [Rpt.] II
b. Administrative Clerkship (1-15) [Rpt.] II

695. Colloquium
a. Research in Gerontology (1) I (Identical with Gero. 695a)

800. Pharmacy Practice Project (1) II Individual pharmacy practice research not related to a thesis or dissertation. Open only to students enrolled in Doctor of Pharmacy program.

803. Pharmacy Clinical Clerkship
b. Institutional Pharmacy Practice (5) [Rpt./10 units] III I S 461.
c. Ambulatory Pharmacy Practice (5) [Rpt./10 units] III I S 461.
d. Drug Information Practice (5) [Rpt./10 units] III I S 461.
e. Adult Care Pharmacy Practice (5) [Rpt./10 units] III I P. 461.

810. Pharmacy Clerkship
a. Internal Medicine (3-10) I II S, 803b.
b. Surgery (3-10) I II S, 803b.
c. Pediatrics (3-10) II II S, 803b.
d. Geriatrics/Gerontology (3-10) I II S, 803b.
e. Outpatient Practice (3-10) I II S, 803b.
f. Emergency Services (3-10) I II S, 803b.
g. Acute Care (3-10) I II S, 803b.
h. Clinical Pharmacokinetics (3-10) I II P, 803b.
i. Psychopharmacology/Neurology (3-10) I II S, 803b.

815. Pharmacy Subspecialty
a. Hematology/Oncology (3-10) I II S P, 10 units of 810 or CR.
b. Cardiology (3-10) I II S P, 10 units of 810 or CR.
c. Pulmonary (3-10) I II S P, 10 units of 810 or CR.
d. Endocrine (3-10) I II S P, 10 units of 810 or CR.
e. GI/Renal (3-10) II II S P, 10 units of 810 or CR.
f. Ob/Gyn/Neonatal (3-10) II II S P, 10 units of 810 or CR.
g. Infectious Disease (3-10) I II S P, 10 units of 810 or CR.
h. Rheumatology/Immunology (3-10) I II S P, 10 units of 810 or CR.
i. Dermatology (3-10) I II S P, 10 units of 810 or CR.
j. Poison Information/Toxicology (3-10) I II S P, 10 units of 810 or CR.
k. Administrative (3-10) I II S P, 10 units of 810 or CR.
l. Research (3-10) I II S 15-30L, P, 30 units of 810 or CR.

896. Seminar
a. Pharmacy Practice (1) II

Philosophy (PHIL)
Social Sciences Building, Room 213 (602) 621-3129


Associate Professor J. Christopher Maloney, Joseph T. Tolliver
Assistant Professors Thomas Christiano, David Owen

Philosophy attempts to answer analytic and speculative questions that perplex reflective people when they examine their basic concepts, goals, and ideals. Some of these questions arise naturally in the course of work in the various sciences and humanities. Hence philosophy has a natural border with all other academic disciplines, and lends itself to joint studies and collaborative programs. The Bachelor of Arts, Master of Arts and Doctor of Philosophy degrees are available with a major in philosophy. The department also encourages joint majors in such related fields as psychology, political science, economics, and linguistics, among others. Specialized minors in philosophy are available for students planning careers in law or the health professions. For details, students should consult the philosophy department's undergraduate advisor.

The major: 30 units, including 111, 112, 344, 260 or 470, and 262 or 471a or 471b. At least 15 units must be in upper-division work. Students contemplating an undergraduate major in philosophy should consult the Philosophy Department's undergraduate advisor for detailed requirements. Students interested in majoring in philosophy as background for graduate or professional work may want to plan a more specialized program in consultation with the department's undergraduate advisor.

The supporting minor should be chosen after consultation with the undergraduate advisor.

The department participates in the honors program, offering honors sections of its introductory courses, periodic honors seminars, and the opportunity to conduct independent honors research.

110. Critical Thinking (3) I II Designed to improve ability to reason and think critically; emphasis on evaluating and presenting arguments.

111. Introduction to Philosophy (3) I II Selected basic philosophical problems and problems: knowledge, belief and truth; the world and God; nature of persons; action and free will; the good life; the ideal community.

112. Introduction to Logic (3) I II Basic introduction to symbolic logic; construction and critical analysis of arguments.

113. Introduction to Moral and Social Philosophy (3) I I Introduction to moral and political theory, and problems of practical ethics. Readings from representative moral and social philosophers.

121. Philosophical Foundations of Western Civilization: Justice and Virtue (3) I II S Classical, medieval and modern moral and political thought; theories of human good, natural rights, political obligation, relation of individual and state, class conflict.

122. Philosophical Foundations of Western Civilization: Mind, Matter, and God (3) I II S Classical, medieval and modern metaphysical questions: What am I — mind, body, or both? Is the nature of the world ultimately physical? What is God? How may we know?

123. Philosophical Foundations of Western Civilization: Science and Inquiry (3) I II S
Classical, medieval, and modern approaches to science, mathematics and knowledge; philosophical problems raised by discovery and change.

145. Science, Technology and Human Values (3) I Nature of science, technology, pseudo-science, and their relation to philosophy and culture; impact of science and technology on society and its values and religion.

202. Symbolic Logic (3) Truth-functional logic and quantification theory; semantic concepts; deductive techniques and translation into symbolic notation. (Identical with Math. 202)

213. Contemporary Moral Problems (3) Issues and arguments arising in contemporary moral debates. Topics will vary but are likely to include abortion, mercy killing, the nature of economic justice, racism, sexism, pornography, animal rights, the death penalty, terrorism, the morality of war, and nuclear deterrence.

233. Philosophy of Religion (3) I Nature of religion; existence and nature of God; religion and meaning, values and knowledge. (Identical with Reli. 233)

238. Philosophy in Literature (3) I Philosophical analysis of selected literary works.

245. Existential Problems (3) II 1991-92 Exploration of central problems of the human condition, such as meaning of life; death; self-deception; authenticity, integrity and responsibility; guilt and shame; love and sexuality.

260. Ancient Philosophy (3) I Survey of Greek philosophy, from the pre-Socratic philosophers through Plato and Aristotle to post-Aristotelian philosophers. (Identical with Clas. 260)

262. Modern Philosophy (3) Survey of major 17th and 18th century British and European philosophers, chosen from Descartes, Spinoza, Leibnitz, Locke, Berkeley, Hume, and Kant.

263. From Hegel to Nietzsche: Man and Society in 19th Century Philosophy (3) Survey of influential 19th century philosophers, including Hegel, Marx, J.S. Mill, Kierkegaard, and Nietzsche. Their views on the individual and society, and human nature.

305. Introduction to the Philosophy of Science (3) Basic issues in the logic of science: scientific concepts and their meaning, testing of hypotheses, explanation, measurement, role of mathematics, truth versus convention, limits of science.

310. History of Ethics (3) I II Reading and analysis of selected ethical theories from the Greeks to the present.

321. Medical Ethics (3) Ethical issues that arise in relation to medicine and health care: abortion, euthanasia, the allocation of scarce medical resources, socialized medicine, doctor-patient confidentiality, paternalism, etc.

322. Business Ethics (3) II Selected ethical issues in business, including corporate responsibility, preferential hiring and reverse discrimination, advertising practices, environmental responsibility.

344. Issues and Methods in Analytic Philosophy (3) Designed to improve ability to think analytically, with emphasis on analytic methodology. Selected readings on the nature of mental states, the analytic/synthetic distinction, personal identity, the concept of knowledge and justified belief, the theory of reference, and the distinction between science and pseudo-science. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proiciency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

350. Minds, Brains, and Computers (3) I An introduction to cognitive science; current issues relating to minds as computers, neuroscience, vision and language. (Identical with Psyc. 350)

370. Issues in Greek Philosophy (3) Philosophical issues in ancient thought. Topics may be selected from the pre-Socratics, Socrates, Plato, Aristotle, and post-Aristotelian philosophy. (Identical with Clas. 370)

376. Introduction to the Philosophy of Language (3) I 1990-91 A survey of basic issues in the philosophy of language. (Identical with Ling. 376)

396H. Honors Proseminar (3) II

403. Foundations of Mathematics (3) II 1992-93 (Identical with Math. 403) May be convened with 503.

412. Readings in Greek Philosophy (3) (Rpt.) (Identical with Grk. 412) May be convened with 512.

413. Advanced Symbolic Logic (3) Propositional and quantification logic. Metatheorems on consistency, independence, and completeness. Set theory, number theory, and model theory. Recursive function theory and Goedel's incompleteness theorem. May be convened with 513.

414. Philosophical Logic (3) Introduction to modal logic; problems of interpretation and application; extensions to such areas as tense logic, epistemic logic, deontic logic. May be convened with 514.


419. Induction and Probability (3) Basic philosophical problems concerning justification of induction, confirmation of scientific hypotheses, and meaning of probability concepts. May be convened with 519.


422. Linguistic Semantics and Lexicology (3) II 1992-93 (Identical with Ling. 422) May be convened with 522.

423. Philosophy of the Physical Sciences (3) Philosophical problems regarding space, time, motion, relativity, causality, measurement, theoretical entities. May be convened with 523.

424. Philosophy of Social Sciences (3) Theories, concepts, and forms of understanding in the social sciences. Possible topics: rational choice and decision at the individual and social levels; democracy; and market mechanisms. P, one course in philosophy. May be convened with 524.

430a-430b. Ethical Theory (3-3) 430a: Metaethics—meaning of moral terms, relativism, subjectivism, ethics and science, social contract theory. 430b: Normative ethics—Utilitarianism, egoism, rights, natural law, justice, deontological duties, blameworthiness and excuses. May be convened with 530a-530b.

433. Aesthetics (3) Classical and contemporary theories of art; the esthetic experience, form and content, meaning, problems in interpretation and criticism of works of art. May be convened with 533.

434. Social and Political Philosophy (3) Fundamental concepts of politics; leading social and political theories, such as anarchism, socialism, social contract, Marxism. May be convened with 534.


438a-438b. Philosophy of Law (3-3) 438a: Nature and validity of law; law and morality, juridical reasoning, law and liberty. 438b: Problems about justice, compensation and contracts and/or responsibility and punishment. (Identical with Pol. 438a-438b) May be convened with 538a-538b.

439. Ethics and the News Media (3) I (Identical with Jour. 439) May be convened with 539.

440. Metaphysics (3) Topics include free will and determinism; causation; personal identity; necessity and essence, truth, realism and ontology. May be convened with 540.

441. Theory of Knowledge (3) Critical examination of some of the major problems concerning evidence, justification, knowledge, memory, perception and induction. May be convened with 541.


443. Knowledge and Society (3) I II Social and interpersonal processes affecting the acquisition and diffusion of knowledge. Emphasis on philosophical perspectives, with interdisciplinary borrowings. P, one philosophy course. May be convened with 543.

450. Philosophy of Mind (3) Topics include the nature of mental states, the relation between mind and brain; and analysis of perception, emotion, memory and action. May be convened with 550.

451. Philosophy of Psychology (3) Investigation of philosophical issues arising from current work in psychology including perception, reasoning, memory, motivation and action. May be convened with 551.

454. Philosophy and Artificial Intelligence (3) Interdisciplinary problems lying at the interface of philosophy and artificial intelligence. May be convened with 554.

463. Philosophy of Language (3) Survey of basic issues in the philosophy of language such as: speech acts, reference, meaning, logical form. May be convened with 563.

474. Philosophy of the Physical Sciences (3) For a description of course topics, see 423. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 423.

523. Philosophy of the Physical Sciences (3) For a description of course topics, see 423. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 423.

524. Philosophy of Social Sciences (3) For a description of course topics, see 424. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 424.

532. Philosophy of Science (3) For a description of course topics, see 431. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 431.

533. Aesthetics (3) For a description of course topics, see 433. Graduate-level requirements include an indepth research project on a central theme or topic of the course. May be convened with 433.

534. Social and Political Philosophy (3) For a description of course topics, see 434. Graduate-level requirements include an indepth research project on a central theme or topic of the course. May be convened with 434.

535. Games and Decisions (3) For a description of course topics, see 435. Graduate-level requirements include an indepth research project on a central theme or topic of the course. May be convened with 435.

536. Social and Political Philosophy (3) For a description of course topics, see 436. Graduate-level requirements include an indepth research project on a central theme or topic of the course. May be convened with 436.

537. Ethics and the News Media (3) For a description of course topics, see 437. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 437.

538a-538b. Philosophy of Law (3-3) For a description of course topics, see 438a-438b. Graduate-level requirements include an indepth research project on a central theme or topic of the course. May be convened with 438a-438b.

539. Ethics and the News Media (3) For a description of course topics, see 439. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 439.

540. Metaphysics (3) For a description of course topics, see 440. Graduate-level requirements include an indepth research project on a central theme or topic of the course. May be convened with 440.

541. Theory of Knowledge (3) For a description of course topics, see 441. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 441.

542. Knowledge and Cognition (3) For a description of course topics, see 442. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 442.

543. Knowledge and Society (3) For a description of course topics, see 443. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 443.

550. Philosophy of Mind (3) For a description of course topics, see 450. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 450.

551. Philosophy of Psychology (3) For a description of course topics, see 451. Graduate-level requirements include an indepth research paper on a central theme or topic of the course. May be convened with 451.

552. Linguistic Semantics and Lexicology (3) II 1992-93 (Identical with Ling. 522) May be convened with 422.
Physics (PHYS)

PAS Building, Room 260
(602) 621-6824


Associate Professors Adam S. Burrows, Anna Hasenfratz, Ke-Chiang Hsieh, Sumit Mazumdar, Fulvio Melia (Astronomy), Michael A. Shupe, Dan Stein, Douglas Toussaint, Jay E. Treat (Emeritus)

Assistant Professors Geoffrey E. Forde, Kenneth A. Johns, Ina Sarcevic, Wing Y. Tam, Ewan M. Wright

The teaching minor: 18 units, including

111a-111b and 112a-112b, 433, 480a, and other courses chosen in consultation with the departmental advisor.

The department participates in the honors program.

102a-102b. Introductory Physics (3-3)

CTD Designed for liberal arts and life science majors with no calculus background. Survey of the basic fields of physics, with emphasis on applications to other fields and historical development. P, high school algebra, geometry, and trigonometry. Both 102a and 102b are offered each semester. Those wishing to take this course as a lecture-laboratory course should register concurrently for 180a or 180b.

107. The Physics of Music (4) I CDT Sound production, musical instruments, frequency analysis, physics of hearing, psychological and physiological effects, harmony and scales, hall acoustics, electronic production and recording. 3R, 3L.

109. Physics in the Modern World (4) I II Basic concepts and the societal impact of physics, with emphasis on modern physics. Topics include mechanics, wave motion, energy, light, nuclear and atomic physics, and astrophysics. 3R, 3L. Open to nonmajors only. P, high school algebra.

110. Introductory Mechanics (4) II CDT Vector concepts; kinematics, statics, and dynamics of particles, particle systems, and rigid bodies; conservation laws of energy, momentum, and angular momentum. 4R, 2L. P, Math. 125a, CR. 125b.

111a-111b. Introduction to Mechanics, Thermodynamics and Relativity (4-4) II CDT Kinematics and dynamics of particles and rigid bodies, conservation laws. First and second laws of thermodynamics and special theory of relativity. 4R, 2L, P, or CR, Math. 125a for 111a; Math. 125b for 111b.

112a-112b. Introduction to Electricity, Magnetism, Optics, and Quantum Theory (4-4) II CDT Laws of electric and magnetic fields, and circuits, Maxwell's equations, EM waves, physical and geometrical optics, and quantum theory. 4R, 2L, P, or CR, Math. 125a for 112a; Math. 125b for 112b.


121. Introductory Optics, Acoustics and Heat (2-3) II CDT Introduction to heat and thermodynamics; treatment of optics and acoustics from viewpoint of scalar wave theory. 3R, 2L, P, CR, Math. 223.

180a-180b. Introductory Laboratory (1-1) Quantitative experiments in physics, both illustrative and exploratory. Designed to accompany 102a-102b; sections are established corresponding to each course. 3R, P, CR, 102a-102b. Both 180a and 180b are offered each semester.


*Credit will be allowed for only one of the following sequences of courses: 102a-102b, 180a-180b and 330; 110, 116, 121, and 330; 111a-111b and 112a-112b.

402. Medical Physics (3) I CDT Basic physics of the human body: the principles of mechanics, electricity, sound, light, and radiation as they apply to physiology, with emphasis on instrumentation for diagnosis and treatment. P, 102b. May be convened with 502.


411a-411b. Electricity and Magnetism (3-3) CDT Electromagnetic phenomena; Maxwell's equations. P, 410 or Math. 422a.

420. Optics (3) I CDT Concepts and experimental techniques of molecular biophysics; physical properties of biological macromolecules and cell organelles, optical interactions, macromolecular transitions, molecular mechanism or regulation. P, 102b, Chem. 103a-103b. (Identical with Micr. 430) May be convened with 530.

425. Thermodynamics (3) I CDT Basic laws of thermals equilibrium; heat engines; ideal and non-ideal gases; phase transitions; introduction to irreversible processes, kinetic theory, and statistical mechanics. P, 112b, Math. 223.

430. Introduction to Biophysics (2) I CDT Concepts and experimental techniques of molecular biophysics; physical properties of biological macromolecules and cell organelles, optical interactions, macromolecular transitions, molecular mechanism or regulation. P, 102b, Chem. 103a-103b. (Identical with Micr. 430) May be convened with 533.

433. Physics Demonstrations (1-3) I II Introduction to teaching materials and laboratory demonstrations illustrating principles of classical and modern physics, with emphasis on inexpensive techniques and direct experience. Advanced degree credit available for nonmajors only. P, two semesters of physics. May be convened with 533.

435. Introductory Quantum Theory and Atomic Spectra (3) I CDT Introductory quantum mechanics; solutions of the Schroedinger equation for hydrogen-like atoms; perturbation theory; atomic structure; spectra of one and many electron systems; Zeeman-Paschen-Bach effects; hyperfine structure. P, 330 or 112b, 410, Math. 254; CR, 475a or Math. 413 recommended.

436. Applications of Introductory Quantum Theory (3) I CDT Applications of quantum theory to molecules, atomic nuclei, elementary particles and simple solids. P, 435. May be convened with 536.

440a-440b. Atomic and Molecular Spectroscopy for Experimentalists (3-3) CDT Experimental techniques to generate, analyze and detect photons from X-ray to IR; interpretation of spectra from gases, liquids, solids and biological macromolecules; light scattering, polarization. P, 330 or 112b. (Identical with Opti. 440a-440b) May be convened with 540a-540b.

445. Experimental Physics 445a-445b-445c are three five-week lecture courses; none is prerequisite to any other.

a. Experimental Spectroscopy (1) I I CDT Effective in using instruments with spectroscopic sources, spectrometers, instrument functions, detectors, light collection optics,
spectral recording and analysis. P, 110, 116, 121, or consult department before enrolling. May be convened with 545a. 
b. Experimental Acoustics (1) I II S Laboratory experiments with sound sources, oscilloscopes, spectrum analyzers, sound level meters, filters, musical instruments, recording, room acoustics. P, 110, 116, 121, or consult department before enrolling. May be convened with 545b. 
c. Experimental Microscopy, Light Scattering and Optics of Small Particles (1) I II S Laboratory experiments with microscopes and polarized scattered light to characterize small particles and surfaces, optical constants, lasers remote sensing, P, 110, 121, or consult department before enrolling. May be convened with 545c.

450. Introductory Nuclear Physics (3) II CDT Basic concepts of nuclear physics: structure and stability of nuclei; nuclear forces; stable systems; nuclear reactions; decay of unstable systems; nuclear radiation characteristics. P, 330 or 112b, Math, 254. May be convened with 550.

460. Introductory Solid-State Physics (3) II CDT Properties of solids from molecular, atomic, and electronic theory; electric, magnetic, and transport properties of metals, insulators, and semiconductors; free electron and band theories. P, 330 or 112b. May be convened with 560.

475a-475b. Methods of Mathematical Physics (3-3) CDT Vector and tensor analysis; differential and integral equations; Green's functions; variational techniques; linear operator theory, with emphasis on physical applications. P, 410, Math, 254, CR, 415a-415b. May be convened with 575a-575b.

480a-480b. Methods of Experimental Physics I (1 to 3-1 to 3) Designed to develop experimental skills and to demonstrate important concepts in classical and modern physics. 3L P, two upper-division courses in phys. or CR. Both 480a and 480b are offered each semester, but students are encouraged not to enroll simultaneously. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

481a-481b. Methods of Experimental Physics II (1 to 3-1 to 3) Continuation of 480a-480b, with emphasis on individual work. 3 or 6L. P, 480b; ten units of upper-division physics. Both 481a and 481b are offered each semester, but students are encouraged not to enroll simultaneously.

485. Introduction to Computational Physics (3) I An introduction to numerical techniques physicists actually employ to solve real physics problems. Its focus is on problems whose solution can best be obtained numerically and on the use of the standard mathematics and graphics packages. Sample physics topics include chaos and nonlinear mechanics, quantum perturbation theory and eigenvalues, particle trajectories, and stellar structure. P, 110, 116, 121 or 111a-111b and 112a-112b.

502. Medical Physics (3) I CDT For a description of course topics, see 402. Graduate-level requirements include an original report demonstrating the ability to construct mathematical models related to one of the diagnostic or therapeutic modalities discussed in the course. P, 102b. May be convened with 402.

504. Introduction to Quantum Optics (3) II (Identical with Opt. 504) 

511. Analytical Mechanics (3) I Laws of motion as developed by Newton, d'Alembert, Lagrange and Hamilton; dynamics of particles and rigid bodies. P, 410.

513. Topics in Advanced Mechanics (3) II Modern topics in classical mechanics, including canonical perturbation theory, invariant mappings, nonintegrated system stochastic behavior and applications to semi-classical quantum theory. P, 511.


530. Introduction to Biophysics (2) I CDT For a description of course topics, see 430. Graduate-level requirements include extra assignments. P, 102b, Chem, 103a-103b. (Identical with Micr. 530) May be convened with 430.

531. Biophysical Theory (II) I CDT Physical concepts and theories describing biomolecular function and structure, molecular evolution, limits to structure, symmetry, oligomer and virus structure, organelle structure and function. (Identical with Micr. 531)

533. Physics Demonstrations (1-3) II For a description of course topics, see 433. Graduate-level requirements include assisting with undergraduate lecture planning and demonstrations. Advanced degree credit available for nonmajors only. P, two semesters of physics. May be convened with 433.

535. Advanced Atomic Physics (3) II 1992-93 Details of atomic structure, interactions of atoms with electromagnetic fields, electrons and ions; techniques for calculating unperturbed and perturbed energy levels, transition probabilities, and atomic interaction cross sections. P, 511, 515b, 570b.

536. Applications of Introductory Quantum Theory (3) II CDT For a description of course topics, see 436. Graduate-level requirements include additional homework problems. P, 435. May be convened with 436.

540a-540b. Atomic and Molecular Spectroscopy for Experimentalists (3-3) For a description of course topics, see 440a-440b. Graduate-level requirements include homework problem assignments at an advanced level. P, 330 or 112b. (Identical with Opt. 540a-540b) May be convened with 440a-440b.

543. Laser Physics (3) I (Identical with Opt. 543)

545. Experimental Physics 545a-545b-545c are three five-week lecture courses; none is prerequisite to any other.

a. Experimental Spectroscopy (1) I II S For a description of course topics, see 445a. Graduate-level requirements include an in-depth research report on a topic selected in consultation with the instructor. P, 110, 116, 121, or consult department before enrolling. May be convened with 445a.

b. Experimental Acoustics (1) I II S For a description of course topics, see 445b. Graduate-level requirements include an in-depth research report on a topic selected in consultation with the instructor. P, 110, 116, 121, or consult department before enrolling. May be convened with 445b.

c. Experimental Microscopy, Light Scattering and Optics of Small Particles (1) I II S For a description of course topics, see 445c. Graduate-level requirements include an in-depth research report on a topic selected in consultation with the instructor. P, 110, 116, 121, or consult department before enrolling. May be convened with 445c.

550. Introductory Nuclear Physics (3) II CDT For a description of course topics, see 450. Graduate-level requirements include additional special topics, to be determined by the instructor. P, 330 or 112b, Math, 254. May be convened with 450.


556a-556b. Electrodynamics of Conducting Fluids and Plasmas (3-3) 1992-93 (Identical with Phy.S. 556a-556b)


560. Introductory Solid-State Physics (3) II CDT For a description of course topics, see 460. Graduate-level requirements include an in-depth paper on a topic in solid-state physics. P, 330 or 112b. May be convened with 460.


570a-570b. Quantum Mechanics (3-3) Principles of quantum mechanics; wave mechanics and matrix mechanics; applications to atomic
418. Physiology for Engineers (4) I Designed to bring to engineering students an awareness of the structure and function of whole organisms, their component organs, and organ systems. Open to nonmajors only. (Identical with Ch.E. 418 and E.C.E. 418)

419. Physiology Laboratory (2) I Laboratory experiments in physiology intended to provide experience with organ systems and measurement techniques. Designed for engineering students enrolled in the clinical engineering and biomedical engineering options. 6L. Open to nonmajors only. P. 418 or CR. (Identical with Ch.E. 419 and E.C.E. 419)

466. Physiology Laboratory (2) II (Identical with Ecol. 466) May be convened with 566.

468. Comparative Physiology (3) II (Identical with Ecol. 468) May be convened with 568.

480. Human Physiology (4) II Principles of physiology with emphasis on the human; designed primarily for students in pharmacy and health related sciences. Consult department before enrolling. P. Chem. 243b, Math. 123, Phys. 102b, CR, 481. (Identical with Tox. 480) May be convened with 580.

481. Physiology Laboratory (1) II Experiments intended to reinforce principles of physiological phenomena; designed primarily for students in pharmacy and health related sciences. Consult department before enrolling. P. Chem. 243b, Math. 123, Phys. 102b, CR, 481. (Identical with Tox. 481) May be convened with 581.

495. Colloquium y. Introduction to the Neurosciences I (2) 1991-92 (Identical with Med. 495y, which is home) May be convened with 595y.
z. Introduction to the Neurosciences II (2) 1991-92 (Identical with Med. 595z, which is home) May be convened with 595z.

503. Cellular Physiology (4) I Fundamental responses of living organisms to environmental changes, by examining mechanisms which operate at the cellular level. Topics include ontogenetic structure and function, transmembrane homeostasis and transport phenomena, excitability, intercellular and intracellular communication, cellular mobility, and nerve-muscle-synapse function. P. Chem. 103b, 104b, 241b, 243b; Phys. 102b; Math. 125a-125b, 125c. 400. (Identical with Tox. 480) May be convened with 581.

588. Principles of Cellular and Molecular Neurobiology (4) I (Identical with Nrsc. 588)

589. Principles of Systems Neurobiology (4) II (Identical with Nrsc. 589)

b. Muscle Physiology (2) [Rpt./12 units] I II P. 503.
c. Endocrinology (2) [Rpt./12 units] I II P. 601/801.
d. Renal Physiology (2) [Rpt./12 units] I II P. 601/801.
e. Molecular and Cellular Excitability (2) [Rpt./12 units] I II P. 601/801.
f. Peripheral Vascular Physiology (2) [Rpt./12 units] I II P. 601/801.
g. Membranes and Transport (2) [Rpt./12 units] I II
h. Systems Neurophysiology (2) [Rpt./12 units] I II
i. Introduction to Personal Computers in Physiology (2) [Rpt./12 units] I II


601. Systems Physiology (7) II Comprehensive coverage of systemic physiology with emphasis in the underlying principles of function. P. Chem. 103b, 104b, 241b, 243b, Phys. 102b. Consult department before enrolling.

605a-605b. Human Neuroscience (3-3) II (Identical with Anat. 605a-605b)

610. Research Methods in Physiology (1-3) II Laboratory course providing students with an understanding of the types of research available in the department. (Maximum length is 8 weeks). Consult department before enrolling.

695. Colloquium a. Motor Control (2) [Rpt./8 units] II (Identical with Ex.S.S. 695a)

696. Seminar a. Physiology Series (1) [Rpt./3 units] I II Open to majors only.
b. Physiology: Preparation and Presentation (1) [Rpt.] I II Open to majors only. Consult with department before enrolling.
c. Physiology Open Forum (1) [Rpt./3 units] I II

582. Topics in Neural Development (2) II (Identical with Nrsc. 582)

585. Exercise and Performance (3-7) [Rpt./12 units] I II P, 503.


803. Human Neuroscience (6) II (Identical with Anat. 803)

815. Subspecialty a. BNI Neurophysiology (4-8) P, completion of basic sciences.

891. Preceptorship a. Physiology (3-12) [Rpt./12 units]


*Available as both 595 and 895

Planetary Sciences (PTYS)

Space Sciences Building, Room 325
(602) 621-6963


Associate Professors Jonathan I. Lunine, Robert B. Singer, Carolyn Porco

Assistant Professors Timothy D. Swindle, William C. Tittemore

Participating Scientists from the Lunar and Planetary Laboratory:

Senior Research Scientists Lyle A. Broadfoot, Larry A. Lebofsky, Donald E. Shemonsky, Associate Research Scientists Jay B. Holberg, Lon L. Hood, Bill R. Sendle

Assistant Research Scientists Robert McMillan, Ann Vickery, Roger Yelle

The Department of Planetary Sciences offers a multidisciplinary program leading to the Master of Science and Doctor of Philosophy degrees with a major in planetary sciences.

The department also offers several courses aimed at introducing undergraduate students to the principal ideas and broad scope of modern planetary science.

For admission and degree requirements, please see the Graduate Catalog.

105. The Universe and Humanity: Origin and Destiny (3) III I Formation and evolution of the Universe, the solar system, and life; events which led to our existence; the future for life in the solar system; life elsewhere. Designed for nonscientists. (Identical with Astr. 105)

106. Survey of the Solar System (4) I IV Interdisciplinary synthesis of planetary and space science; the sun, planets, satellites, interplanetary gas, comets, small bodies, space missions. Designed for nonscientists. 3R, 3L, Math. 117R/S. (Identical with Astr. 106 and Geos. 106)

107. Planet Earth: Evolution of a Habitable World (3) I II History of the Earth as a planet
including the origin of the solar system; formation of life; comparative evolution of Earth, Mars, Venus, and Titan; global climate change past and present. Designed for nonscientists. P. Math. 116 recommended, not required.


411. Introduction to Planetary Geology (4) I 1992-93 Geologic processes and landforms on satellites and the terrestrial planets, their modification under various planetary environments, and methods of analysis. 3R, 3L. (Identical with Geos. 411)

419. Global Tectonic Processes (3) II (Identical with Geos. 419) May be convened with 519.

441a-441b. Dynamic Meteorology (3-3) (Identical with Atmo. 441a-441b) May be convened with 541a-541b.

503. Introduction to the Solar System (3) I 1991-92 For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper on a selected topic and an oral class presentation. This course does not count toward the major requirements in planetary sciences. (Identical with Astr. 503 and Geos. 503) May be convened with 403.


510. Principles of Cosmochemistry (3) I 1992-93 Chemical compositions of solar system objects; equilibrium and nonequilibrium chemical processes applied to planets; cosmochemistry. (Identical with Geos. 510)


519. Global Tectonic Processes (3) II (Identical with Geos. 519) May be convened with 419.

520. Meteorites (3) II 1992-93 Classification; chemical, mineralogical and isotopic composition; cosmic abundances; ages; interaction with solar and cosmic radiation; relation to comets and asteroids. P. 510. (Identical with Geos. 520)


530. Chemical Evolution of the Earth (3) I (Identical with Geos. 530)

541a-541b. Dynamic Meteorology (3-3) (Identical with Atmo. 541a-541b) May be convened with 441a-441b.

544. Physics of High Atmospheres (3) II 1991-92 Physical properties of upper atmospheres, including gaseous composition, temperature and density, ozonosphere, and ionospheres, with emphasis on chemical transformations and eddy transport. (Identical with Atmo. 544)

545. Stellar Atmospheres (3) I 1991-92 (Identical with Astr. 545)


554. Evolution of Planetary Surfaces (3) II 1992-93 The geologic processes and evolution of terrestrial planet and satellite surfaces including the Galilean and Saturnian and Uranian satellites. Course includes one or two field trips to Meteor Crater or other locales. (Identical with Geos. 554)


567. Inverse Problems in Geophysics (3) II 1992-93 (Identical with Geos. 567)


571. Terrestrial Planets (3) I 1991-92 Geophysical and geochemical techniques used to deduce composition and evolution of terrestrial planets. Topics include the Earth, Moon, Mars, Venus, and meteorites. (Identical with Geos. 571)

582. High Energy Astrophysics (3) II 1991-92 (Identical with Astr. 582)

583. Thermodynamics in Geosciences (3) (Identical with Geos. 583)

589. Topics in Theoretical Astrophysics (3) (Rpt.) (Identical with Phys. 589)

596. Seminar
a. Frontiers of Cosmochemistry (3) [Rpt.4]

**Planning (PLNG)**

Committee on Planning (Graduate)

Professors Fred S. Matter, Co-chair (Architecture), Gordon F. Mulligan, Co-chair (Geography), Robert B. Bechtel (Psychology), Michael Bonine (Geography), Nathan Burs (Hydrology and Water Resources), Hanna J. Cornter (Renewable Natural Resources), Kenneth E. Foster (Arid Lands), Lay J. Gibson (Geography), Robert C. Giebner (Architecture), R. Frank Gregg (Renewable Natural Resources), William Havens (Landscape Architecture), Robert Hershberger (Architecture), Helen M. Ingram (Political Sciences), David A. King (Renewable Natural Resources), W. Kirby Lockard (Architecture), Lawrence D. Mann (Geography), Philip R. Ogden (Range Management), Richard W. Reeves (Geography), Sandra Rombloom (Architecture), Thomas F. Saarinen (Geography), Arthur L. Silvers (Management and Policy), Sororoosh Sorooshian (Hydrology and Water Resources), Ervin H. Zube (Renewable Natural Resources)

Associate Professors D. Robert Altschul (Geography), Harry der Boghoshian (Architecture), Michael D. Bradley (Hydrology and Water Resources), Michael Deeter (Landscape Architecture), Dennis C. Doxtater (Architecture), Charles E. Glass (Mining and Geological Engineering), Alfredo R. Huetel (Soil and Water Science), Stuart E. Marsh (Land Resources Sciences), E. Gregory McPherson (Landscape Architecture), David A. Plane (Geography), Charles M. Poster (Architecture), Donovan C. Wilkin (Renewable Natural Resources), Robert H. Wortman (Civil Engineering)

Assistant Professors Robert M. Itami (Landscape Architecture), D. Phillip Guertin (Watershed Management)

The interdisciplinary Committee on Planning directs a graduate professional program leading to the Master of Science degree with a major in planning.

The major consists of 54 units: 36 units of core course work, 9 units in a chosen area of concentration, and 9 units of free electives. Core courses include 500, 544, 557, 584, 602, 605, 609, 611, 657, 693, 696, and Law 660. Areas of concentration include: arid lands (addressing development in arid environments), community design (focusing on physical dimensions of urban design), environmental planning (stressing behavioral aspects of environmental issues), regional planning (emphasizing mainstream urban and regional land-use development), renewable natural resources (allowing both resource management and landscape design options), transportation planning (stressing travel forecasting and facilities design), and water resources (allowing both analytical and policy options).

The program requires completion of a project course and a comprehensive written examination to be taken after completion of the 54 units of course work. Internship experience is required and students are exposed to field applications in other course work as well. The program is specifically designed to expose students to the interdisciplinary nature of most planning problems. The course work provides a mixture of theoretical and practical perspectives on diverse planning issues.

Interested persons should contact one of the two committee co-chairs (names listed above) for further information.

110. Regional Land Use (3) I (Identical with Geog. 110)
266. Urban Public Transportation Systems (3) 11992-93 (Identical with C.E. 668)

267. Preservation of Historic Environments (3) 11991-92 Current planning and legal methods to enhance the preservation of historic urban areas and structures; concentrated analysis of selected case studies. Field trips.

267. Internship (g) Policy and Planning (1-4) S (Identical with M.A.P. 693g, which is home)

268. Seminar (h) Land-Use Regulation (3) I II (Identical with M.A.P. 696h, which is home)

269. Legal Inquiry in Policy and Planning (3) II (Identical with M.A.P. 696i, which is home)

270. Environmental Planning (3) II (Identical with M.A.P. 696j, which is home)

271. Planning Administration (3) I II (Identical with M.A.P. 696k, which is home)

272. The General Plan (3) [Rpt.6 units] I (Identical with Geog. 696o, which is home)

273. The Land Development Process (3) [Rpt.6 units] I II (Identical with Geog. 696p, which is home)

Plant Pathology (PLP)

Forbes Building, Room 104
(602) 621-1828


Associate Professors H. Earl Bloss (Emeritus), Iraj J. Misaghi

Assistant Professors Martha C. Hawes, Leeland S. Pierson III

The department offers programs leading to the Master of Science and Doctor of Philosophy degrees with a major in plant pathology. Concentrations are available in bacteriology, mycology, nematology, virology, physiology of parasitism, genetics of pathogens, diseases of economically important plants and soilborne fungi.

For graduate admission and degree requirements, consult the Graduate Catalog.

205. General Plant Pathology (3) I Detailed study of representative plant diseases, with emphasis on basic concepts of diagnosis, cause, epidemiology, and control. P. Ecol. 104 or PI.S. 100.

250. Forest Pathology (3) II Basic principles of plant pathology, with emphasis on diseases of forest trees and associated vegetation. Designed for majors in natural resources. 2R, 3L, P, P.S. 100. (Identical with Ws.M. 250)

451. Biology and Characterization of Plant Pathogenic Agents (4) I To acquaint students with the biological properties of the various groups of plant pathogens and the contemporary methods used to characterize these agents and diagnose the diseases they cause. 2R, 3L, P, 205. (Identical with Micr. 451) May be convened with 551.
Adjunct Professors John W. Radin, Anson E. Thompson
Adjunct Assistant Professor Steven P. McLaughlin (Assistant Professor, Arid Lands)
Adjunct Assistant Research Professor Victoria Marcian
Assistant Research Scientists Jon P. Chernicky, John J. McGrady, John M. Nelson
Extension Specialists Donald J. Garrot, Jr., Michael W. Kilby, David M. Kopeck, Michael J. Oltman, Jeffrey C. Silvertoth, Jimmy L. Tipton

The Department of Plant Sciences provides education to prepare a student for a wide range of opportunities in plant-related sciences and agriculture. The Bachelor of Science in Agriculture is available to undergraduate students with a major in plant sciences. At the time of catalog production, the majors in horticulture and agronomy were under review. For further information regarding these degree programs, consult the department.

The department also offers the Master of Science and Doctor of Philosophy degrees with a major in plant sciences. For graduate admission and degree requirements, consult the Graduate Catalog.

Undergraduate students must complete course work in five of the six study areas, as listed under the general education requirements in the College of Agriculture section of this catalog.

Plant sciences majors: The following courses are required: Chem. 103a-103b, 104a-104b, and 241a, 243a and either 241b/243b or BioC 460; Math. 124; M.C.B. 181; Phys. 180a and either 102a or 103a; P.S. 100, 101, 312, 495a and courses in crop/plant physiology, plant anatomy and statistics. Each major is required to develop an area of emphasis within the Department by completing an additional minimum of 12 upper-division units chosen from departments or closely related courses and selected in consultation with a major advisor. The areas of interest include agronomy/horticulture, plant breeding/plant genetics and plant physiology. The agricultural business curriculum requires students selecting this curriculum may major in plant sciences. Students must complete the requirements for the major as indicated above with the exception that only one of the following courses is required: P.S. 405; Ento. 151 or 201R; or P.I. 205. Additional course requirements for the agricultural business curriculum are Acct. 200; A.Ec. 213, 215, 450, and 3 courses from the following: Econ. 300, 330; Acct. 210; M.A.P. 320; A.Ec. 213, 313, 403, or 404.

The minor in plant sciences: Students may obtain a minor in plant sciences. Twenty units are required from the departmental course offerings with the prerequisites satisfied prior to taking the course. Courses will be selected depending on the area of the student's interest and in consultation with a minor advisor.

100. Plant Science (3) I II Germination, emergence, growth, and reproduction of important crop plants; how these plant processes are influenced by the environment.

101. Plant Sciences Laboratory (1) I II Laboratory exercises in plant sciences. 3L. P. 100 or CR.

220. Microcomputing Applications (3) I II (Identical with A.B.T. 220)

234. Plant Materials (3) II (Identical with L.Ar. 234)

312. Plant Genetics (4) II Critical examination of the various theories of heredity and their application to plant breeding, including demonstrations illustrating genetic factors in economic plants. 3R, 3L. P. 100, 101, Chem. 103a-103b; and either M.C.B. 181 or Ecol. 260.

330. Plant Propagation (3) I Principles and practices of plant propagation by seed and asexual methods, including use of growth regulators, rooting media and misting systems. Physiological basis of propagation methods will be emphasized. 2R, 3L. P. 100, 101, and either M.C.B. 181 or Ecol. 260.


355. Turfgrass Science and Culture (3) II 1992-93 Speciation, growth, development, use and establishment, and environmental stresses influencing cultural practices. P. 100, 101 and either M.C.B. 181 or Ecol. 260.

368. Principles of Grassland Agriculture (3) II 1992-93 Adaptation, culture, and growth of legumes, grasses, and other forage plants. All-day field trip. P. 100, 101 and either M.C.B. 181 or Ecol. 260.

405. Weed Science (3) I Principles and effects of controlling agronomic and horticultural weeds, with emphasis on chemical control methods; weed identification. 2R, 3L. P. Ecol. 260 and either 312 or M.C.B. 181. May be taken with 505.

408. Arid Land Crop Ecology (3) II Physical and biotic environment of crops in relation to crop production, and geographical distribution; relations among the human population, crop productivity, and man's environment. P. Ecol. 260 and either 312 or M.C.B. 181. May be taken with 508.

415. Principles of Plant Breeding (3) I Application of the principles of genetics, botany and statistics to the improvement of plants. P. 312 or Ecol. 320. May be taken with 515.


463. Plant Water Relations (3) I Analytic approach to the study of water movement into and through plants; development of internal water

482. Plant Cell and Tissue Culture (3) II Principles and theory of calus induction, embryoid and plantlet regeneration, nutrient transport, protoplast culture and fusion and plant transformation. 2R, 3L, P, 312, 460. May be convened with 582.

495. Colloquium a. Senior Report (1) II Writing-Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)

505. Weed Science (3) I For a description of course topics, see 405. Graduate-level requirements include a research paper on an approved subject. P. 460. May be convened with 405.

508. Arid Land Crop Ecology (3) II For a description of course topics, see 408. Graduate-level requirements include written reports of topics from current literature, and an oral class presentation. P. 460. May be convened with 408.

509. Information Sources for Agricultural Scientists (1) I Information systems and retrieval techniques, with particular reference to concepts, uses and limitations; emphasis on abstracts, indexes, alerting services, journals and government documents. (Identical with Li.S. 509)

510. Plant Molecular Biology (3) III 1992-93 (Identical with Bioc. 510)

515. Principles of Plant Breeding (3) I For a description of course topics, see 415. Graduate-level requirements include participation in computer-aided exercises in simulated recurrent selection. P. A.E.C. 539, Ecol. 510, and either 312 or Ecol. 320. May be convened with 415.

541. Economic Botany of Arid Lands (3) I 1992-93 Examines past, present, and potential future industries based on plant resources in arid lands. Survey of useful products from arid lands plants, their biosynthesis and physiological function, taxonomic and geographic sources, and their role in local and global economies. P. 460. (Identical with Ar.L. 541)

550. Developmental Plant Anatomy (4) I 1991-92 For a description of course topics, see 450. Graduate-level requirements include preparation of an in-depth research project. 3R, 3L, P. 460. May be convened with 550.

560. Plant Physiology (4) I For a description of course topics, see 460. Graduate-level requirements include an analytical paper on selected areas in plant physiology. P. 312, Chem. 241a, 243a. (Identical with Ecol. 560 and M.C.B. 560) May be convened with 460.


563. Plant-Water Relations (3) II For a description of course topics, see 463. Graduate-level requirements include preparation of an in-depth research project. P. 460. (Identical with Ws.M. 563) May be convened with 463.

564. Plant Growth and Development (3) II 1991-92 Selected topics in growth and development. P. 460. (Identical with M.C.B. 564)

582. Plant Cell and Tissue Culture (3) II For a description of course topics, see 482. Graduate-level requirements include measurement of gene expression in transgenic plants. P. 312, 460. May be convened with 482.

627. Advanced Genetics (3) I 1992-93 Advanced topics in genetics, selection from strain and tetrad analysis; chromosome structure and organization; recombination at the molecular level and gene conversion; mutation classifications and origins; genetic complementation and its relation to a genetic unit and its function. P. 312 or Ecol. 320. (Identical with Gene. 627)

631. Crop Physiology (3) I 1992-93 Plant processes, modifications, and environmental interactions in relation to growth of crop plants, with emphasis on recent advances and research techniques. P. 460.


635. Advanced Cytogenetics (4) I 1991-92 Molecular and classical cytogenetics including analysis of alterations in chromosome structure, and cytogenetic principles of aneuploids, haploids and polyploids. Emphasis on plant kingdom. 3R, 2L. P. 6 units of genetics. (Identical with Gene. 635)

695. Colloquium a. Current Topics in Plant Biology (1) I II (Identical with P.P. 695a)


Political Science (POL)
Social Sciences Building, Room 315
(602) 621-7600

Professors James W. Clarke, Richard C. Cortner, Helen M. Ingram, Conrad F. Joyner, Paul Kelso (Emeritus), Clifford M. Lytle, Edward N. Muller, Jerrold G. Rusk, Lawrence A. Scarpino, Michael P. Sullivan, Peter A. Toma (Emeritus), John C. Wahike (Emeritus), Allen S. Whiting, Edward J. Williams, Clifton E. Wilson (Emeritus)

Associate Professors John A. Garcia, Head, Phillip C. Chapman, Jeanne Nienerber-Carke, John E. Crow, William J. Dixon, Jerrold D. Green, Donald R. Hall (Emeritus), Thomas M. Holm, Barbara Norrander, Daniel J. O'Neil, Lyn Ragdale, Thomas J. Volgy

Assistant Professors Paul G. Buchanan, David Gibbs, Richard Jankowski, Deborah R. Mathies, Viv Spike Peterson, David Wilkins, John P. Willerton

Adjunct Professors R. Frank Gregg

The Department of Political Science offers courses on the philosophies, processes, organizations, methods, and policies of government and related political institutions. These courses focus on government and politics in the United States and foreign countries and also on how governments of different nations relate to one another. Political science instruction is useful for pursuing careers in government, politics, law, business, education, journalism, and the media.

The department offers the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy with a major in political science. A Bachelor of Arts in Education and a Master of Education with a teaching major in political science are also available. For information on graduate degrees, please see the Graduate Catalog.

The major: Thirty units of course work in political science must be taken, including 102 and at least one of the following: 100, 120, 140, 160. At least 18 units of this course work must be upper-division courses (300- and 400-level courses). Individual study cannot be used to satisfy this 18-unit requirement. Students must also take courses from five of the six fields of study listed below.

The minor: Twenty units of course work must be taken with a concentration in one of the six subfields recognized by the department. No fewer than 12 hours shall be taken in one subfield; 102, 120, 140 or 160 may be included as part of the 12 hours.

The teaching minor: Twenty units of course work in political science must be taken. Of the total twenty units, twelve must be taken in one of the six subfields. In addition, one of the lower-division courses — 100, 102, 120, 130, or 160 — must be within the appropriate subfield.

Teacher certification: The U.S. and Arizona Constitutions require for a teacher's certificate may be satisfied by three course options: 102, 130; 102, 214; or 110. An additional option is the constitutions examination, which carries no university credit.


Special programs: Majors interested in law, civil service, or foreign service should consult the department's career advisors regarding an appropriate course of study. Internships are offered in connection with the State Legislature, the Public Defender, the Juvenile Court, administrative agencies of the City of Tucson and Pima County, and the U.S. Congress. Prelaw students interested in legal problems of American Indians may combine prelaw and American Indian policy courses in the Department of Political Science with the minor in American Indian studies.

The department participates in the honors program.

100. Introduction to Politics (3) I II Issues in contemporary political analysis; human values and political goals; how governments differ and why they change; how nations influence one
another. Not open to students with previous credit in 140, 120, or 160.

102. American National Government (3) I II General survey of the constitutional bases, organization, and functioning of the American national government; recent and current trends. Credit allowed for this course or 110, but not for both.

110.* National and State Constitutions (3) I II Meets the state requirement for a teacher's certificate. Designed for seniors intending to teach. Credit allowed for this course or 102, but not for both.

*The state requirement for a teacher's certificate may be taken through correspondence.

120. Introduction to International Relations (3) I II Study of the international system, its actors and their capabilities; ends and means of foreign policy; international tension, conflict, and cooperation.


140. Introduction to Comparative Politics (3) I II Survey of the major political systems and analysis of comparative political concepts, with a view to preparation for more advanced study.

160. Introduction to Political Ideas (3) I II Basic issues in political thought, with emphasis on contemporary problems of democracy, liberty, authority, obligation, and ideology.

205. The American Presidency (3) I II Political dynamics of the executive office and its relationship to the competitive branches of government within the American political system.

206. Public Policy and Administration (3) I II Theory and practice of executive agencies, including policy making and other functions, processes, personnel and fiscal management, and administrative law.

214. Arizona Government (1) Arizona constitution. Offered through correspondence only.

231. Political Parties in an Age of Media and Money (3) I II American two-party system; party organization and activists: party roles in media, money, nominations, elections, and campaigns; party influence in government; the future of parties.

240. Canadian Government and Politics (3) I Canada as a North American alternative: political culture, English-French relations, structures and processes, problems of federalism, environmental policies, Canadian-U.S. relations.

242. Western European Political Systems (3) Examination of the ideological framework, political culture, functions and processes of the Western European political systems.

247. Introduction to Latin-American Politics (3) I Survey of the political forces and social groups important in shaping contemporary Latin America; examination of Indians, slaves, peasants, landlords, labor, the middle sectors, and the military; discussion of theories of instability.

250. Contemporary International Politics (3) I II Analysis of conflicts of national interests; decision making in the present international system; role-playing and simulation experience.

270. Colonization and Native People (3) I II An overview of various colonial models and definitions. Includes individual studies of the relations between the Ainu and Japan, American Indians and the United States, the Sami and Norway, and the Maori and New Zealand. (Identical with A.H.S. 270)

280. Politics and the Vietnam War (3) I The American experience in Vietnam in terms of generational politics, foreign and military policy-making processes, the sociopolitical aspects of the war, and American political culture.

290. Politics and the Novel (3) I II Discussion and analysis of significant political questions as seen through the eyes of 19th and 20th century novelists, including Camus, Forster, Naipaul, Penn Warren, Dostoevsky, and Zola. (Identical with Engll. 290)

297. Workshop a. U.N. (1-3) I II Open to participants in Model U.N. programs only.
   b. Election Law (3) I II All-day field trips.

309. The Judicial Process (3) I II Structure, function, and processes of the "third branch" of the American government.

315. Political Sociology (3) I I (Identical with Soc. 315)

328. Problems in Contemporary Political Theory (3) I II Intensive examination of selected problems and concepts in political theory.

330. Minority Groups and American Politics (3) I II Problems of the poor; analysis of systematic poverty in the U.S. and theories of causation; selected policy problems: education, housing, job training, enforcement of antidiscrimination statutes; future of "power" movements. (Identical with A.A.S. 330 and M.A.S. 330)

332. Politics of the Mexican-American Community (3) I II Political structure and processes of the Mexican-American community, with emphasis on history, schooling, political behavior, and class; future trends; bibliography. (Identical with M.A.S. 332)

334. Politics and American Indians (3) I II Examination of public policy on American Indians and analysis of the political culture of American Indian communities. (Identical with A.H.S. 334)

350. Politics and the Health Care System (3) I II Analysis of social, economic, political, ethical and legal problems in the practice, administration and allocation of health care services, and discussion of proposals for alternative arrangements.


393. Internship a. Administrative Internship (1-6) I Rpt./units I I S
   b. Public Defender (1-6) I II
   c. County Attorney (1-6) I II
   d. Senatorial Internship (1-12) I I Open to majors only.
   e. Congressional Internship (1-12) I II Open to majors only.
   f. Legal Internship (1-6) I Rpt./units I I S

396H. Honors Proseminar (3) I I
respond to, authority. Based on presumption that people's reactions to the public order are influenced by the private order—or disorder—of their minds and the way they learned to respond to the private authorities of their childhoods. P. 102, plus an introductory level course in psychology, sociology, or anthropology. May be convened with 536. Writing Emphasis Course**


438a-438b. Philosophy of Law (3-3) (Identical with Phil. 438a-438b) May be convened with 538a-538b.


441. Arab-Israeli Conflict (3) II Traces the birth and growth of the Arab-Israeli conflict since 1948, and examines the development of international impediments to conflict resolution on both the Arab and Israeli sides. Also surveys the role of the Great Powers in Middle East politics generally. P. 102. (Identical with N.E.S. 441) May be convened with 541.

442. Transformation of Agrarian Societies in the Middle East (3) II (Identical with N.E.S. 442) May be convened with 542.

443. Soviet Politics (3) I Revolution and contemporary ideological state, party, and mass organizations; economic and social planning; civil liberties; models of autocracy and pluralism. P. 102. (Identical with R.S.S. 443) May be convened with 543. Writing-Emphasis Course**

444. East European Politics (3) I Divergent models of Communist development, from East Germany to Yugoslavia; political, economic, social, and cultural reform. P. 102. May be convened with 544.

445. Comparative Political Revolution (3) I Examines the causes and consequences of 20th-century revolutions and the revolutionary process, with emphasis on contemporary events. May be convened with 545. Writing-Emphasis Course**

447. Latin-American Political Development (3) II Presentation of strategies for development in Latin America; examination of case studies from Cuba, Brazil, Chile, Guatemala, and other countries. Open to juniors and seniors only. P. 102. (Identical with L.A.S. 447) May be convened with 547. Writing-Emphasis Course**

448. Government and Politics of Mexico (3) I Description and analysis of Mexico's political economy, its political system, and its foreign policy, with emphasis on Mexican-U.S. relations. P. 102. (Identical with L.A.S. 448 and M.A.S. 448) May be convened with 548.

449. The Politics of Cultural Conflict (3) II Comparative examination of the approaches of different types of political systems to the internal conflict of a racial, religious, linguistic, and/or ethnic nature. P. 102. May be convened with 549.


451. Soviet Foreign Policy (3) I Ends and means of Soviet foreign policy; the decision-making process; Soviet relations with the West and developing nations. P. 102. (Identical with R.S.S. 451) May be convened with 551.

452. Communist Foreign Relations (3) II Interrelations of fourteen Communist-party states, with emphasis on cooperation and conflict in such organizations as the Comecon and the Warsaw Pact. P. 102. May be convened with 552.

454. Theories of International Relations (3) I Introduction to theories of international relations on the levels of man, nation-state, and the international system, with a logical and empirical evaluation of approaches and theories. P. 102, 120 or 250, 247. May be convened with 554.

455. American Foreign Policy (3) I Analysis of the Cold War; Congressional-Executive clashes over foreign policy control; approaches to policy analysis. P. 102. May be convened with 555.

456. International Law (3) I The international state system; legal-political problems, including territory, environment, seas. P. 102, 120, or 250. May be convened with 556. Writing-Emphasis Course**

457. Inter-American Politics (3) I Survey and analysis of the leading political and economic issues at controversy between the United States and Latin America. P. 102. (Identical with L.A.S. 457) May be convened with 557.

459. Problems of World Order (3) I Analysis of complex, interrelated global problems, threats to survival, quality of life, and exploration of past and present policies and future worlds. Course is value-oriented and prescriptive. P. 102. May be convened with 559.

460. Modern Chinese Foreign Relations (3) I Survey of the developments and trends in Chinese foreign relations in the modern period, focusing mainly on the relationship between the theoretical and actual objectives of China's foreign policy and its environment. (Identical with Chn. 460) May be convened with 560.

464. International Relations of East Asia (3) II National interests, issues and conflicts, relations, and influence of domestic politics in interstate relations in East Asia. P. 102. (Identical with E.A.S. 464) May be convened with 564.


471. Constitutional Law: Civil Liberties (3) I II Analysis of the constitutional guarantees of civil liberties in the U.S. P. 102. May be convened with 571.

474. Administrative Law (3) I Law governing the organization, powers, and procedures of the executive and administrative establishment, with emphasis on the limitations imposed by the American constitutional system. P. 102. May be convened with 574.

475. Concepts in Criminal Law (3) I Focus on questions such as what constitutes a crime; when is killing murder; what makes punishment just; what distinctions exist between justifiable and excusable crimes. P. 102.

476. Women and the Law (3) I Legal status of women in America, including constitutional protections, marriage and family relationships, educational and vocational opportunities, political rights, criminal law. P. 102. (Identical with W.S. 476) May be convened with 576.

480. Formation of Public Policy (3) I Needs and demands for public action on policy issues; organization and nature of political support; foreign and domestic problems and decision making in the formation of public policy at the national, state, and local levels. P. 102. Writing-Emphasis Course**

481. Environmental Policy (3) I Role of government in management of energy, natural resources and environment; process and policy alternatives; special attention to the Southwest. P. 102. (Identical with H.W.R. 481 and R.N.F. 481) May be convened with 581.

483. Urban Policy (3) I II Analysis and discussion of social, economic, and political problems and proposed solutions in changing urban environments. P. 102. May be convened with 583.

484a-484b. Development of Federal Indian Policy (3-3) 484a: European colonial precedents through the treaty-making period. P. 102. 334. 484b: End of treaty-making to the present. P. 334. 484a is not prerequisite to 484b. (Identical with A.In.S. 484a-484b) May be convened with 584a-584b.


486. Political Systems of India and Pakistan (3) II (Identical with N.E.S. 486) May be convened with 586.


488. Governing Science and Technology (3) II (Identical with Geog. 488)

496. Seminar a. Russian and Soviet Studies II (3) (Identical with R.S.S. 496a, which is home)

**Writing-Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of the catalog).
Graduate-level requirements include a much higher level of performance on term paper or research paper, and/or an additional paper or 8-10 pages. May be convened with 407.

510. Struggle for the Presidency (3) I (Identical with Comm. 510) May be convened with 410.

512. Local Government and Administration (3) I I For a description of course topics, see 412. Graduate-level requirements include a reading assignment of at least two additional textbooks and writing an essay on each. P, 130. May be convened with 412.

521. Ancient and Medieval Political Theory I I For a description of course topics, see 421. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 421.

522. Early Modern Political Theory (3) II For a description of course topics, see 422. Graduate-level requirements include additional research, readings, and paper(s). May be convened with 422.

523. Recent Political Thought (3) II For a description of course topics, see 423. Graduate-level requirements include an extended bibliography, with notes and commentary on readings, submitted at the end of the semester. May be convened with 423.

526. Cross-National Research Methods (3) II (Identical with Soc. 526)

527. Marxism and its Critics (3) I I For a description of course topics, see 427. Graduate-level requirements include a research term paper of 15-25 pages with a bibliography, as well as a beginning research bibliography. P, Junior standing. May be convened with 427.

531. Political Culture and the Dynamics of Change in American Society (3) I I For a description of course topics, see 431. Graduate-level requirements include additional research and paper. May be convened with 431.

532. Pressure Groups (3) I I For a description of course topics, see 432. Graduate-level requirements include a much higher level of performance of term paper or research paper. Additional readings and essays on those readings may also be required. May be convened with 432.

535. Public Opinion and Voting Behavior (3) I I For a description of course topics, see 435. Graduate-level requirements include additional research, readings, and paper(s). (Identical with Soc. 535) May be convened with 435.

536. Political Socialization (3) II For a description of course topics, see 436. Graduate-level requirements include an extensive research paper. May be convened with 436.

537. Democracies, Emerging and Evolving (3) I For a description of course topics, see 437. Graduate-level requirements include extensive reading and a research paper. (Identical with L.A.S. 537) May be convened with 437.

538a-538b. Philosophy of Law (3-3) (Identical with Phil. 538a-538b) May be convened with 438a-438b.

541. Arab-Israeli Conflict (3) I I For a description of course topics, see 441. Graduate-level requirements include additional research and paper. May be convened with 441.

542. Transformation of Agrarian Societies in the Middle East (3) (Identical with N.E.S. 542) May be convened with 442.

543. Soviet Politics (3) I For a description of course topics, see 443. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 443.

544. East European Politics (3) II For a description of course topics, see 444. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 444.

545. Comparative Political Revolution (3) I For a description of course topics, see 445. Graduate-level requirements include extensive reading and a research paper. May be convened with 445.

547. Latin-American Political Development (3) II For a description of course topics, see 447. Graduate-level requirements include additional course readings. (Identical with L.A.S. 547) May be convened with 447.

548. Government and Politics of Mexico (3) I For a description of course topics, see 448. Graduate-level requirements include a book review and related discussion with the instructor. (Identical with L.A.S. 548) May be convened with 448.

549. The Politics of Cultural Conflict (3) II For a description of course topics, see 449. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 449.

550. Religion and Politics (3) II For a description of course topics, see 450. Graduate-level requirements include additional readings, research, and paper(s). (Identical with L.A.S. 550) May be convened with 450.

551. Soviet Foreign Policy (3) I For a description of course topics, see 451. Graduate-level requirements include extensive reading plus a research paper. May be convened with 451.

552. Communist Foreign Relations (3) I I For a description of course topics, see 452. Graduate-level requirements include additional research, research, and paper(s). May be convened with 452.

554. Theories of International Relations (3) I For a description of course topics, see 454. Graduate-level requirements include additional assignment/paper. May be convened with 454.

555. American Foreign Policy (3) I I For a description of course topics, see 455. Graduate-level requirements include additional assignment/paper. May be convened with 455.

556. International Law (3) For a description of course topics, see 456. Graduate-level requirements include additional research and paper(s). May be convened with 456.

557. Inter-American Politics (3) I I For a description of course topics, see 457. Graduate-level requirements include additional research and paper(s). May be convened with 457.

558. Problems of World Order (3) II For a description of course topics, see 459. Graduate-level requirements include additional research and paper. May be convened with 459.

560. Modern Chinese Foreign Relations (3) II For a description of course topics, see 460. Graduate-level requirements include an additional research paper. (Identical with Chn. 460) May be convened with 460.

564. International Relations of East Asia (3) II For a description of course topics, see 464. Graduate-level requirements include an additional research paper. (Identical with E.A.S. 564) May be convened with 464.

570. Constitutional Law: Federalism (3) I I For a description of course topics, see 470. Graduate-level requirements include an additional paper and readings. May be convened with 470.

571. Constitutional Law: Civil Liberties (3) I II For a description of course topics, see 471. Graduate-level requirements include an additional paper and readings. May be convened with 471.

574. Administrative Law (3) I For a description of course topics, see 474. Graduate-level requirements include an additional paper and readings. May be convened with 474.

576. Women and the Law (3) I For a description of course topics, see 476. Graduate-level requirements include additional research, readings, and paper(s). May be convened with 476.

579. Research Design (4) I Introduction to experimental and quasi-experimental research design; survey research; the use of aggregate statistics; historical documents and life-history materials; participant observation; unobtrusive methods.

580. Methods of Political Inquiry (3) II Systematic examination of problems of scope and methods of inquiry in the discipline of political science; intended to acquaint students with the discipline and to prepare them for scholarly research in the field.

581. Environmental Policy (3) II For a description of course topics, see 481. Graduate-level requirements include additional readings and a substantial research paper of at least 25 pages in length. (Identical with H.W.R. 581 and R.N.R. 581) May be convened with 481.

582. Research and Methodology (4) II Quantitative techniques and computer applications in political science.

583. Urban Public Policy (3) I I For a description of course topics, see 483. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 483.

584a-584b. Development of Federal Indian Policy (3-3) For a description of course topics, see 484a-484b. Graduate-level requirements include an additional research paper. (Identical with A.In.S. 584a-584b) May be convened with 484a-484b.
585. Political Risk and Intelligence Analysis (3) II Examination of political risk and intelligence analysis with emphasis on forecasting political developments in nations.

586. Political Systems of India and Pakistan (3) II (Identical with N.E.S. 586) May be convened with 486.

587. Race and Public Policy (3) I For a description of course topics, see 487. Graduate-level requirements include additional paper, usually bibliographic in nature. (Identical with A.In.S. 587) May be convened with 487.

595. Colloquium
a. American Political Institutions (3) II
b. Political Behavior (3) II
c. Survey of Political Theory (3) II
d. Comparative Politics (3) II
e. International Relations (3) II
f. Public Policy (3)

596. Seminar
a. American Political Institutions (3) [Rpt. /2] II
b. Political Behavior (3) [Rpt. /2] II
c. Political Theory (3) [Rpt. /2] II
d. Comparative Politics (3) [Rpt. /2] II (Identical with L.A.S. 596d)
e. International Relations (3) [Rpt. /2] II
f. Public Law and the Judicial Process (3) [Rpt. /2] II
g. Public Policy (3) [Rpt. /2] II
h. American Indian Law and Policy (3) [Rpt. /2] II (Identical with A.In.S. 596h)
i. Water and Equity in the Southwest (3) [Rpt. /1] II (Identical with R.N.R. 596i)

610a-610b. Fiscal and Budgetary Administration of Public Agencies (3-3) (Identical with M.A.P. 610a-610b)

696. Seminar
i. International Water Resource Management (1-3) [Rpt. /2] (Identical with H.W.R. 696i, which is home)
v. Public Choice I (3) II (Identical with Econ. 696v, which is home)
w. Public Choice II (3) II (Identical with Econ. 696w, which is home)

Portuguese
(See Spanish and Portuguese)

Psychology (PSYC)
Psychology Building, Room 312 (602) 621-7447


Associate Professors Harold S. Arkowitz, Jeff Greenberg, Ronald H. Pool, Rosemary A. Rosser, Linda Swisher (Speech and Hearing Sciences), Gary Wende

Assistant Professors Felice Bedford, Paul Bloom, Denise Cummins (Cognitive Science), Aurelio J. Figuerdo, Elizabeth Glisky, Laura McCloskey, Mary Peterson, Varda Salomon, Cyma Van Petten, Karen Wynn

Adjunct Professor Joseph Santiago
Adjunct Assistant Professor Catherine M. Shisslak

The Department of Psychology offers courses designed to provide a scientific understanding of cognition, emotion, and motivation, the biological basis of mental life and behavior in the nervous and endocrine systems, the organization and development of mind and behavior in the individual, the processes of social interaction, and the nature and treatment of psychopathology.

Degrees awarded are the Bachelor of Arts, Bachelor of Science, Master of Arts and Doctor of Philosophy with a major in psychology. The master’s degree is awarded during doctoral training; there is no Master of Arts program as such.

All psychology majors must satisfy departmental distribution requirements by completing one course (3 units) in each of the following areas: cognition, emotion and motivation (CEM); psychobiology and neuroscience (PN); and individual and social processes (ISP). CEM courses include 218, 340, 355, 370, 415, 419, 425, 440, 449, 472, 473, 479, and 488. PN courses are 302, 312, 370, 403, 411, 412, 413, 414, 417, 419, 437, 478, and 481. Courses in the ISP area include 212, 216, 300, 313, 316, 371, 375, 385, 410, 416, 417, 421, 427, 430, 431, 437, 435, 450, 452, 454, 458, 465, 467, 478, 483, and 487.

The major for the B.A.: 36 units of psychology, of which at least 18 units must be in upper-division work. Majors must take 101, 230, and 290. The remaining 27 units must include at least one Writing-Emphasis Course numbered 400-498, and should be completed by the end of the junior year.

The major for the B.S.: 36 units of psychology, distributed as required for the B.A. In addition, 8 units in a biological laboratory science (excluding Ecol. 107), 8 units in chemistry or 8 units in physics laboratory; Math. 117R/S or whichever Math. 119 or 123.

Students intending to major in psychology are encouraged to complete 101 in their freshman year, and 230 and 290 by the end of their sophomore year. In general, courses numbered 200-399 lay the foundations for courses numbered 400-498, and should be completed by the end of the junior year.

The major for the B.S.: 36 units of psychology, distributed as required for the B.A. In addition, 8 units in a biological laboratory science (excluding Ecol. 107), 8 units in chemistry or 8 units in physics laboratory; Math. 117R/S or whichever Math. 119 or 123.

Students planning to attend graduate school in psychology should complete 102, 405 and 475, and should consult with an advisor no later than their sophomore year.

Recommended minors are biological, physical, or social sciences, philosophy, linguistics, mathematics, or computer science.

The department participates in the honors program.

101. Introduction to Psychology (3) I II S Survey of psychology including history, systems, and methods; structure and functions of the nervous and endocrine systems; learning, motivation and emotion; sensation and perception, and memory; thought and language; personality, development, social interaction; psychotherapy and psychotherapy. Required for admission to all other Psychology courses. CR, 102 recommended.

102. Topics in Psychology (1) I II S Optional discussion course designed to complement the lectures and readings in 101. Laboratory demonstrations, Library research leading to modest writing assignment. Strongly recommended for prospective majors and students in the Honors Program. CR, 101.

210. Brain and Behavior (3) I Current concepts, research strategies and findings in the brain sciences, emphasizing their application to behavior and social sciences. Open to freshmen and sophomores. Credit is allowed for this course or 302, but not both. P, 101.


240. Human Development (3) I Development across the life span. Topics include social, emotional, and intellectual growth. Open to freshmen and sophomores. Credit is allowed for this course or 313, but not for both. P, 101.


296. Proseminar
H. Psychology Honors (3) II P, acceptance into honors program.

300. Social Psychology (3) I II S Introduction to major theories and research findings of social psychology; to provide an understanding of the roles of cognitive and motivational processes in social behavior. P, 101 or 8 units of biological laboratory science.

302. Introduction to Biopsychology (3) I II S Survey of the basic principles of nervous system function in relation to perception, learning, memory, emotion, and thinking. Credit is allowed for this course or 210, but not for both. P, 290, or 8 units of biology lab science.

312. Primate Behavior (3) I II S Survey of psychological research on nonhuman primates; includes sensory processes, learning, development, social and abnormal behaviors. P, 290.


314. Introduction to Personality and Social Development (3) I II S Introduction to the development of personality, emotion, and social cognition and behavior from conception to adolescence. P, 101.


350. Minds, Brains and Computers (3) [Rpt.] (Identical with Phil. 350)


371. Environmental Psychology (3) I Basic concepts in environmental psychology; the relationship between the individual and the large-scale environment. P, 290.

385. Industrial-Organizational Psychology (3) I III S The application of psychology to problems of industrial organizations, including personnel, job satisfaction, leadership, and advertising. P, 290.

401. Biological Bases of Motivation (3) I Biological compounds related to life and the role of behavioral processes occurring within organisms and how they interact with behavior. P, 101; 230 and 290; 302 or 8 units of biological laboratory science. May be convened with 501.

403. Laboratory in Mammalian Systems Neurophysiology (3) I III S Neurophysiology laboratory including stereotaxic surgery, microelectrode recording of neural signals, electrical and chemical stimulation, and principles of analog and digital signal processing. P, 290, 302. May be convened with 503. Writing-Emphasis Course*.


412. Animal Learning (3) II Animal learning with emphasis on interspecies comparisons. P, 290. May be convened with 512. Writing-Emphasis Course*.

413. Drugs, Brain and Behavior (3) I III Physiology, neurotoxic and behavioral effects of drugs on individual neurotransmitter systems in the brain. Special emphasis will be given to the historical use and political significance of the major drugs of abuse. P, 101, 230, 290, 302.

414. Personality and Social Development (3) I II Research and theory in developmental psychology with an emphasis on social cognition, social and emotional growth. P, 290, 240 or 314. May be convened with 514.

415. Cognitive Development (3) I Introduc- tion to major theories, methods, and research findings associated with the development of cognition and intelligence. P, 290, 240 or 313. May be convened with 515.

416. Advanced Personality (3) I III Advanced study of theories of personality; methods and results of personality study. P, 290. May be convened with 516.

418. Abnormal Psychology (3) I III Nature and etiology of various forms of behavior disorder, mental deficiency, and other deviations; critical evaluation of current theories. P, 290. May be convened with 518.


421. Psychology of Death and Loss (3) I III Basic concepts in psychology of death and loss, with emphasis on both the adjustment to death and loss, and the underlying phenomenon, humanistic and current social considerations. P, 290 or graduate standing. May be convened with 521.


427. Field Methods in Environmental Psychology (3) I III Behavior in man-made or managed environments, with emphasis on objective methods; designed for students having a professional interest in environmental design or management. P, 290, 371 or graduate standing. (Identical with Arch. 427 and LAr. 427) May be convened with 527.

428. Antisemitism (3) (Identical with Hist. 429)

430. Honors Psychology, Law and Social Policy (3) Critical review of theory, methods and research in the psychology, law and social policy interface. P, 101; 230 and 290; 300; 6 units of a social science, or graduate standing. May be convened with 530.

431. Ethical Issues in Psychology (3) I III A consideration of issues in the derivation of ethical criteria, selection of the appropriate subset of criteria to guide ethical decision-making, and utilization of the criteria when making a decision. P, upper-division standing or honors student. May be convened with 531.

435. Adult Development and Aging (3) I Change and continuity in cognition, personality, and adjustment during adulthood, with emphasis on aging processes and late life. P, 255, or 101 and two courses in gerontology or human development; or graduate standing. (Identical with Gero. 435) May be convened with 535.

437. Gerontology: A Multidisciplinary Perspective (3) I III Biological, psychological, and social issues in aging, including brain changes with age, cognitive change with age, and the social impact of increasingly older population demographics. May be convened with 537.

446. Environmental Cognition (3) [Rpt.] I Recent advances in the area of environmental cognition, with an emphasis on cognitive aspects of environmental psychology. May be convened with 546.

449. Social Cognition (3) [Rpt./6 units] I II Analysis of cognitive processes in the context of personality and social interaction; perception, memory, thought and language concerning self, others, and social situations. P, 255, 300, 316 or 355. May be convened with 549.

450. Psychological Assessment and Testing (3) I III Evaluation of assessment processes and of measurements of intelligence, aptitudes, personality, and interests; test theory; social implications. P, 290. May be convened with 550. Writing-Emphasis Course*.

453. Lexical and Syntactic Development (3) I III Current theory and data on first language acquisition with special focus on research that relates to linguistic theory and learnability theory to empirical studies of children's linguistic abilities. P, senior standing or consult department before enrolling; one lower-division course in cognitive psychology, developmental psychology, or linguistic theory. May be convened with 553.

454. Culture and Mental Health (3) I Mental health in cross-cultural perspective; universal and culture specific disorders, traditional and western psychotherapy, cultural values in treatment methods and in research. P, 290, 418. May be convened with 554.

458. Psychopathology (3) II In-depth study of current theoretical and research formulations in behavior deviancy, various approaches to behavior change. P, 290. May be convened with 558.

465. Neural Encoding, Memory and Computation in the Mammalian Brain (3) I III Theoretical principles and biological mechanisms by which information is represented, categorized, stored, and recalled in specific central nervous system (CNS) circuits in the course of adaptive behavior. P, one advanced course in neurobiology, biological or cognitive psychology, one advanced course in math or computer science. May be convened with 565.

467. Principles of Mammalian Systems Neurophysiology (2) I II Topics in the neurophysiology of sensation, perception, cognition, and action in mammals illustrating the application of modern research methods to the understanding of higher brain function. Enrollment is restricted to those concurrently enrolled in the lab. P, Nesc. 588; CR, PSYC, 500. May be convened with 567.

472. Human Memory and Cognition (3) II Human learning, memory, and cognition; emphasis on information-processing approach to results and theory. P, 290, 370; or graduate standing. May be convened with 572. Writing-Emphasis Course*.

473. Natural Language Processing (3) II (Identical with Ling. 473) May be convened with 573.

475. History of Psychology (3) I Growth of psychology as a science; major schools and theories; contributions of famous investigators and major advances; psychology as an art and a science today. P, 290 and 6 upper-division units in psychology. May be convened with 575.

478. Sleep and Sleep Disorders (3) II Topics include sleepwake rhythms, sleep deprivation, dreams, and the diagnosis and treatment of sleep disorders. P, 290, 302. May be convened with 578.

479. Topics in the Cognitive and Affective Bases of Behavior (3) [Rpt./1] II Variable content (consult schedule): learning, cognition,
perception, psycholinguistics, emotion, others. P, 290 and 6 units of upper-division psychology; or grad. standing. May be convened with 579.

484. Psychology and Health (3) [Rpt./1] II Current research and theory concerning psychological contributions to health maintenance, illness prevention and treatment, and the organization of health services. May be convened with 584.

485. Contemporary Issues in Psychology (3) [Rpt./1] II Variable content (consult schedule): major topical problems in psychological research, theory, and applications. P, 290 and 6 units of upper-division psychology; or grad. standing. May be convened with 585. Writing-Emphasis Course*

487. Psychological Clinical Research (3) [Rpt./1] II Recent advances in the study of behavioral mechanisms. May be convened with 488.

488. Computational Linguistics (3) I (Identical with Ling 488) May be convened with 588.

496. Seminar

a. Special Topics in Cognitive Science (3) II (Identical with Phil 496a)

*Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

500a-500b. Current Issues in Psychological Theory and Research (3-3) Intensive examination of a range of content areas addressed in contemporary psychological theory and research. Open to psychology graduate students only.

501. Body Chemistry and Behavior (3) I For a description of course topics, see 401. Graduate-level requirements include an in-depth research paper on a single aspect of body chemistry and behavior. P, 255; 302 or 308. May be convened with 401.

502. Principles of Neuroanatomy (4) II (Identical with Anat. 502)

503. Laboratory in Mammalian Systems Neurophysiology (3) I II For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper on a single aspect of a current problem in neurological psychology. P, 101, 255, 302. May be convened with 403.


507a-507b. Statistical Methods in Psychological Research (3-3) Statistical research design, methods and metascience. Both semesters include an introduction to computerized analytical techniques and software commonly applied in psychological research, such as SAS, SPSSX, BMDP, and EGS. 507a: Bivariate and multiple regression, application of structural equation modeling to manifest variable (path analysis) and latent variable (multivariate) causal analysis. 507b: Application of the general linear model to analysis of variance, covariance and multiple comparisons, exploratory and confirmatory factor analysis, canonical correlation, discriminant function analysis and multivariate analysis of variance. Open to majors only.

508. Methods for Field Research (3) II Research problems and methods particularly relevant to field research. The logic of inquiry and approaches to data analysis appropriate to field trials and quasi-experimental research.

509. History of Psychological Theories and Research (3) II Development of psychology as a science; schools, systems, theories, major advances, famous investigators.

510. Advanced Social Psychology (3) I II For a description of course topics, see 410. Graduate-level requirements include an in-depth research paper on a single aspect of the theory or method of social psychology. P, 255, 300. May be convened with 410.

511. Animal Behavior (3) I For a description of course topics, see 411. Graduate-level requirements include an in-depth research paper on a single aspect of animal behavior. P, 295 May be convened with 411.

512. Animal Learning (3) II For a description of course topics, see 412. Graduate-level requirements include an in-depth research paper on an aspect of animal learning. P, 255. May be convened with 412.

514. Personality and Social Development (3) II For a description of course topics, see 414. Graduate-level requirements include an in-depth research paper on an aspect of personality and social development. P, 255, 314. May be convened with 414.

515. Cognitive Development (3) I II For a description of course topics, see 415. Graduate-level requirements include an in-depth research paper on an aspect of cognitive development. P, 255, 313. May be convened with 415.

516. Advanced Personality (3) I II For a description of course topics, see 416. Graduate-level requirements include an in-depth research paper on an aspect of personality study. P, 255, 316. May be convened with 416.

518. Abnormal Psychology (3) I II For a description of course topics, see 418. Graduate-level requirements include an in-depth research paper on an aspect of abnormal psychology. P, 255. May be convened with 418.

519. Field-Based Human Learning (3) I II For a description of course topics, see 419. Graduate-level requirements include advanced research applications in psychology or related areas.

520. Neurobiology (3) [Rpt./1] II Recent advances in neurobiology, with a strong emphasis on cellular and molecular mechanisms of nervous system function.

521. Psychology of Death and Loss (3) I II For a description of course topics, see 421. Graduate-level requirements include an in-depth research paper on an aspect of psychology of death or loss. P, 255 or graduate standing. May be convened with 421.

522. Psychobiology (3) [Rpt./1] II Recent advances in psychobiology, with a strong emphasis on the neural bases of sensation, perception, motivation, emotion, and action.

524. Animal Behavior (3) [Rpt./1] II Recent advances in the study of behavior from an ethological/evolutionary perspective.

525. Thinking, Reasoning, and Problem Solving (3) II For a description of course topics, see 425. Graduate-level requirements include an in-depth research paper on an aspect of thinking, reasoning, or problem solving. May be convened with 425.

527. Field Methods in Environmental Psychology (3) I II For a description of course topics, see 427. Graduate-level requirements include an in-depth research paper on an aspect of environmental psychology field methods. P, 371 or graduate standing. (Identical with Arch. 527 and L.Ar. 527) May be convened with 427.

528. Cognitive Neuroscience (3) [Rpt./1] I Recent advances in analysis of the neural bases of cognitive functions, such as learning, memory, and thinking.

530. Psychology, Law and Social Policy (3) [Rpt./3] II Critical review of theory, methods, and research in the psychology, law and social policy interface. May be convened with 430.

531. Ethical Issues in Psychology (3) I II For a description of course topics, see 431. Graduate-level requirements include an in-depth research paper on a single aspect of the course topic. May be convened with 431.

532. Conflict and Cooperation in the Dyad (3) I (Identical with M.A.P. 532)

535. Adult Development and Aging (3) I For a description of course topics, see 435. Graduate-level requirements include an in-depth research paper on an aspect of a specific psychological problem of the aged. P, 255 or 101 and two courses in gerontology or human development; or graduate standing. (Identical with Ger. 535) May be convened with 435.

537. Gerontology: A Multidisciplinary Perspective (3) I II For a description of course topics, see 437. Graduate-level requirements include an in-depth research paper on a single aspect of gerontology. May be convened with 437.

540. Perception and Attention (3) [Rpt./1] I Recent advances in the areas of perception and attention, with an emphasis on visual process.

542. Psycholinguistics (3) [Rpt./1] II Recent advances in the area of psycholinguistics, with an emphasis on sentence processing and the contribution of linguistic theory to an understanding of psychological mechanisms.

544. Cognitive Neuropsychology (3) [Rpt./1] I Recent advances in the area of cognitive neuropsychology, with an emphasis on the contribution of the brain to cognitive activities including memory, thinking, learning, and perceiving.

545. Interactive Behavior in Small Groups (3) II (Identical with M.A.P. 545)

546. Environmental Cognition (3) [Rpt./1] I For a description of course topics, see 446. Graduate-level requirements include an in-depth research paper on a single aspect of environmental cognition. May be convened with 446.

549. Social Cognition (3) [Rpt./6 units] I For a description of course topics, see 449. Graduate-level requirements include a research paper pertinent to the topic of social cognition. May be convened with 449.

550. Psychological Assessment and Testing (3) I II For a description of course topics.
Graduate-level requirements include an in-depth research paper on psychological assessment and testing, P. 255. May be convened with 450.

551. Acquisition of Speech and Language (3) (Identical with Sp.H. 551)

553. Lexical and Syntactic Development (3) I II For a description of course topics, see 453. Graduate-level requirements include a written paper on a subject pertinent to topic area. May be convened with 453.

554. Culture and Mental Health (3) I For a description of course topics, see 465. Graduate-level requirements include an in-depth research paper on culture and mental health, P. 101, 418. May be convened with 454.

558. Psychopathology (3) II For a description of course topics, see 458. Graduate-level requirements include an in-depth research paper on psychopathology, P. 255. May be convened with 458.

562. Mental Health Policy (3) [Rpt./3] I II Major issues in law and mental health, including law and policies relating to the clients and providers of mental health services, and the organization/structure of the system for delivering these services.

565. Neural Encoding, Memory and Computation in the Mammalian Brain (3) I II For a description of course topics, see 465. Graduate-level requirements include Graduate-level requirements include an in-depth research paper on a single aspect of neural encoding. P, one advanced course in neurobiology, biological or cognitive psychology, one advanced course in math or computer science. May be convened with 465.

567. Experimental Phonetics: Physiology (3) (Identical with Sp.H. 567)

568. Experimental Phonetics: Acoustics and Perception (3) II (Identical with Sp.H. 568)

572. Human Memory and Cognition (3) II For a description of course topics, see 472. Graduate-level requirements include an in-depth research paper on human memory and cognition. P, 255, 370; or graduate standing. May be convened with 472.

573. Natural Language Processing (3) II (Identical with Ling. 573) May be convened with 473.

575. History of Psychology (3) I For a description of course topics, see 475. Graduate-level requirements include an in-depth research paper on an aspect of history of psychology. P, 255 and 6 upper-division units in psychology. May be convened with 475.

578. Sleep and Sleep Disorders (3) II For a description of course topics, see 478. Graduate-level requirements include a critical review of the research literature of a relevant topic. May be convened with 478.

579. Topics in the Cognitive and Affective Bases of Behavior (3) [Rpt./1] I II For a description of course topics, see 479. Graduate-level requirements include an in-depth research paper on an aspect of cognitive and affective bases of behavior. P, 255 and 6 units of upper-division psychology; or graduate standing. May be convened with 479.

580. Clinical Neuropsychology (3) [Rpt./1] I II Cognitive and affective sequelae of human central nervous system disease/damage, with emphasis on clinical evaluation, management and rehabilitation.

582. Psychopathology (3) [Rpt./1] I II Advanced survey of current theory and research in symptoms, causes and treatment of the major psychological disorders.

584. Psychology and Health (3) [Rpt./1] I II For a description of course topics, see 484. Graduate-level requirements include an additional paper pertaining to the course topic. May be convened with 484.

585. Contemporary Issues in Psychology (3) [Rpt./1] I II For a description of course topics, see 485. Graduate-level requirements include an in-depth research paper on an aspect of contemporary psychological research. P, 255 and 6 units of upper-division psychology; or graduate standing. May be convened with 485.

586. Behavioral Research in Judgment and Decision Making (3) I (Identical with M.A.P. 568)

588. Computational Linguistics (3) I (Identical with Ling. 588) May be convened with 488.


621. Clinical Assessment Methods (3) I II Theory and practice in interview techniques and cognitive and personality assessment. Open to majors only.

622. Clinical Principles of Behavior Modification (3) I Systematic review of the major theories of behavior modification, with emphasis on application to clinical problems. Open to graduate psychology majors only.

625. Clinical Community Psychology (3) II Expanding role of psychology in innovative mental health functions, with emphasis on consultation, program development, primary prevention and social system modification. Open to majors only.

628. Psychotherapy (3) [Rpt./2] I II Current research and theory in psychotherapy. Alternate semesters will emphasize individual insight, behavioral, and treatment approaches.

694. Practicum a. Clinical Interviewing and Assessment (1-3)[Rpt./1] I II Open to clinical psychology students only.

b. Psychotherapy (1-3) [Rpt./1] I II Open to clinical psychology students only.

c. Community Mental Health (1-3) [Rpt./1] I II Open to clinical psychology students only.

695. Colloquium a. Motor Control (2) II (Identical with Ex.S.S. 695a)

696. Seminar d. Judgment and Decision Making (3) [Rpt./2] I (Identical with M.A.P. 696d, which is home)

Public Administration and Policy

Harvill Building, Room 453
(602) 621-7965

Professors Michael Gottfredson (Management and Policy, Psychology), Helen Ingram (Political Science), Theodore Koff (Management and Policy), John Schwarz (Political Science), Lee Sigelman (Political Science), Arthur Silvers (Management and Policy) Associate Professors H. Brinton Milward, Director (Management and Policy), Walter Powell (Sociology), Ronald Vogel (Economics) Assistant Professors Susan Gonzales Baker (Mexican American Studies), Lawton Robert Burns (Management and Policy), Chris C. Demchak, Howard Frant, Michael Polakowski, Edelia Schlager

The School of Public Administration and Policy offers two degrees designed to prepare men and women for a variety of staff level and managerial positions in public sector and not-for-profit organizations, and private organizations dealing with the public sector. The curriculum is also designed to prepare students for postgraduate work in such fields as public administration or law. The degrees offered are the following:

The Bachelor of Science in Public Administration with majors in public management, health and human services administration, and criminal justice administration. For degree requirements, please see the College of Business and Public Administration section of this catalog.

The Master of Public Administration. For admission and degree requirements, please see the Graduate Catalog.

Public Management

(See Management and Policy)

Public Policy, Planning and Administration

(See Management and Policy)

Range Management

(See Renewable Natural Resources)
Reading
(See Language, Reading and Culture under Education)

Rehabilitation
(See Special Education and Rehabilitation under Education)

Religious Studies (RELI)
Modern Languages Building, Room 371
(602) 621-7416

Committee on Religious Studies
Professors James Borhek (Sociology), Joseph L. Cowan (Philosophy), Robert Gimello (East Asian Studies), David Soren (Classics), John Ulreich (English), Donald Weinstein (History)
Lecturer Robert A. Burns, Chair

Religious studies is an interdisciplinary program offering a wide range of approaches to the study of various religions.

The major: 30 units requiring general survey courses in both Asian and Western religious traditions (120, 130—6 units). It also requires 6 units of courses involving the application of particular disciplinary approaches to the study of religion (233, 411). Finally, the major requires at least 9 units each in further study of Western and Eastern religions.

The minor: 20 units, including 120, 130 and 14 additional units in religious studies.

120. Western Religions (3) I II Religions of the Western World: Judaism, Christianity, Islam.
126. Greek Mythology (3) I II (Identical with Hist. 126)
130. Asian Religions (3) I II (Identical with Hist. 130)
140. South Asian and Middle Eastern Humanities (3) I (Identical with N.E.S. 140)
142. Chinese Humanities (3) I (Identical with Chn. 142)
233. Philosophy of Religion (3) I (Identical with Phil. 233)
271. The History of Christianity (3) I (Identical with Hist. 271)
273. Introduction to Judaism (3) I II 1992-93 (Identical with J.S. 273)
302. Protestant Thought in the 20th Century (3) II Survey of the various strands of Protestant theology since the turn of the century, with special reference to authors such as Rauschenbusch, Barth, Brunner, Tillich, Bultman and Bonhoeffer.
303. Epistles of St. Paul (3) I Examination of the religious and cultural background in the Greco-Roman world during the lifetime of St. Paul; analysis of Paul's thought in Acts and the Epistles.
320a-320b. Literature of the Bible (3-3) (Identical with Eng. 320a-320b)
322. Sociology of Religion (3) I II (Identical with Soc. 322)
323. Religious Organizations in America (3) I II (Identical with Soc. 323)
330a-330b. Chinese Thought (3-3) (Identical with Chn. 330a-330b)
331. Taoist Traditions of China (3) I 1991-92 (Identical with Chn. 331)
332a-332b. Judaic Thought and Culture (3-3) (Identical with J.S. 332a-332b)
333. Buddhist Meditation Traditions (3) I (Identical with E.A.S. 333)
340. Jesus in Contemporary Thought (3) I 1991-92 Survey of present thinking about the meaning of Jesus, including humanistic, Jewish, and various Christian interpretations.
345. Hindu Religious Activities (3) [Rpt./6 units] I I (Identical with E.A.S. 345)
348. Myth and Archetype (3) I II (Identical with Class. 348)
370a-370b. History of the Jews (3-3) (Identical with Hist. 370a-370b)
372a-372b. History and Religion of Israel in Ancient Times (3-3) I (Identical with N.E.S. 372a and J.S. 372b)
374. The Holocaust (3) II 1992-93 (Identical with Hist. 374)
382. Archaeology and the Bible (3) II (Identical with J.S. 382)
405a-405b. Medieval Europe (3-3) (Identical with Hist. 405a-405b)
407a-407b. Intellectual History of Medieval Europe (3-3) (Identical with Hist. 407a-407b)
408. The Renaissance (3) I (Identical with Hist. 408)
409. The Reformation (3) I I (Identical with Hist. 409)
410. History of Hell in Early Europe (3) I (Identical with Hist. 410)
411. Anthropology of Religion (3) I (Identical with Anth. 411)
416. Tudor-Stuart England (3) I I (Identical with Hist. 416)
428. Antisemitism (3) I (Identical with Hist. 428)
430. Prophecy in Ancient Israel (3) II (Identical with J.S. 430)
434. Islamic Thought (3) II (Identical with N.E.S. 434)
450. Religion and Politics (3) II (Identical with Pol. 450)
454. Spanish Inquisition (3) I 1992-93 (Identical with Hist. 454)
455. Introduction to Rabbinic Literature (3) II (Identical with J.S. 455)
487a-487b. History of East Asian Buddhism (3-3) (Identical with E.A.S. 487a-487b)
488. History of Byzantium (3) II (Identical with Hist. 488)
490. Indian Religions and Spirituality (3) I (Identical with A.In.S. 490)
495. Colloquium i. Confucianism: the Classical Period (3) (Identical with Chn. 495i, which is home)
j. Confucianism: the Neo-Confucian Tradition (3) (Identical with Chn. 495j, which is home)

Remote Sensing (REM)
1002 N. Warren Avenue, Room A17
(602) 621-4242

Committee on Remote Sensing (Graduate)
Professors Philip N. Slater (Optical Sciences), Chair, Victor R. Baker (Geosciences), Robert E. Dickinson (Atmospheric Physics), Barry D. Ganapole (Nuclear and Energy Engineering), Lloyd W. Gay (Renewable Natural Resources), Benjamin N. Herman (Atmospheric Sciences), John A. Reagar (Electrical and Computer Engineering), Richard W. Reeves (Geography and Regional Development), Sorooosh Sooroshiar (Hydrology and Water Resources) Associate Professors Charles E. Glass (Mining and Geological Engineering), Alfredo R. Huele (Soil and Water Science), Charles F. Hutchinson (Arid Lands Resources Sciences), Stuart Marsh (Arid Lands Resources Sciences), John W. Olsen (Anthropology), William O. Rasmussen (Renewable Natural Resources), Robert A. Schowengerdt (Electrical and Computer Engineering, Arid Lands Resources Sciences), Robert B. Singer (Lunar and Planetary Laboratory, Geosciences) Adjunct Professors Ray D. Jackson (Soil and Water Science)

Remote sensing concerns the collection of information related in some way to the Earth's natural resources or environment. Data are primarily collected by satellite and aircraft systems in conjunction with localized ground-based surveys and measurements. The data are processed by digital computer or optical techniques to extract information of value to Earth scientists and resource and environment managers at the local, state, and federal levels. The Committee on Remote Sensing offers no major at the present time but minor programs are available for doctoral students with majors in disciplines within the colleges of Agriculture,
**Renewable Natural Resources (RNR/LAR/RAM/WSM/WFSC)**

**Biological Sciences East, Room 325 (602) 621-7255**


Associate Professors Michael T. Deeter, Gordon S. Lehman, Donald V. Lightner (Veterinary Science), R. William Mannan, William J. Matter, E. Gregory McPherson, Bruce A. Roundy, E. Lamar Smith, Donovan C. Wilken (Assistant Professors Lee A. Graham, Lisa J. Graumlich (Tree-Ring Laboratory), Philip Guertin, Robert M. Itami, Vicente L. Lopes, Mitchel P. McClaran, Guy R. McPherson, Thomas W. Swetnam (Tree-Ring Laboratory)

Extension Specialists Donna K. Chickering, George B. Ruyie, John R. Stair

The programs of study in the School of Renewable Natural Resources prepare students for careers in teaching, research, extension, management, and environmental service organizations that require a fundamental knowledge about the science, planning, and management of renewable natural resources. The Bachelor of Science in Agriculture is also available with majors in range management, watershed management and wildlife and fisheries science.

The Bachelor of Science in Renewable Natural Resources degree is available with majors in range management, watershed management and wildlife and fisheries science. A Bachelor of Science in Agriculture is also available with a major in range management.* Undergraduate minors are available in these general areas of study. Each major is composed of general education and supporting science courses, a series of interdisciplinary renewable natural resource courses, and courses that develop additional knowledge in subjects specific to each major. The natural resource core curriculum is designed to integrate subjects of importance to all students in renewable natural resource fields, to introduce students to the interdisciplinary nature of resource management, and to develop an understanding of multiple-use management systems.

A major in landscape architecture for the Bachelor of Landscape Architecture and Master of Landscape Architecture degrees is also offered. In addition, a student may obtain the degree of Master of Science or Doctor of Philosophy with a major in range management, watershed management, wildlife and fisheries science, or renewable natural resource studies. For information concerning graduate admission and degree requirements, consult the Graduate Catalog.

*At the time of catalog production, these programs were under review. For further information regarding the status of these degree programs, prospective students should contact the mail.

### Renewable Natural Resources (RNR)

**135. Conservation of Natural Resources (3)** I Conservation and multiple use of renewable natural resources, including forest, watershed, range, wildlife, and recreation; history of forest and range use and its present status.

**200. Natural Resources — Concepts (3)** I Historical and philosophical developments in natural resources management; social, political, and economic factors affecting natural resource use; the role of natural resource managers in society.

**202. Natural Resources — Plant Identification (3)** I Plant classification, identification and nomenclature, with emphasis on the grass, rose, legume, composite, pine, and other plant families containing important forest and range plants. Use of dichotomous keys and recognition of representative species will be utilized to develop plant identification skills. 1R, 6L.

**271. Natural Resources — Computer Applications (3)** I Application of microcomputer software for management of renewable natural resources. Includes spreadsheets, data base management systems, and statistical programs with emphasis on the introduction to geographic information systems and their applications. 2R, 3L. Open to majors only. P. Stat. 160 or 263, prior computer experience.


**321. Natural Resources — Measurements (3)** I Study of basic land, climatic, hydrologic and vegetation measurements, and recreation use and animal census techniques employed in management of natural resources; methods, instrumentation, data analysis, presentation and interpretation of results. 2R, 3L. P. Math. 118, R.N.R. 271.

**384. Natural Resources — Management Practices (4)** I Introduction to land resource management practices used to achieve societal goals. Includes practices used to produce water, wood, forage, wildlife and other renewable resources; to protect water, soil, wilderness and scenic attractions; and to mitigate the adverse impacts of management and land-use activities on the environment. 3R, 3L. Field trips. P. basic ecology course, 316 or Ra.M. 382.

**397. Workshop d. Writing for Applied Sciences (2)** I (Identical with A.Ed. 397d)

**417. Introduction to Geographic Information Systems (3)** I Computer techniques for capture, processing, analysis and display of geographic information, with emphasis on applications in land resource management and planning.

*Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

**517. Introduction to Geographic Information Systems (3)** I For a description of course topics, see 417. Graduate-level requirements include a thorough bibliographic review and a scholarly paper on a current application of geographic information systems in the student's major field. P. basic knowledge of computer operations. (Identical with Geog. 517 and S.W. 517) May be convened with 417.

**538. Fire Ecology (3)** I For a description of course topics, see 438. Graduate-level requirements include a research report on the ecological impacts of fire in a specific vegetation type. P. basic ecology course, 316 or Ra.M. 382. May be convened with 438.

**546. Principles of Research (3)** I Philosophy of science and the principles of conducting research, including formulation of problems, prob-
LEARNING RESOURCES

575. Economics of Land and Water in the American West (3) (Identical with A.Ec. 575)
May be convened with 475.

576. Advanced Natural Resource Economics (3) (Identical with A.Ec. 576)

578. Global Change (3) (Identical with Geos. 578) May be convened with 478.

580. Natural Resources — Policy and Administration (3) II For a description of course topics, see 480. Graduate-level requirements include an in-depth policy analysis paper. May be convened with 480.

581. Environmental Policy (3) II (Identical with Pol. 581) May be convened with 481.

586a-586b. Natural Resources — Planning and Economics (3-3) For a description of course topics, see 486a-486b. Graduate-level requirements include additional research on a planning project. May be convened with 486a-486b.

589a-589b. Advanced Environmental Interpretation (2-2) For a description of course topics, see 489a-489b. Graduate-level requirements include development and presentation of an original interpretive program. Students must be available for some weekend field work. Field trips. P. 12 units in biology or renewable natural resources. May be convened with 489a-489b.

595. Colloquium
b. Public Natural Resource Management (2) II 1992-93

c. Human Dimensions in Renewable Natural Resources (3) I 1991-92
d. Topics in Forest and Range Ecology (2) II 1992-93

e. Heritage Resources Planning and Management (2) II 1991-92

596. Seminar
i. Water and Equity in the Southwest (3) [Rpt.] I II (Identical with Pol. 596i)

597. Workshop
a. Natural Resource Conservation Workshop (1) [Rpt./2] S Field trips.

598. Practicum
a. Teaching in Renewable Natural Resource Studies (1-3) [Rpt./4 units] II
b. Teaching in Range Management (1-3) [Rpt./4 units] II
c. Teaching in Watershed Management (1-3) [Rpt./4 units] II
d. Teaching in Wildlife and Fisheries Science (1-3) [Rpt./4 units] II

696. Seminar
a. Renewable Natural Resources (1-2) [Rpt.] I II

697. Workshop
a. Interdisciplinary Problem Solving in Natural Resources I (2) I II Consult department before enrolling. (Identical with H.W.R. 697a, which is home) Note: 697a is part of a two-semester sequence. Students receive a grade of “K” at the end of the first semester. Credit and grade for 697a will be awarded only upon completion of 697b.
b. Interdisciplinary Problem Solving in Natural Resources II (2) I II P. 697a. (Identical with H.W.R. 697b, which is home) Note: 697b is part of a two-semester sequence. Credit and grade for 697b will be awarded only upon completion of 697b.

698. Practicum
a. Teaching in Renewable Natural Resource Studies (1-3) [Rpt./4 units] II
b. Teaching in Range Management (1-3) [Rpt./4 units] II
c. Teaching in Watershed Management (1-3) [Rpt./4 units] II
d. Teaching in Wildlife and Fisheries Science (1-3) [Rpt./4 units] II

101. Introduction to Landscape Architecture (2) I Introduction to the profession of landscape architecture.

119. Landscape Design Process (2) I Introduction to programming, analysis and problem solving in landscape design. 1R, 5S. P. Art 102 or 104.

212. Landscape Graphic Communication (3) II Introduction to materials and techniques of graphic communication and their application in landscape design. 1R, 5S. P. 211.


250. Landscape Analysis (3) II Introduction to basic analytical methods leading to the solution

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522a-522b. Advanced Landscape Design (4-4) 1992-93 Issues and problems in urban landscape design. Relationships with architects and engineers are stressed. Field trips. 522a: 1991-92 Issues and problems in urban landscape design which are directed toward urban fringe and to urban and regional systems.
Range Resources

E. Lamar Smith, Program Leader

Range Management (RAM)

The major in range management prepares students to begin professional careers concerned with management of rangelands for livestock production, wildlife habitat, watershed protection, and other range resource values. Range management students obtain a Bachelor of Science in Renewable Natural Resources or a Bachelor of Science in Agriculture. The B.S. in Renewable Natural Resources meets standards for federal employment as a range conservationist and is accredited by the Society for Range Management.

Range management majors may tailor their program to meet individual career objectives by selecting appropriate minors and/or elective courses. Students planning a career in federal or state rangeland management agencies are advised to select a minor in wildlife management or watershed management. Those interested in range management, agricultural lending institutions, private consulting, international development, ranch appraising, or similar careers may take an agricultural economics curriculum offered in the Department of Agricultural Economics or a minor in agricultural economics. Students planning on careers in research or teaching may wish to emphasize additional basic sciences and mathematics.

Courses required are: Engl. 101, 102, or 103H, 104H; 307 or 308; Comm. 100, 102; Econ. 201a; A.Ec. 476; M.C.B. 181, 460; Econ. 165; Diet 103a-103b; Stat. 160 or 263; S.W. 200, 201; An.S. 430, 477 or 474; R.N.R. 200, 202, 271, 316, 321, 384, 480, 486a-486b; Ra.M. 382, 436, 446, 456, 487. In addition, students must complete at least two of the following: Ws.M. 422; Phys. 102a; S.W. 431; Math. 123; Geos. 101, 103.

Students majoring in other fields may take a minor in range management. Twenty-one units of foundation courses must be completed before the minor is initiated. Foundation courses are six units of chemistry, eight units of biological sciences, S.W. 200, 201, and Stat. 160 or 263. Required courses in the minor total 15 units and are R.N.R. 384; R.N.R. 202 or Ra.M. 382; Ra.M. 436, 446, and 456. An additional requirement of five credits of upper-division courses should be selected in consultation with an advisor in the faculty of range management.

*At the time of catalog production, the B.S. in Agriculture program was under review. Consult the school for further information.


436. Grazing Ecology and Management (2) I Application of animal diet and nutrition, grazing behavior, and vegetation-soil-herbivore interactions in management of grazing animals for improved livestock production, wildlife habitat, watershed protection, forest reproduction or other land use objectives. Includes design of water developments, fences and other structural range improvements. May be convened with 536.

446. Range Vegetation Improvement (3) I Rangeland habitat manipulation through vegetation control and establishment including mechanical, chemical, and burning treatments. Re-vegetation techniques for rangeland and drastically disturbed semiarid lands. 2R, 3L, P, M.C.B. 181, Ecol. 182, S.W. 200. May be convened with 546.


467. Rangeland Management Plan (2) II Conduct a field inventory, development management alternatives, and conduct establishment of alternative management proposals in a written plan. 6L. All-day field trips. P, 456. May be convened with 587. Writing-Emphasis Course*

*"Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)"

556. Grazing Ecology and Management (2) I For a description of course topics, see 436. Graduate-level requirements include additional required readings and research paper on selected topic. May be convened with 436.

546. Rangeland Vegetation Improvement (3) I For a description of course topics, see 446. Graduate-level requirements include additional required readings and research paper on selected topic. May be convened with 446.

587. Rangeland Management Plan (2) II For a description of course topics, see 487. Graduate-level requirements include additional assigned readings and discussion periods. P, R.N.R. 202, 321. May be convened with 487.

Watershed Resources

Richard H. Hawkins, Program Leader

Watershed Management (WSM)

Watershed management courses, which consider the management needs of whole water-
sheds and their multiple uses, qualify the student for a professional career with resource management agencies. Emphasis is placed on the use and protection of resources of water, wildlife habitat, recreation, and other values. Students in watershed management may select one of several areas of specialization to further develop their knowledge in physical hydrology, forest hydrology, rangeland hydrology, soil hydrology, water quality, or aquatic biology.

In addition to the requirements for the curriculum in natural resources, students majoring in watershed management must complete: Chem. 103a-103b, 104a-104b; Econ. 201a; Eng. 101, 102 or 103H, 104H; 307 or 308; M.C.B. 181; Ecol. 182; Geos. 101, 103; Math. 125a-125b, Stat. 160 or 263; Phys. 102a-102b; 180a; R.N.R. 200, 202, 271, 316, 321, 364, 480, 486a-486b; S.W. 200, 201; Comm. 100, 102; A.B.T. 406; A.Ec. 476; Atmo. 171; Engr. 101; Ws.M. 460, 462.

Minors are available in watershed management. Foundation courses consist of prerequisites to the courses selected for the minor. The minor consists of 20 units including S.W. 200, 201; Stat. 160 or 263. The remaining units may be selected from Ws.M. 408, 410, 415, 460 and 462 in consultation with a watershed faculty advisor.

254. Forest Pathology (3) II (Identical with PI.P. 250)

330. Introduction to Remote Sensing (3) I (Identical with Geog. 330)

408. Wildland Fire Management (3) I Principles of fire behavior in forest, range and other vegetation types; interrelationships of fuels, weather, and topography; pyrolysis and combustion processes; effects of fire; fuels inventory; prevention; detection, and control techniques; fire danger rating and fire behavior modeling. May be convened with 508.

410. Silviculture (3) II Principles and technical procedures for reproducing, planting, and tending forest crops, with reference to watershed. Weekend field trips. P, R.N.R. 316. May be convened with 408.

415. Mensuration (3) II For a description of course topics, see 415. Graduate-level requirements include the performance of a special analysis of mensurational data from an arid land inventory. P, R.N.R. 271, 321, Math. 123. May be convened with 415.

502. Photogrammetry (1) II 1992-93 For a description of course topics, see 420. Graduate-level requirements include a scholarly paper on geodetic control, topographic mapping techniques, or computer mapping. P or CR 522. May be convened with 420.

522. Photointerpretation (2) II For a description of course topics, see 422. Graduate-level requirements include the preparation of a detailed report based on the application of the principles of photointerpretation to a specific problem in the management of natural resources. May be convened with 422.

531. Dryland Forest Management (3) II 1992-93 Utilization and management of forest resources in dry environments; biophysical and socioeconomic issues related to the development of forest commodities and amenities. P, 6 units of upper-division Ws.M.

532. Agroforestry (3) I 1991-92 Ecological and socioeconomic factors related to the planning and implementation of agroforestry systems. P, 6 units of upper-division Ws.M.


566. Quantitative Dendrochronology (3) II 1992-93 (Identical with Geos. 566)

567. Natural Resource Economics and Public Policy (3) II (Identical with A.Ec. 577)

571. Water Quality Control (3) II (Identical with C.E. 571) May be convened with 571.

577. Colloquium a. Non-Point Source Pollution from Watersheds (3) II P, 460.

655. Dendroclimatology (3) II 1992-93 (Identical with Geos. 655)

671. Wildlife and Fisheries Resources William W. Shaw, Program Leader

Wildlife and Fisheries Science (WFSC)

A major in wildlife and fisheries science prepares the student for careers that apply ecological sciences for the management and conservation of fish and wildlife resources. Career opportunities include positions with state fish and wildlife agencies, federal wildlife and land management agencies, environmental consulting firms, and nongovernmental conservation organizations. The major has two closely related options: fisheries science and wildlife ecology. Students are encouraged to obtain practical experience as summer employees, interns, or volunteers with natural resource management agencies or conservation organizations.

In addition to the requirements for the curriculum in natural resources, the following courses are required for both options in wildlife and fisheries science: Chem. 103a-103b, 104a-104b, 241a, 243a; Econ. 201a; A.E. 476; Eng. 101, 102 or 103H; 104H; 307 or 308; M.C.B. 181; Ecol. 182; 320 or An.S. 213; 472 or 436; Phys. 102a, 180a; S.W. 200, 201; Comm. 100, 102; Math. 123 or 124 or 125a; Stat. 160 or 263; Ra.M. 382; R.N.R. 200, 202, 271, 316, 321, 384, 386; A.B.T. 406; A.Ec. 476; Atmo. 171; Engr. 101; Ws.M. 460, 462.

126. Wildlife Conservation Laboratory (1) I Laboratory exercises and field trips covering conservation techniques; animal census, habitat analysis, population dynamics, and management techniques. 3L. Field trips. P, CR, 125.

213. Animal Genetics (3) I (Identical with An.S. 213)

405. Aquatic Entomology (3) II 1992-93 (Identical with Ento. 405) May be convened with 505.


441. Limnology (4) I Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters. 2L, 3L. Weekend field trips. P, 444 or 446. Laboratory exercises and field trips covering phases of wildlife management. P, CR, 125, 126; and laboratory methods of study. P, CR, 455R, 482. May be convened with 544.

444. Wildlife Management/Mammalian Species (4) I Management of wildlife as a resource; characteristics of wildlife species; principles of population dynamics in wildlife populations; techniques used in studying wildlife. 3R, 3L and field work. Weekend field trips. P, R.N.R. 384. May be convened with 544. Wildlife Management/Avian Species (4) II Field and laboratory methods used in avian species management; evaluation of avian habitats; census, productivity, diagnosis, and control of avian populations. 3R, 3L and field work. Weekend field trips. P, R.N.R. 384. May be convened with 546.

448. Current Problems in Wildlife Ecology (1) [Rpt.] I Discussions and assignments covering current problems, including the biological, economic, aesthetic, political, and sociological phases of wildlife management. P, 444 or 446.

449. Diseases of Wildlife (3) I (Identical with V.Sc. 449) May be convened with 549.

455R. Fishery Management (3) I II Methods and concepts pertaining to fishery investigations and management; application of principles for enhancement of fisheries and aquatic habitats. P, 441 or 444. May be convened with 555R. Writing-Emphasis Course.*  

455L. Fishery Management Laboratory (1) I II Field and laboratory methods pertaining to fishery investigations and management. P, CR, 455R, 482. May be convened with 555L.

482. Ichthyology (4) I 1991-92 (Identical with Ecol. 482) May be convened with 582.

484. Ornithology (4) II (Identical with Ecol. 484) May be convened with 584.

485. Mammalogy (4) I (Identical with Ecol. 485)

489. Selected Studies of Birds (2) I [Rpt.] (Identical with Ecol. 589) May be convened with 489.

505. Aquatic Entomology (3) III 1992-93 (Identical with Ento. 505) May be convened with 405.

530. Principles of Nutrition (3) I I (Identical with An.S. 530) May be convened with 430.

541. Limnology (4) I For a description of course topics, see 441. Graduate-level requirements include a report that synthesizes literature on a research issue of current concern, an in-class presentation and several discussion meetings. Weekend field trips. P. 444 or 446. Laboratory exercises and field trips covering phases of wildlife management and an oral presentation of results. Weekend field trips. P, R.N.R. 384. May be convened with 444.

544. Wildlife Management/Mammalian Species (4) I For a description of course topics, see 441. Graduate-level requirements include an in-depth research paper on an aspect of wildlife management and an oral presentation of results. Weekend field trips. P. R.N.R. 384. May be convened with 444.

546. Wildlife Management/Avian Species (4) II For a description of course topics, see 444. Graduate-level requirements include an in-depth research paper on an aspect of wildlife management and an oral presentation of the results. Weekend field trips. P, R.N.R. 384. May be convened with 446.

549. Diseases of Wildlife (3) III (Identical with V.Sc. 549) May be convened with 449.

555R. Fishery Management (3) II For a description of course topics, see 455R. Graduate-level requirements include a report on a current research issue in management and a report on a research issue, plus several discussion meetings. P, 444 or 446. (Identical with V.Sc. 555R) May be convened with 455R.

555L. Fishery Management Laboratory (1) I II For a description of course topics, see 455L. Graduate-level requirements include a detailed report and presentation on a current advance in field or laboratory methods of study. P, CR, 455R, 482. May be convened with 455L.


582. Ichthyology (4) I 1991-92 (Identical with Ecol. 582) May be convened with 482.

584. Ornithology (4) II (Identical with Ecol. 584) May be convened with 484.

589. Selected Studies of Birds (2) I [Rpt.] (Identical with Ecol. 589) May be convened with 489.

595. Colloquium c. Wildlife Habitat Analysis (2) II 1991-92

649. Fishery-Water Quality and Toxicology (3) I Pertinent water quality parameters essential for fish life, and the effects of various substances and their interrelationships to fish and aquatic organisms. 2R, 3L, P, 441 or 455R; Chem. 241a. (Identical with V.Sc. 649)

695. Colloquium a. Advanced Issues in Fisheries and Wildlife Science (2) [Rpt.]/3 II

696. Seminar (1-3) a. Fish and Wildlife Ecology (1) II [Rpt.]

Russian and Slavic Languages (RUSS)

Modern Languages Building, Room 340  
(602) 621-7341  
Professors John Garrard, Joe Malik, Jr. (Emeritus)  
Associate Professors Margaret Gibson, Head, Alexander Dunkel, Delbert Phillips, Boriss Roberts (Emeritus)  
Assistant Professors Galina De Rocke, Teresa Polowy

The Department of Russian and Slavic Languages provides instruction designed to develop competence in the Russian language, awareness of cultural traditions, and an understanding of literature and the arts. All Russian conversation courses are oriented toward developing proficiency skills as defined by the American Council on the Teaching of Foreign Languages (ACTFL). The basic training received by Russian majors prepares them for government service, international business careers, teaching, graduate study, and research. The Arizona Russian Institute in the USSR provides an opportunity for study abroad at Leningrad University. 

The degrees available are Bachelor of Arts and Master of Arts with a major in Russian. Students in the College of Education may earn a Bachelor of Arts in Education with a teaching major in Russian. The Master of Arts in Education with a major in teaching and teacher education provides an option for 15 hours of study in Russian. For graduate admission and degree requirements, consult the Graduate Catalog.

The major: 28 units beyond 200-level courses including 301a-301b, 305a-305b, 307a-307b, 310 (Writing-Emphasis course) and 9 units from 405a-405b and 407a-407b. No more than 3-6 units of independent study can apply to the major. It is recommended that students contemplating graduate study in Russian take 330, 340, 350, Russian Literature in Translation, and/or 250a-250b, Russian Humanities in Translation.

The supporting minor: 20 units selected from unlimited-wide disciplines with the assistance and approval of the major advisor.  
The Russian minor: 201a-201b, 207a-207b, 301a-301b, 305a. In addition, 310 is highly recommended.

The teaching major: 22 units beyond the 200-level courses including 301a-301b, 305a.
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305a-b, 307a-307b, 407a-407b. 310 is highly recommended.

The minor consists of 10 units beyond the 200-level courses including 301a-301b, 307a-b.

The department participates in the honors program. Prospective honors students must consult the departmental advisor.

101a-b. Elementary Russian (4-4) Both 101a and 101b are offered each semester. (The first yeel work offered in a foreign language shall be counted toward a minor.) Phillips.

120. Set Union Today (3) Introduction to contemporary Soviet society.

201a-b. Intermediate Russian (4-4) P, 101b.

205. Using Scientific Russian (4) Alternate course for 201b for students interested in reading and translating scientific literature. P, 201a.

207a-b. First Level Russian Conversation (3, 101b.


217. Imiation (1) [Rpt./3 units] II General improvement of the student's language skills through oral training in Russian intonation. P, 101b.

250a-b. Russian Humanities in Translation (250a: I II The Quest for Identity: Russia's oral heritage—literature, art, music, architecture, religious tradition—from the earliest beginnings through the 19th century. 250b: I II The 19th for Utopia: 20th century literature, art, music, architecture, film, and theater in the pre-revolutionary Russia and the emigration. Not prerequisite to 250b.

285. Induction to Humanities Computing (3) (Identical with Gen. 285)

296. minor

301a-b. Advanced Grammar and Composition (3) P, 201b or 205.

305a-b. Readings in Russian Texts (3-3) Reading of original texts, with emphasis on the development of reading skills and the acquisition of extensive vocabulary through the study of word formation. P, 201b or 205.

307a-b. Second Level Russian Conversation (2) P, 207b.

310. Russian Civilization and Culture: Pre-Christian Era to the Present (3) I Selected topics in Russian culture and civilization: architecture, fine art, literature, music, and theater with an emphasis on their artistic, historical, ideological and aesthetic contexts. Taught in English. Open to majors. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

330. Russian Literature from Beginnings to 1850. Readings and discussion in English of representative Russian literary works from earliest times to 1850.

340. Nineteenth Century Russian Literature (3) Readings and discussion in English of representative Russian literary works of the 19th century.

350. Twentieth Century Russian Literature (3) Readings and discussion in English of representative Russian literary works from the 20th century.

396H. Honors Proseminar (3) I

405a-405b. Survey of Russian Literature (3-3) Historical survey of Russian literature from the earliest times to the Soviet period; designed to acquaint students with literary terminology and facilitate comprehension of lectures in Russian. P, 301b or 305b.


485. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] It is highly recommended.

496. Seminar

501a-501b. Russian Stylistics (3-3) Designed to improve the student's practical mastery and understanding of Russian at a higher and more sophisticated level. P, 301b.

507a-507b. Advanced Russian Conversation (3-3) Emphasis on attaining proficiency at the advanced level in accordance with the guidelines established by the American Council on the Teaching of Foreign Languages (ACTFL). P, 407b.

579a-579b. Problems of Teaching Russian (1-1) Survey of modern methods of language teaching, with emphasis on the particular problems presented by Russian. All GTAs must complete both a and b. Minimum of two units will be counted toward Master's degree requirements.

581. Russian Phonology and Morphology (3) II Synchronic study of the phonology and morphology of modern Russian. P, 301b or 305b.

583. History of the Russian Language (3) Advanced training in the Russian language from Indo-European up to the modern period. P, 301b or 305b.

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] It is highly recommended.

596. Seminar
a. Language Program in USSR III (3) S Training in Russian conversation, grammar and phonetics conducted in Moscow by specialists trained in the teaching of Russian to foreigners. Field trips. P, 407b.


686. Russian Drama (3) Examination of the major dramatic works of nineteenth- and twentieth-century Russian playwrights. P, 405b.

96. Seminar
b. Russian Literature: 18th Century (3) [Rpt./12 units]

c. Russian Literature: 19th Century (3) [Rpt./12 units]
d. Russian Literature: 20th Century (3) [Rpt./12 units]

Russian and Soviet Studies (RSS)

Douglass Building, Room 200 W 621-5585

Committee on Russian and Soviet Studies

Professors Robert Browder (Emeritus, History), Seymour Goodman (Manager Information Systems), Richard Reeves (Geography and Regional Development), Allen Whiting (Political Science)

Associate Professors Alexander Dunkel (Russian and Slavic Languages), Frederick Kellogg (History)

Assistant Professors Galina DeRoeeck (Russian and Slavic Languages), Douglas Weiner (History), John Willerton (Political Science)

Affiliated Staff Andrew Makuch (Acquisitions, Main Library)

Russian and Soviet Studies is an interdisciplinary academic major that offers courses in the many disciplines involved in the study of Russian and the Soviet Union. It is designed to prepare students for careers in government, academia, and science and technology. The committee offers the Bachelor of Arts degree with a major in Russian and Soviet studies.

The major consists of 33 units of course work: Russ. 301a-301b, 250a or 250b or 310; R.S.S. 305, 421, 422, 425, 443, 450 or 409, 496a, 496b. R.S.S. 496b must be taken in the spring semester of the junior year, 496b in the fall semester of the senior year. The student must have advanced standing in order to take R.S.S. 305 and 450.

Although not required for the major, Russ. 120 is strongly recommended as an introductory course for Russian and Soviet studies majors.

The minor in Russian and Soviet studies consists of 21 units of course work chosen from one of the following departments: Economics, History, Management Information Systems, East Asian Studies and/or Near Eastern Studies, and Political Science. A list of courses considered suitable for the minor is available in the Russian and Soviet Studies office.

In addition to the courses listed above, the committee offers courses taught by visiting Soviet specialists for which the student may receive credit.

The committee participates in the honors program.

305. Soviet Economic System (3) (Identical with Econ. 305)

409. Soviet Union (3) (Identical with Geog. 409)

421. History of Russia: Early Period (3) (Identical with Hist. 421)

422. History of Russia: Modern Period (3) (Identical with Hist. 422)

423. Intellectual History of Russia (3) (Identical with Hist. 423)
Second Language Acquisition and Teaching (SLAT)

Modern Languages Building
Room 456
(602) 621-7216 or 621-7391

Committee on Second Language Acquisition and Teaching (Graduate)

Professors Muriel Saville-Troike, Chair (English), Richard Demers (Linguistics), Kenneth Ian Forster (Psychology), Roseann Duenas Gonzalez (English), Kenneth Goodman (Language, Reading and Culture), Yetta M. Goodman (Language, Reading and Culture), Jane Hill (Anthropology), Terry Langendoen (Linguistics), Adrienne Lehrer (Linguistics), Susan Philips (Anthropology), Hamid Qafisheh (Near Eastern Studies), Renee A. Schulz (German), Rudolph C. Troike (English)

Associate Professors Shirin Antia (Special Education and Rehabilitation), Robert Arriew (French), Margaret I Gibson (Russian), Judy Nichols Mitchell (Language, Reading and Culture), Luis C. Moll (Language, Reading and Culture), Frank Pialorsi (English), Duane H. Roen (English), Richard Ruiz (Language, Reading and Culture), Karen L. Smith (Spanish and Portuguese), Linda Swisher (Speech and Hearing Sciences), William J. Wilson (Near Eastern Studies)

Assistant Professors H. Douglas Adamson (English), Eloise Jelinek (Linguistics), Donna M. Johnson (English), Teresa L. McCarty (Language, Reading and Culture), Robert N. Smed (Spanish and Portuguese), Mary Wildner Bassett (German), Haru Yamada (East Asian Studies), Okie Zepeda (Linguistics)

The Committee on Second Language Acquisition and Teaching offers a program leading to a Doctor of Philosophy degree with a major in second language acquisition, learning and teaching. The cooperating departments include Anthropology; East Asian Studies; English; French and Italian; German; Language, Reading and Culture; Linguistics; Near Eastern Studies; Psychology; Russian and Slavic Languages; Spanish and Portuguese; and Speech and Hearing Sciences. Students may choose from specializations in (1) second language analysis (grammar; contrastive linguistics/interlanguage studies), (2) second language use (discourse analysis, sociolinguistics, language policy/planning, rhetoric, pragmatics), (3) second language processes and learning (second foreign language acquisition: theory and research), (4) second language pedagogical theory and program administration (ESL/FL methods, curriculum development, testing and evaluation, reading and writing, educational technology).

For admission and degree requirements, please consult the Graduate Catalog.

Secondary Education
(See Teaching and Teacher Education under Education)

Sociology (SOC)
Social Sciences Building, Room 400
(602) 621-3531


Associate Professors James T. Borhek, Courtney B. Cleland (Emeritus), Robert R. Evans (Emeritus), Celestino Fernandez, Patricia L. MacCorquodale, Jerry L.L. Miller, Walter W. Powell, Michael E. Sobel

Assistant Professors Susan G. Baker (Public Administration and Policy), Elisabeth S. Clemens, Debra Friedman, Karen Heimer, Calvin K. Morrill (Communication), Michael Polakowski (Public Administration and Policy), James Ranger-Moore, Kathleen C. Schwartzman, James Shokey

Adjunct Professor Andrew M. Greeley

Sociology is the scientific study of social relations in all kinds of human populations, ranging in size from two individuals to nations. Sociologists study changing and stable patterns of social interaction, values and attitudes.

The Department of Sociology offers the following degrees: Bachelor of Arts, Master of Arts, and Doctor of Philosophy with a major in sociology.

The major: 36 units, including 301, 375a-375b, and 401. A minimum of 27 units must be in upper-division courses. Students may construct concentrations within the sociology major in consultation with an advisor.

The supporting minor for sociology majors is chosen by the student in consultation with an advisor. The minor in sociology for nonmajors consists of 20 units, 12 of which must be in the upper division.

The teaching minor: 21 units, including 251, 301, 375a-375b, and 401.

101. Introduction to Sociology (3) I II Sociological concepts and principles, with special reference to contemporary society.

150. Sociology of Women (3) I II Sociological approach to women's roles in American society, with emphasis on trends and problems relating to sex-role identification and socialization. P, 101 or 301. (Identical with W.S. 150)

160. Minority Relations and Urban Society (3) I II Analysis of minority relations and mass movements in urban society; trends in the modern world, with special reference to present-day race problems and social conflict. (Identical with A.A.S. 160 and M.A.S. 160)

161. The Chicano in American Society (3) II Study of Mexican Americans (Chicanos) as an ethnic-cultural group in American society, analysis of their present problems as a minority group, focus on Chicano-Anglo relations in southwestern U.S. (Identical with M.A.S. 161)

189. World Population (3) I II Basic concepts of population studies; analysis of social trends, problems and solutions in relation to environmental factors, with relevance to both advanced and developing nations. P, 101 or 301.


243. Sociology of Adult Life (3) I II The life course perspective with emphasis upon the middle years; implications for personal and social planning in the United States. P, 6 units of social science. (Identical with F.S. 243 and Gero. 243)

251. Sociology of Education (3) I II Educational system as a basic social institution; its structure, impact on society, and effects on students; consideration of alternative structures. P, 3 units of social sciences.

301. Sociological Analysis (3) I II A survey of sociological concepts and principles for sociology majors. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing- Emphasis Courses" in Academic Guidelines sections of this catalog)

302. Medical Sociology (3) I II Organization of health care in the U.S.; its impact on patients and society; health care practitioners; medical industries; policy debates. P, completion of the freshman English requirement.

310. Culture and the Individual (3) I II (Identical with Anth. 310)

313. Collective Behavior and Social Movements (3) I II Study of riots, panics, crazes, reform and revolutionary movements; their origins, social bases, careers and consequences. P, 6 units of social sciences.

315. Political Sociology (3) I II Current competing theories of socio-political institutions. P, 6 units of social sciences.

321. Sociology of the Family (3) I II Analysis of the modern family and its characteristics in a social and historical setting. P, 9 units of social science.

322. Sociology of Religion (3) I II Religion as a social institution with special reference to industrial societies. (Identical with Rel. 322)
322. Religious Organizations in America (3) II Analysis of religious organizations with primary reference to the U.S., including the nature and variety of belief systems, organizations and relations to each other and the larger society. P. 6 units of sociology or religious studies. (Identical with Anth. 323)

324. Sociology of Sexuality (3) II Impact of individual and community sexual attitudes and behavior on other sociological and psychological functioning. Credit is allowed for this course or Hlth. 330, but not for both. P. 3 units of sociology and 3 units of another social science.

326. Industrial Sociology (3) I Survey of the sociology of work and its organization, with emphasis on social supports of work motivation and effectiveness. P. 6 units of sociology.

333. Group Dynamics (3) I II Study of small groups; their objectives, leadership, interpersonal relations, and effectiveness. P. 101 or 301; 3 additional units of sociology or psychology.

340. Sociology of Childhood and Youth (3) II Children, adolescents, and young adults in American society; their social roles, relationships, and problems. P. 6 units of sociology.

341. Juvenile Delinquency (3) I II Nature and causes of, and reactions to, juvenile delinquency. P. 201; 3 additional units of sociology.

342. Criminology (3) I II Study of the social origins of criminal law, criminal behavior, and reactions to crime. P. 6 units of sociology.

375a-375b. Social Research Methods (3-3) 375a: Problems of conceptualization and design; elementary techniques of data collection and analysis. P. 301 and Math. 117P/S. Writing Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). 375b: Techniques of statistical description and elementary statistical inference, as applied to sociological data. 2R, 3L. No lower-division course may serve as a substitute for 375a or 375b.

384. Sociology of Latin American Societies (3) II Analysis of their social structures and institutions, including government, religion, family, education, stratification, urban and rural development, economics, migration, P. 101 or 301; 3 additional units in sociology or anthropology. (Identical with Anth. 384 and L.A.S. 384)

396H. Honors Proseminar (3) I II

401. Sources of Sociological Theory (3) I II Critical review of the works of leading sociologists. P. for all students, 9 units of social science. P. for majors, 301. Writing-Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

403. Sociosomatics (3) II Social control of bodily process and structure, including social determinants of health. Both macro and sociopsychological theory and statistical research literature. P. upper-division standing and 3 units of social science or consult department before enrolling. May be convened with 503.

404. Sociology of the Southwest (3) I Populations, cultures, and social problems in their regional setting, with emphasis on the Southwest. P. 101 or 301; 6 additional units of sociology or anthropology. (Identical with Anth. 404, A.In.S. 404 and M.A.S. 404) May be convened with 504.


407. Peasant Communities (3) I (Identical with Anth. 407)

420. Communication and the Legal Process (3) I (Identical with Comm. 420). May be convened with 520.

422. Complex Organizations (3) II Theories and research regarding large-scale organizations and their relations to the individual and society. P. 9 units of sociology. May be convened with 522.

434. Kinship and Social Organization (3) II (Identical with Anth. 434) May be convened with 534.


436. Social Structure and Personality (3) II Relation between the person and the group; social factors in character formation. P. 9 units of sociology. May be convened with 536.

442. Transformation of Agrarian Societies in the Middle East (3) II (Identical with N.E.S. 442) May be convened with 542.

444. Group-Process Methods in Management (3) I II Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog. (Identical with M.A.P. 444)

450. Social Stratification (3) II Theories of social class, caste, and rank; social mobility in contemporary society. P. 9 units of sociology. (Identical with Anth. 450) May be convened with 550.

457. Bio-Social Determinants of Socialization (3) II (Identical with F.S. 457)

458. Sociology of Gender (3) II Social construction, variation and consequences of gender categories across time and space. Topical decision-making, deviance and institutional (family, religion, politics) approaches. P. 101 or consult department before enrolling. (Identical with W.S. 459) May be convened with 559.

467. Race and Ethnic Relations (3) II Social processes involved in minority groups in terms of race, caste, class, ethnicity, politics, and religion. P. 101 or 301; 6 additional units of sociology or anthropology. (Identical with A.A.S. 467, Anth. 467, A.In.S. 467 and M.A.S. 467) May be convened with 567.

486. Comparative Community Development (3) I Principles of social change applied to problems of community development, including analysis of specific programs. P. 6 units of social sciences. (Identical with Anth. 486) May be convened with 586.


503. Sociosomatics (3) II For a description of course topics, see 403. Graduate-level requirements include the use of graduate-level theory, research methods, and statistics. P. Upper-division standing and 3 units of sociology or consult department before enrolling. May be convened with 403.

504. Sociology of the Southwest (3) II For a description of course topics, see 404. Graduate-level requirements include extra readings and a research paper. P. 101 or 301; 6 additional units of sociology or anthropology. (Identical with Anth. 504 and A.In.S. 504) May be convened with 404.

505. World-System Theory and Research (3) I II Theory and research on the modern world-system.

506. Social Gerontology (3) II For a description of course topics, see 406. Graduate-level requirements include extra readings and a research paper. P. 9 units of sociology. (Identical with Gerontology 506) May be convened with 406.

508. Sociology of Culture (3) II Theory and research on the nature of cultural systems, cultural production, and consumption, and strategies of interpretive analysis. P. consult with department before enrolling.

510. Political Sociology (3) Basic approaches in political sociology, with emphasis on the relationship of economic and political processes.

515. Social Movements and Collective Action (3) II A sociological examination of the emergence and development of social movements/collective action at both the societal and individual levels. Major theoretical perspectives on social movements/collective action will be reviewed as will recent and classical empirical works in the area. P. admission to graduate program or departmental approval.

520. Communication and the Legal Process (3) I II (Identical with Comm. 520). May be convened with 420.

522. Complex Organizations (3) II For a description of course topics, see 422. Graduate-level requirements include extra readings and a research paper. P. 9 units of sociology. May be convened with 422.

525. Organization Theory (3) Basic review of classic and contemporary approaches to the study of complex organizations; formation, development, and internal processes.

526. Cross-National Research Methods (3) II Introduction to the logic and methods of cross-national social research. (Identical with Pol. 526)

530. Theories and Research in Social Psychology (3) A comprehensive introduction to the major theoretical perspectives, methodologies, research areas, and issues in contemporary social psychology.

531. Socialization and Society (3) II Various theoretical perspectives are applied to the content, processes, and contexts of socialization throughout the life cycle to see how individuals become social beings and societal participants. P. 530, or consult department before enrolling.

532. Role, Self, and Identity (3) II An examination of the concepts of role, self, and identity in relation to social action and social psychological functioning. Alternative approaches are
presented, but the symbolic interactionist perspective is highlighted. P, 530, or consult department before enrolling.

533. Social Relations, Groups, and Networks (3) I An analysis of social interaction in relations, groups, and networks, emphasizing the reciprocal influences of social structure and social process. Theories of exchange, power, status, and justice are considered. P, 530, or consult department before enrolling.

534. Kinship and Social Organization (3) II (Identical with Anth. 534) May be convened with 434.


536. Social Structure and Personality (3) II For a description of course topics, see 436. Graduate-level requirements include extra readings and a research paper. P, 9 units of sociological knowledge. May be convened with 436.

540. Theories of Crime and Public Policy (3) II (Identical with M.A.P. 540)

541. Deviance and Social Control (3) Basic critical review of traditional and contemporary concepts and formulations of deviance and social control; evaluation of contemporary research bearing upon deviance theory and informal and formal mechanisms of social control. P, 201, 341 or 342.

542. Transformation of Agrarian Societies in the Middle East (3) II (Identical with N.E.S. 542) May be convened with 442.

550. Social Stratification (3) II For a description of course topics, see 450. Graduate-level requirements include extra readings and a research paper. P, 550 May be convened with 450.

551. Stratification and Class (3) Basic examination of concepts and research in the area of stratification, with emphasis on the classic statements and contemporary research.

557. Race and Ethnic Relations (3) I II For a description of course topics, see 467. Graduate-level requirements include extra readings and a research paper. P, 101 or 301; 6 additional units of sociology or anthropology. (Identical with Anth. 567 and A.In.S. 567) May be convened with 467.

570a-570b. Social Statistics (3-3) 570a: Probability, distributions, estimation and hypothesis testing. 570b: Ordinary least squares regression, generalized least squares regression, structural equation models (path analysis and non-recursive systems).


580. Population Studies (3) I Theory and research in the fields of fertility, mortality, and migration, with emphasis on their relationships to social structure. An original research project is required.

585. Theory Construction in Sociology (3) I Sociological theories as alternative explanations. Classic and modern examples of working through the implications of alternative theories to formulate competing hypotheses for empirical tests. P, two courses in social science theory, preferably 500a-500b.

586. Comparative Community Development (3) I For a description of course topics, see 486. Graduate-level requirements include extra readings and a research paper. P, 6 units of social sciences. (Identical with Anth. 586) May be convened with 486.

595. Colloquium a. Introduction to Graduate Study (1) I

596. Seminar a. Advanced Problems in Research (1-3) [Rpt.] I II
b. Graduate Teaching (3) II 2R, 3L.
c. Advanced Problems in Deviant Behavior (1-3) III
e. Social Organization (3) I [Rpt.6 units] P, completion of first-year graduate program curriculum in sociology. [Note: This is a two-semester course beginning in fall which receives a "K" grade at end of first semester].
f. Advanced Social Change (1-3) [Rpt.] I II

g. Advanced Juvenile Delinquency (1-3) I II
h. Macrosociology (1-3) I III

597. Extension Specialists Paul W. Brown, Thomas A. Doerge, John E. Watson

The Department of Soil and Water Science provides students with a broad background in soil science and water quality, with emphasis on environmental aspects of land and water use or plant production. The department offers the Bachelor of Science in Agriculture, Master of Science, and Doctor of Philosophy degrees with a major in soil and water science. All undergraduate students majoring in soil and water science must satisfy the general education requirements of the College of Agriculture, and must complete the following courses: Chem. 103a, 103b, 104a-104b, 241a or 322, 323; Phys. 102a, 180a; M.C.B. 181; Geos. 101; and Math. 123. The University Writing-Emphasis Course requirement can be met by completion of S.W. 411, 435 or 450.

A major in an emphasis in environmental science must complete S.W. 105, 106, 200, 201, 411, 435; A.Ec. 217; Pol. 481; and two of the following: S.W. 431, 450, 453, 470; H.W.R. 250. A minor in soil and water science, emphasizing either environmental science or plant production, is available to students from other disciplines. Requirements include S.W. 200, 201, and three of the following: S.W. 105 and 106, 201, 316 and 317, 411, 431, 435, and 470. In addition, students must take 6 units of environmental courses. A minor in soil and water science, emphasizing either environmental science or plant production, is available to students from other disciplines. Requirements include S.W. 200, 201, and three of the following: S.W. 105 and 106, 201, 316 and 317, 411, 431, 435, and 470. In addition, students must take 6 units of environmental courses. A minor in soil and water science, emphasizing either environmental science or plant production, is available to students from other disciplines. Requirements include S.W. 200, 201, and three of the following: S.W. 105 and 106, 201, 316 and 317, 411, 431, 435, and 470. In addition, students must take 6 units of environmental courses.

510. Introduction to Environmental Science: Land, Water, and Air (3) I Introduction to contemporary environmental issues and their relationship to physical, chemical, and biological principles. Discussion and evaluation of risks and tradeoffs in addressing solutions to environmental pollution. Optional field trip. P, high school chemistry recommended; CR, 106 encouraged. Caldwell

106. Environmental Science Laboratory: Land, Water, and Air (1) I Laboratory exercises and field trip experiences to study environmental problems related to land, water, and air resources. Basic physical, chemical and biological principles that relate to understanding environmental problems will be stressed. Field trips. P, algebra and high school chemistry recommended.

200. Soils (3) I II G.F. Fundamental principles of soil science-origin, nature, and constitution of soils; their chemical, physical, and biological properties in relation to plant growth and the nonplant uses of soils. P, Chem. 101a and 102a or 103a and 104a. Post


250. Water in Biosystems (3) I G.R. Identical with A.B.T. 250

316. Soil Fertility (3) II CTD Fertility status of semiarid and arid soils; factors affecting avail-
ability of the essential elements; influence of physical, chemical, and biological conditions on soil fertility; practices for assessing and improving soil fertility. P, 200.

317. Soil Fertility Laboratory (1) II Practical application of the basic concepts of soil fertility presented in 316, through demonstration and experimentation under laboratory, greenhouse and field conditions. Field trip. P, CR, 316.

330. Introduction to Remote Sensing (3) I (Identical with Geog. 330)


411. Soil Chemistry (3) I CDT Soil chemical interactions with water, air, plants and pollutants. 2R, 3L. P, 200, Chem. 103b, 104b. May be convened with 511. Bohn Writing-Emphasis Course. P, satisfaction of upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

417. Introduction to Geographic Information Systems (3) II (Identical with R.N.R. 417) May be convened with 517.

431. Soil Morphology, Classification and Survey (3) I Theory and practice of describing characteristics of soils; principles of soil classification and the classification systems; methods and applications of soil surveys. 2R, 3L. Field trips. P, 200, 201. May be convened with 531. Post


450. Anticipating the Future: Focus on Environment (3) II Techniques to understand broad issues about the future with focus on environmental topics. Uses computer conferencing and significant student discussion with opportunities for team approaches and reporting. P, upper-division standing. May be convened with 550. Caldwell Writing-Emphasis Course. P, satisfaction of upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

453. Remote Sensing of the Environment (3) II Remote sensing techniques and applications; problems and solutions; principles of soil, water, grasslands, and forest. Fundamental energy-matter interactions that influence the spectral characteristics of vegetation, soil, and water. 2R, 3L. Field trips. P, 330 or Phys. 102b. May be convened with 553. Hute

461. Soil and Water Conservation (3) S Consideration of major world soil and water conservation problems and solutions; principles of soil erosion by wind and water and their effects on world food problems. 2R, 3L. Field trips. P, 200. May be convened with 561. Post

470. Soil Physics (3) II CDT Soil structure and physical constitution of soils; the physical properties of soil-water systems, movement and exchange of gases in the soil, and physical laws governing the movement and availability of soil water. 2R, 3L. P, 200, Phys. 102b, CR, Math. 125a. May be convened with 570. Warrick

501. Management of Arid Lands and Salt-Affected Soils (3) II Principles and practices of soil, water and crop management under arid and semiarid conditions, the use of diagnostic procedures for evaluating soils and waters, reclamation, and economics of irrigation project development. 2R, 3L. Field Trip. Dutt

505. Chemical Analysis of Soils and Plants (3) II 1991-92 Principles and methods of chemical analysis of soils, water and biological materials with emphasis on instrumental techniques. 1R, 6L. P, Chem. 322, 323; Phys. 102b, 180b, Hendricks


511. Soil Chemistry (3) I CDT For a description of course topics, see 411. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. 2R, 3L. P, 200, Chem. 103b, 104b. May be convened with 411. Bohn

517. Introduction to Geographic Information Systems (3) II (Identical with R.N.R. 517) May be convened with 417.


530. Environmental Measurements (3) II 1992-93 Theory and application of physical fundamentals, basic electronic circuits, transducers, data acquisition and computer-based analysis to environmental measurements. 2R, 3L. P, Phys. 102b, Simpson

531. Soil Morphology, Classification and Survey (3) II For a description of course topics, see 431. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. Field trips. P, 200, 201. Geos. 101. May be convened with 431. Post

535. Soil Microbiology (3) I For a description of course topics, see 435. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. P, Chem. 241a, 241b. (Identical with Micr. 535) May be convened with 435. Pepper

541. Soil Genesis (3) II 1992-93 Physical and chemical processes and mineralogy of weathering and soil formation; quantitative pedology; the soil as part of the ecosystem. Field trips. P, Geos. 101 and Chem. 103b. (Identical with Geos. 541) Hendricks

545. Advanced Soil Microbiology (2) II 1992-93 Interaction between soil organisms and roots and rhizosphere dynamics. Fate and detection of pollutants in and around advanced topics in soil microbiology. P, 435 or Micr. 425. (Identical with Micr. 545)

550. Anticipating the Future: Focus on Environment (3) II For a description of course topics, see 450. Graduate-level requirements include a report in an area of special interest. May be convened with 450.

553. Remote Sensing of the Environment (3) II For a description of course topics, see 453. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. Field trips. P, 330 or Phys. 102b. May be convened with 453. Hute

561. Soil and Water Conservation (3) S For a description of course topics, see 461. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. Field trips. P, 200. May be convened with 461. Post


570. Soil Physics (3) II CDT For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. P, 200, Phys. 102b, CR, Math. 125a. May be convened with 470. Warrick

573. Monitoring Biosphere Processes (2) I 1992-93 Global-scale interactions of soils with their plant cover and climate. The spatial distributions and dynamics of soil-plant-water processes with emphasis on measurements from space. P, 200; 330 or 453. Hute


696. Seminar a. Topics in Soil, Water and Environmental Science (1) I II

Southwest Studies

1052 N. Highland Avenue
(602) 621-2484
The Southwest Center
Director Joseph C. Wilder

Southwest studies are designed to bring new perspectives to regional subjects through an interdisciplinary approach. Courses on the Southwest are taught through many university departments and programs, including American Indian studies, anthropology, English, geography, history, Latin American studies, linguistics, Mexican American studies, political science, sociology, Spanish and Portuguese, and women's studies. For information, contact the Southwest Center.
Spanish and Portuguese
(Spanish/Portuguese)

Modern Languages Building,
Room 545
(602) 621-3123

Professors Charles Tatum, Head, Leo L. Barrow, A. Dolores Brown (Emerita), Jack Emory Davis (Emeritus), John J. Gilbert, Lanin A. Gyurko, Richard P. Kinkade, Miguel Méndez, Dana A. Nelson, José Promis, Eliana S. Rivero, Renato I. Rosaldo (Emeritus)

Associate Professors Gilbert E. Evans, Karl C. Gregg, Judith Nantell, Karen L. Smith, H. Reynolds Stone

Assistant Professors Maria José Barbosa, June Jaramillo, Ana Perches, Robert N. Smead, Amy Williamsen

Lecturers Adalberto Guerrero, M. Nieve Pereira Parsons

The Department of Spanish and Portuguese offers courses in language skills, linguistics, poetics, composition, literature, and culture. It offers creative writing in Spanish. There is an alternate track designed especially for native speakers of Spanish with courses in language and culture, culminating in creative writing and a variety of classes in Chicano literature. The department provides academic direction in summer programs in Spanish at the Guadalajara Summer School and in Spain, and in a semester program in Portuguese at Pontificia Universidad Católica in Rio de Janeiro.

The department offers programs leading to the following degrees: Bachelor of Arts with majors in Spanish or Portuguese; Bachelor of Arts in Education with a teaching major in Spanish; Master of Arts with a major in Spanish (emphasizing either literature or language and linguistics); Master of Arts in Education with a teaching major in Spanish; and Doctor of Philosophy with a major in Spanish. For further information regarding the graduate programs, please consult the Graduate Catalog.

The major in Spanish for the B.A.: 36 upper-division units, 18 in language (including 405) and 18 in literature (including 320 and 6 units of one survey, either 400a-400b or 401a-401b).

The major in Portuguese for the B.A.: 30 units at 200 level or higher.

The supporting minor for majors in Spanish or Portuguese: recommended subjects are classics, drama, English, philosophy, other modern languages, humanities, history and theory of art or of music, journalism, speech, anthropology, political science, business, economics, history, linguistics, psychology, sociology; other subjects as may be individually justified.

The teaching major for the B.A. in Education: 24 units in upper-division Spanish, including 310, 320, 329, 330, 414, 470.

The teaching minor for the B.A. in Education: 20 units in Spanish, including 310, 320, 329.

Spanish 101, 102, 201, 202 and Portuguese 101, 102, 301a-301b are for the student who is learning a second language. Spanish and Portuguese 205 and 206 are for the student who has already learned a second language, preferably some Romance language. Span. 203, 303a-303b, 323, 333, 415 comprise the alternate track in communication skills for native speakers of Spanish.

Students will be placed in the proper class according to one or more of the following factors: previous experience or study, departmental placement examinations, individual counseling. Placement examinations are given during the summer to incoming freshmen and during the week of registration preceding the fall and the spring semesters to all students needing advice on placement. Non-credit proficiency examinations are available during registration and the first week of classes for students interested in challenging 300-level language courses; no credit or grade is given for this type of intra-departmental examination. Consult an undergraduate advisor. For information about proficiency examinations with credit, consult the Academic Guidelines section of this catalog.

The four-semester language proficiency group requirement may be satisfied by completing with a passing grade Span. 202, 203, 206, Port. 205 or 206. It may also be satisfied by placing in the fifth semester on the departmental placement examination or through Advanced Placement. Placement of students who are native speakers of Spanish is determined by placing in the fifth semester on the departmental placement examination or through Advanced Placement. Placement of students needing advice on placement. Non-credit proficiency examinations are available during registration and the first week of classes for students interested in challenging 300-level language courses; no credit or grade is given in such circumstances.

Writing-Emphasis Course: Since writing in all upper-division courses is in either Spanish or Portuguese, the requirement will be satisfied through completion of at least one 3-unit course designated as a Writing-Emphasis Course within the minor department. (See pertinent section in the Academic Guidelines section of this catalog.)

The department participates in the honors program.

For further information, contact your advisor and those of the Department of Spanish and Portuguese.

Spanish (SPAN)

101. First Semester Spanish (4) GRD Oral approach. For the student with no previous experience in Spanish.


201. Second Year Spanish (4) GRD Credit allowed for 201 or 203, but not for both. P, 102 or placement by examination.

202. Second Year Spanish (4) GRD Credit allowed for 202 or 333, but not for both. P, 201 or placement by examination.

203. Oral Communication in Spanish (4) Designed for native speakers of Spanish only, considered to be at the third-semester level. Credit allowed for this course or 201, but not both. (Identical with M.A.S. 203)

204a-204b-204c. Intensive Spanish (8-8-8) Offered in Guadalajara only. 204a is the equivalent of 101 and 102. 204b is the equivalent of 101 and 202. 204c is the equivalent of 201 and 202. Recommended for highly motivated students and/or those with experience in another Romance language.

205. Intensive Spanish (4) 205 is the equivalent of 101 and 102. Recommended for highly motivated students and/or those with experience in another Romance language.

206. Intensive Spanish (4) 206 is the equivalent of 201 and 202. Recommended for highly motivated students and/or those with experience in another Romance language.

277. Eroticism and Love in the Middle Ages (3) I II S (Identical with Ger. 277)

281. Introduction to Humanities (3) S (Identical with Ger. 285)

301a-301b. Intermediate Spanish (3-3) I II S (Identical with M.A.S. 301a-301b)

302. Intensive Spanish, Fifth and Sixth Semesters (6) GRD Offered in Guadalajara only. For those who have completed four semesters of college Spanish or equivalent. Will cover the 5th and 6th semester Spanish. A complete immersion in the study of intermediate Spanish, teaching all four skills. P, 202. Credit allowed for this course or 301a-301b, but not both.

303a-303b. Comprehensive Spanish for the Native Speaker of Spanish (3-3) I II S (Identical with L.A.S. 303a-303b)


320a-320b. Advanced Spanish (3-3) I II S (Identical with Ger. 320a-320b)


323. Commercial and Technical Spanish (3) I II P, 301b.


333. Native Speaker of Spanish (3) I II P, 202, 203, 204.


340. Survey of Spanish Literature (3-3) I II P, 301b.

341. Survey of Spanish- American Literature (3-3) I II P, 301b.

354. Selected Spanish Theatre (3) I II P, 301b.


400a-400b. Survey of Spanish Literature (3-3) 400a. From the beginning through the 17th century. 400b. 18th-20th centuries. P, 320. 400a is not prerequisite to 400b.

401a-401b. Survey of Spanish-American Literature (3-3) 401a. From the beginning through the 18th century. 401b. 19th and 20th centuries. P, 320. 401a is not prerequisite to 401b. (Identical with L.A.S. 401a-401b)

402. Survey of Mexican Literature (3) M.S. Major works by Mexican writers. Offered in Guadalajara only. F, five semesters of Spanish. (Identical with L.A.S. 402)
405. Advanced Composition and Conversation (3) II Study and practice in formal discussion and expository writing. P. 320. (Identical with L.A.S. 405) May be convened with 505.

414. Teaching of Modern Languages (3) II (Identical with T.T.E. 414) May be convened with 514.


422. Introduction to Romance Philology (3) I Survey of the development of the modern Romance tongues from the Latin language. P. Knowledge of two Romance languages. (Identical with Fre. 422, Ita. 422 and Port. 422) May be convened with 522.

423a-423b. Theory of Spanish Syntax (3-3) 423a: Introduction to current theories of syntax to describe specific phenomena. 423b: More detailed and further-ranging analysis of Spanish grammar within the general theory. P. 423a. (Identical with Ling. 423a-423b) May be convened with 523a-523b.

427. Applied Linguistics (3) I Application of linguistic theory, including psycholinguistic and sociolinguistic approaches to pedagogy. (Identical with Ling. 427) May be convened with 527.


435. Cervantes' Don Quixote (3) II P. 320. May be convened with 535.


447. Contemporary Mexican Literature (3) II S Major novelists of modern Mexico; their works, narrative perspective, characterization, language, time, space, and themes. P. 320. (Identical with M.A.S. 447) May be convened with 547.


473. Spanish for the Native Speaker of Spanish Classroom Teacher (3) II Practical Spanish for the elementary and secondary school subject-matter teacher who uses Spanish as the medium of instruction. P. 303a or 329 or 330. (Identical with M.A.S. 473) May be convened with 573.

485. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Ger. 485) May be convened with 585.

501. Literary Theory and Criticism (3) II 1992-93 Historical survey of theoretical writings on literature, with their implications for practical criticism.


504. Thirteenth Century Spanish Literature (3) II 1992-92 Epic, clerical verse, and origins of prose. P. 420 or 503.

505. Advanced Composition and Conversation (3) I II For a description of course topics, see 405. Graduate-level requirements include additional oral presentations and a specialized research paper. P. 330. (Identical with L.A.S. 505) May be convened with 405.

506. Fifteenth Century Spanish Literature (3) II 1992-93 Traditional courtly and satiric literature; the Celestina. P. 420 or 503.

508. Golden Age Theater II: Lope de Vega and His School (3) II 1992-93 The drama at apogee, principally in the plays of Lope de Vega and of Tirso de Molina. P. 400a.


514. Teaching of Modern Languages (3) II (Identical with T.T.E. 514) May be convened with 414.

515. Creative Writing in Spanish (3) II For a description of course topics, see 415. Graduate-level requirements include a research paper on creative writing theory from various authors' perspectives. P. 405. (Identical with L.A.S. 515) May be convened with 415.


520. Realism and Naturalism (3) II 1992-93 Major prose writers of the 19th century from Galdos to Blasco Ibanez.

521. The Generation of '98 (3) I 1991-92 Major literary expressions concerning the problems of Spain and the Spaniard from the late 19th century to 1936.

522. Introduction to Romance Philology (3) I For a description of course topics, see 422. Graduate-level requirements include a research paper of some amplitude on the morphology of the language for which the course credit is given. P. knowledge of two Romance languages. (Identical with Fre. 522) May be convened with 422.

523a-523b. Theory of Spanish Syntax (3-3) 523a: For a description of course topics, see 423a. Graduate-level requirements include additional readings and reports. P. 523a. (Identical with Ling. 523a-523b) May be convened with 423a-423b.

524. Contemporary Spanish Novel (3) II 1992-93 The novel since the Civil War.

525. Contemporary Spanish Poetry (3) II 1989-90

527. Applied Linguistics (3) I For a description of course topics, see 427. Graduate-level requirements include additional readings and reports. (Identical with Ling. 527) May be convened with 427.


531. Spanish-American Civilization (3) II For a description of course topics, see 431. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 431.

532. Pre-Columbian Culture and Myths (3) II 1992-93 For a description of course topics, see 432. Graduate-level requirements include additional readings and reports. P, 320. (Identical with L.A.S. 532) May be convened with 432.


534. Cultural and Literary Origins of Hispanic Southwest (3) I 1991-92 For a description of course topics, see 434. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 434.

535. Cervantes’ Don Quixote (3) II Graduate-level requirements include an in-depth research paper and formal oral presentations. P, 320. May be convened with 435.


541. Children’s Literature in Spanish (3) I For a description of course topics, see 441. Graduate-level requirements include two in-depth research papers. P, 320. (Identical with L.A.S. 541 and L.S. 541) May be convened with 441.

542. Mexican-American Poetry (3) I 1992-93 For a description of course topics, see 442. Graduate-level requirements include additional readings and reports. P, 320. (Identical with L.A.S. 542) May be convened with 442.

543. Mexican-American Literature (3) II For a description of course topics, see 443. Graduate-level requirements include additional readings and reports. P, 320. (Identical with Engi. 543, L.A.S. 543 and L.S. 543) May be convened with 443.

544. Mexican-American Narrative (3) I 1992-93 For a description of course topics, see 444. Graduate-level requirements include additional readings and reports. P, 320. (Identical with L.A.S. 544) May be convened with 444.

545. Novel of the Mexican Revolution (3) I Graduate-level requirements include additional readings and reports. P, 320. (Identical with L.A.S. 545) May be convened with 445.

546. Mexican-American Theater (3) I 1991-92 For a description of course topics, see 446. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 446.

547. Contemporary Mexican Literature (3) II S For a description of course topics, see 447. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 447.

549. Mexican and Mexican-American Film (3) II 1991-92 For a description of course topics, see 449. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 449.


573. Spanish for the Bilingual Classroom Teacher (3) II For a description of course topics, see 473. Graduate-level requirements include an in-depth study of special approaches to teaching grammar to native speakers of Spanish. P, 320a or 303 or 320. May be convened with 473.


578. Multimedia Approaches to Second Language Acquisition and Learning (3) II S Study of the theory and applications of multimedia to the development of second language skills.

585. Linguistic and Computer-assisted Approaches to Literature (3) II S Graduation requirements. P, 608 a.

586. Seminar (3) II S For a description of course topics, see 485. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 485.

591. Mexican and Mexican-American Film (3) II 1991-92 For a description of course topics, see 486. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 486.


621. Spanish in the Americas (3) I 1992-93 (Identical with L.A.S. 621)
549. Brazilian Literature in Film (3) 1992-93
For a description of course topics, see 449.
Graduate-level requirements include an in-depth research paper. P, 301a-301b. (Identical with L.A.S. 549) May be convened with 449.

564. Studies in Portuguese Literature (3) II
For a description of course topics, see 464.
Graduate-level requirements include extra compositions. P, 301a-301b. May be convened with 464.

596. Seminar

m. Mexican-American Heritage Bibliography - A Library Seminar (3) [Rpt.6 units] I (Identical with M.A.S. 596m, which is home)

696. Seminar

a. Portuguese Language (3) [Rpt.] II
b. Brazilian Literature: 16th-18th Centuries (3) II
c. Brazilian Literature: 19th Century (3) I

(Identical with L.A.S. 696k)

Special Education
(See Special Education and Rehabilitation under Education)

Speech and Hearing Sciences (SPH)
Speech Building, Room 104
(602) 621-1644

Associate Professors Kathryn A. Bayles, Linda Matkin, Ralph L. Shelton
Assistant Professors Jeannette D. Hoit, Yingyong Qi
Clinical Instructors Monica C. Golfer, Suzanne K. Quinn, Ruth E. Jones, Marilyn A. Pipes, Cynthia D. Psaltis, Rebecca B. Vance, Lucy E. Weeks
Director Anthony B. DeFeo (Speech-Language Clinic)

The Department of Speech and Hearing Sciences prepares students for careers in basic and clinical sciences (speech-language pathology, audiology, speech science, and hearing science) in university, laboratory, medical or other clinical settings, or as public school clinicians. Professional certification in the state of Arizona and with the American Speech-Language-Hearing Association requires graduate study with the acquisition of at least 30 semester credits or a Master of Science degree.

The department offers the following degrees: Bachelor of Science in Speech and Hearing Sciences, Master of Science and Doctor of Philosophy with a major in speech and hearing sciences. For graduate admission and degree requirements, consult the Graduate Catalog.

The major: In addition to the group units required for the B.S., as described in the College of Arts and Sciences section of this catalog, the major requires 30 units, including 260, 280, 367, 370a-370b and 483.

In addition to the general education requirements for the B.S. degree as described in the College of Arts and Sciences section of this catalog, the department requires one course in mathematics or statistics beyond college algebra and 6 hours in a laboratory science course beyond the minimum requirement. Students enrolled in the American Indian Professional Training program should consult with their advisors regarding the mathematics and science requirements.

A 20-unit minor is also required. At least 24 units in the major must be taken in residence. Minimum total units for the degree with this major—125.

106. Voice and Articulation (2) I II Designed to improve voice, articulation, and fluency patterns in speech. Class members' presentations are videotaped and analyzed. Individual laboratory practice.

107. Survey of Hearing, Language, and Speech: Normal and Disorders (3) II Role of speech, hearing, and language in human communication; normal processes and disorders in speech, language, and hearing; directed observations in laboratories and clinics.

260. Speech Science (4) I II Anatomy, neuroanatomy, physiology of the speech mechanism; acoustical characteristics of voice and speech sounds; frequency, intensity, time and wave composition. 3R, 3L. (Identical with Ling. 260)

280. Hearing Science (4) I II Anatomy, neuroanatomy, physiology of the auditory mechanism; audiology and psychoacoustics; decibel scale, normal auditory function. 3R, 3L.

350. Language Science (3) I The form, meaning, use, and biological base of language are described and related to monolingual and bilingual language development and impairment.

367. Phonetics (3) I Scientific study of speech sounds; articulatory phonetics, transcription, dialects and articulatory errors.

370a-370b. Introduction to Communication Disorders: Children and Adults (3-3) Nature of disordered communicative processes; principles of assessment and intervention of these disorders. 370a: Communication Disorders of Children. 370b: Communication Disorders of Adults. Open to majors only or consult department before enrolling. P, 250, 280.


458. Introductory Clinical Studies: Speech-Language Pathology (1-3) [Rpt.9 units] I II Basic clinical procedures for managing a limited range of speech and language disorders. Includes observation and supervised practice. Open to majors only, P, 551 or CR 471.

459. Introductory Clinical Studies: Audiology (1-3) [Rpt.9 units] I II Basic clinical procedures for identifying and managing a limited range of hearing losses in children and adults. Includes observation and supervised practice. Open to majors only, P, 483 or CR.

460. Speech and Hearing Science Instrumentation (2) I Consideration of some common and specific instruments and methods employed in speech and hearing laboratories and clinics. P, 260, 280 or CR. May be convened with 560R.

460L. Speech and Hearing Science Instrumentation Laboratory (1) P, CR, 460R. May be convened with 560L.

471R. Articulation Disorders and Therapies (2) I II Etiology, diagnosis, prognosis, and therapy for the articulatory aspects of communication problems. P, 370, 367, CR or subsequent registration in 471L (for majors). May be convened with 571R.

471L. Laboratory in Articulation Disorders (1) I Open to majors only. P, 471R or CR. May be convened with 571L.

483. Principles of Audiology (3) I Basic principles and techniques of audiological testing, etiologies of hearing impairment, and intervention strategies. P, 280 or graduate standing. May be convened with 583.

484. Audiologic Rehabilitation: Adults (3) II Speech reading; auditory training; problems encountered with amplification units; social, psychological, educational, speech, and language difficulties encountered by the hearing handicapped. P, 280, 483. May be convened with 584.

486. Child Audiology (3) II Study of the development and disorders of the auditory system; audiometric evaluation and differential diagnosis in infants and children; psychological, auditory, and educational aspects of the habilitation of aurally handicapped children. P, 280, 483. May be convened with 586.

496. Seminar

a. Clinical Observation and Analysis (1) I II

*Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of the catalog).

500. Introduction to Quantitative Methods and Research in Speech and Hearing Sciences (2) I Study of measurement and research design and their application in research and professional practice.

511. Professional Issues in Speech-Language Pathology and Audiology (1) I Professional practice issues including certification, licensure, supervision, quality control, ethics, federal and state legislation.

512. Principles of Neuroanatomy (4) II (Identical with Anat. 502)

510. Counseling Techniques in Communication Disorders (3) I Basic counseling techniques pertinent to clinical practice with the communication handicapped and their families.

551. Language Acquisition (3) II For a description of course topics, see 451. Graduate-level requirements include a scholarly paper project on a selected topic relevant to the course. (Identical with Ling. 551) May be convened with 451.

552. Language Disorders in School Age Children (3) II The nature and treatment of language disorders in children from grades K-12; relationships between language and
543. Principles of Audiology (3) I For a description of course topics, see 483. Graduate-level requirements include a scholarly paper/project on a selected topic relevant to the course. P, 280 or graduate standing. May be convened with 483.

544. Audiologic Rehabilitation: Adults (3) II For a description of course topics, see 484. Graduate-level requirements include a scholarly paper and/or project on a selected topic. P, 280, 483. May be convened with 484.

545. Audiologic Habilitation: Children (3) I Amplification, room acoustics, auditory and visual processing, evaluation and remedial programming for children with mild to moderate hearing impairment. P, 483 or 589.

546. Child Audiology (3) II For a description of course topics, see 486. Graduate-level requirements include a scholarly paper and/or project on a selected topic. P, 280, 483. May be convened with 486.


549. Advanced Audiologic Evaluation (3) Principles and techniques of administering and interpreting the comprehensive audiologic evaluation. 3R, 3L. P, 280, 483.


551. Seminar a. Experimental Phonetics (1-3) [Rpt./2 or 9 units] I II b. Clinical Audiology (1-3) [Rpt./2 or 9 units] II c. Hearing—Physiology and Psychophysics (1-3) [Rpt./2 or 9 units] II d. Language and Language Disorders (1-3) [Rpt./2 or 9 units] II e. Speech Pathology (1-3) [Rpt./2 or 9 units] II

600. Research Methods in Communication Sciences and Disorders (3) II Design and execution of descriptive and experimental research in communication sciences and disorders.

658a-658b. Advanced Clinical Studies: Speech-Language Pathology (1 to 3—1 to 3) [Rpt./9 units] I II With faculty consultation and supervision, students assume responsibility for all aspects of case management of children and adults. Exposure to clinical research methods and interdisciplinary staffings. 658b is in an extern setting. P, 471, 553.

659. Advanced Clinical Studies: Audiology (1-3) [Rpt./9 units] II With faculty consultation and supervision, students assume responsibility for all aspects of case management of adults and children. Exposure to clinical research methods and interdisciplinary staffings.

665R. Aerodynamic Evaluation and Management of the Speech Mechanism (2) II Principles and clinical methods of aerodynamic evaluation and management of the disordered speech mechanism, with practical experience provided through case studies and class experiments. P, 260, 460R/L, 567.
Statistics (STAT)
Economics Building, Room 317
(602) 621-4158

Professors Yashaswini Mittal, Head, J.L. Denny, Jean E. Weber
Associate Professor L. Larry Wright

The department offers a program leading to the Master of Science degree with a major in statistics. For graduate admissions and degree requirements, consult the Graduate Catalog.

160. Introduction to Statistics (3) I II Basic probability, uses of numerical data, useful probability distributions, estimation and hypothesis testing. Not applicable to the math major. P, Math. 117R/S.

263. Statistical Methods in Biological Sciences (3) I II An introduction to descriptive and inferential statistical techniques, with special emphasis on analysis of biological and clinical data. P, Math. 117R/S.


361. Statistics for Engineering and the Physical Sciences (3) I II Probability theory, point and interval estimation, hypothesis testing and regression analysis, applications to quality control and reliability theory. P, 9 units of calculus.


564. Theory of Probability (3) I (Identical with Math. 564) May be convened with 464.

565. Statistics for the Medical Sciences (4) I Standard and nonparametric one- and two-sample procedures, ANOVA designs, linear and multiple regression, bioassay, probit analysis, and contingency tables. 3R, 3L. Not open to majors. P, two semesters of calculus. (Identical with Fox. 565)

566a. Theory of Statistics (3-3) 566a: I For a description of course topics, see 466a. Graduates with independent coursework may qualify for more extensive problem sets or advanced projects. P, 464. (Identical with Math. 566a) May be convened with 466b. 566b: II Admissibility and invariance, exponential families, confidence intervals, sequential theory, multiple decision problems, other advanced topics depending on the instructor.


569. Seminar a. Research Methods (1-4) [Rpt./6 units] I II


663a-663b. Applied Statistics (3-3) 663a: I Analysis of variance, multiple regression components of variance, experimental design, failure of assumptions, randomization, exploratory data analysis, 663b: II Nonparametric methods, robust point and interval estimation, contingency tables, analysis of quantitative data, causal data, actual case histories.


665. Applied Time Series Analysis (3) I Methods used in time series analysis, with emphasis on applications, including computer analysis of data and consideration of violations of model assumptions. P, 560.


806. Theory of Probability (3) I (Identical with Math. 468) May be convened with 566a.


939. Internship a. Speech Pathology (1-6) I II Open to majors only.

959. Colloquium a. Motor Control (2) [Rpt./8 units] I II (Identical with Ex.S.S. 695a)

966. Seminar a. Experimental Phonetics (1-3) [Rpt./9 units] I II
b. Clinical Audiology (1-3) [Rpt./9 units] I II
c. Hearing—Physiology and Psychophysics (1-3) [Rpt./9 units] I II
d. Language and Language Disorders (1-3) [Rpt./9 units] I II
e. Speech Pathology (1-3) [Rpt./9 units] I II


564. Theory of Probability (3) I (Identical with Math. 564) May be convened with 464.

565. Statistics for the Medical Sciences (4) I Standard and nonparametric one- and two-sample procedures, ANOVA designs, linear and multiple regression, bioassay, probit analysis, and contingency tables. 3R, 3L. Not open to majors. P, two semesters of calculus. (Identical with Fox. 565)

566a. Theory of Statistics (3-3) 566a: I For a description of course topics, see 466a. Graduates with independent coursework may qualify for more extensive problem sets or advanced projects. P, 464. (Identical with Math. 566a) May be convened with 466b. 566b: II Admissibility and invariance, exponential families, confidence intervals, sequential theory, multiple decision problems, other advanced topics depending on the instructor.


568. Applied Stochastic Processes (3) II (Identical with Math. 568) May be convened with 468.

569. Seminar a. Research Methods (1-4) [Rpt./6 units] I II


663a-663b. Applied Statistics (3-3) 663a: I Analysis of variance, multiple regression components of variance, experimental design, failure of assumptions, randomization, exploratory data analysis, 663b: II Nonparametric methods, robust point and interval estimation, contingency tables, analysis of quantitative data, causal data, actual case histories.


665. Applied Time Series Analysis (3) I Methods used in time series analysis, with emphasis on applications, including computer analysis of data and consideration of violations of model assumptions. P, 560.
330R. Engineering Statistics (3) I II Engineering applications of statistical hypothesis testing, confidence intervals, linear regression, and experimental design. 1.5ES, 1.5ED. P, Math. 254, S.I.E. 230, CR 330L.

330L. Engineering Statistics Lab (1) I II Problem solving in the applications of engineering statistics. 0.5ES, 0.5ED. CR, 330R.


350. Deterministic Systems (3) II Analysis and design of linear deterministic systems in both the time and frequency domains using Fourier analysis, Laplace transforms and state space methods. Attention will be given to modeling physical and engineering systems. 3ES. P, Math. 254.

370. Microcomputer Systems (4) I II Boolean algebra, combinational and sequential logic circuits, state machines, simple computer architecture, assembly language programming, and real-time computer control. The computer is used as an example of systems engineering design; it is analyzed as a system, not as a collection of components. 3R, 3L. 1ES, 1.5ED. P, Eng. 101, E.C.E. 207.

377. Software for Engineers (3) I FORTRAN and C Modular design, program verification, data structures, and development of algorithms. Credit is allowed for this course or CS 342, but not for both. 1.5ES, 1.5ED. CR, 321.

406. Engineering Quality Control (3) II Quality planning, on-line statistical process control techniques for monitoring and improving the quality of manufactured products, acceptance sampling, and government standards. 2ES, 1ED. P, 230 or A.M.E. 474, CR, 330R, 330L.

408. Reliability Engineering (3) I Time-to-time failure, failure-rate, and reliability determination for early, useful and wear-out lives; equipment reliability prediction; spare parts provisioning; reliability growth; reliability allocation. Credit for this course or A.M.E. 472, P, 330, Math. 223, 1.5ES, 1.5ED. May be convenied with 508.


411. Human Interaction with Computers and Software (3) II The interaction of technical requirements with the characteristics of computer users and programmers as they affect the design of software, and the physical and cognitive interfaces between people and computers. 1ES, 2ED. P, 310. May be convenied with 511.

422. Engineering Decision Making Under Uncertainty (3) I Application of principles of probability and statistics to the design and control of engineering systems in a random or uncertain environment. Emphasis is placed on Bayesian decision analysis. 1ES, 2ED. P, 330R-330L. May be convenied with 522.

431. Digital Systems Simulation (3) I II Simulation modeling of systems using digital computer languages, emphasizing random variate generation, modeling, timekeeping structures and statistical design and analysis of simulation experiments. 1.5ES, 1.5ED. P, 321, 330R, 330L.

440. Survey of Optimization Methods (3) II Survey of methods including network flows, integer programming, nonlinear programming, and dynamic programming. Model development and solution algorithms are covered. 3ES. P, 340. May be convenied with 540.

442. System Design Projects (3) I II Practical application of engineering knowledge by student teams to actual system design problems in industry or business. Development of report writing and oral presentation skills. 3ED. P, 431. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)

453. Deterministic Control Systems (3) I The analysis and synthesis of deterministic linear control systems, with emphasis on design using both frequency-domain and state-variable approaches. 1.5ES, 1.5ED. P, 350.

462. Production Systems Analysis (3) I II Production systems, product and process design, quantitative methods for forecasting, aggregate planning, inventory control, materials requirement planning, production scheduling, manpower planning and facility design. 3ES. P, 340.

463. Facilities and Production Systems Design (3) I Case studies emphasizing aspects of production systems design such as facility location, facility layout, group technology, product and process design, material handling, and automated assembly. The student will be required to work in groups. Solutions will be presented using both written and oral reports. 3ED. CR, 462.

464. Facilities Layout and Location (3) I II Definition and solution of continuous and discrete, single and multifacility location problems for various objectives. Relative location of facilities departments for minimizing material handling and interaction costs. Emphasis on quantitative methods. 3ES. May be convenied with 564.

473. Concepts in Information and Communication Systems (3) I II Modeling and analysis of information and communication systems/networks for applications in telecommunications, systems and computer communication networks. Topics selected from the following: signal representation, sampling, coding and error detection, modulation, OSI network architecture, network protocols, delay models of performance, routing and flow control. 3ES. P, 321, 340. May be convenied with 573.

474. Expert Systems (3) I I Building, testing and evaluating expert systems, computer systems that emulate the human and draw conclusions based on incomplete or inaccurate data. Each student will build an expert system using commercially available expert system shells. 1ES, 2ED. P, familiarity with computers. May be convenied with 574.

475. Computational Methods for Games, Decisions, and Artificial Intelligence (3) I II An introduction to automata, computer representation and optimal solution of games and decision problems. Principles of heuristic programming and machine learning. A programming project is to be selected from areas such as game strategies, graphics, recreational mathematics, and manufacturing simulation. Microcomputer experience is emphasized. 1.5ES, 1.5ED. P, 270 or C.S. 227. May be convenied with 575.

476. Mathematical Analysis (3) I II An intermediate-level introduction to numerical methods and error analysis for function approximation and interpolation, integration, solution of linear and nonlinear equations, and differential equations. 3ES. P, Engr. 102, Math. 254. May be convenied with 576.


486. Modeling Manufacturing Systems (3) I II An intermediate-level introduction to topics in hierarchical design, planning, and control of manufacturing systems. Topics include modeling automated transfer lines, cellular manufacturing, and flexible manufacturing systems. Emphasis on material flow and analysis of throughput rate. 2ES, 1ED. P, 321, 340. May be convenied with 586.

495. Colloquium (1) I Open to majors only. P, Senior standing.

507. Advanced Engineering Quality Control (3) I II Advanced techniques for statistical quality assurance, including multivariate control charting, principal components analysis, economic design of acceptance sampling plans and control charts, inspection errors, and select papers from the recent literature. P. 530.

508. Reliability Engineering (3) I II For a description of course topics see 408. Graduate-level requirements include a special report of 30 pages on a specific reliability engineering topic. Credit for this course or A.M.E. 572. May be convenied with 408.


511. Human Interaction with Computers and Software (3) I II For a description of course topics see 411. Graduate-level requirements include separate examinations and a major project. P, 310. May be convenied with 411.


518. Reliability Testing (3) I II Mean-time-between-failure and reliability confidence limits; sequential testing; sampling; accelerated, sudden-death, and suspended-items; nonparametric, and Bayesian testing. Credit for this course or A.M.E. 575. P, 408, 530.

520. Stochastic Modeling (3) I I Modeling of stochastic processes from an applied viewpoint. Markov chains in discrete and continuous
time, renewal theory, applications to engineering processes. P. 321.

521a-521b. Advanced Systems Modeling and Simulation (3-3) (Identical with M.I.S. 521a-521b)

522. Engineering Decision Making Under Uncertainty (3) I For a description of course topics, see 422. Graduate-level requirements include a semester research project. P. 330R, 330L. May be convened with 422.

525. Queueing Theory (3) II Application of the theory of stochastic processes to queueing phenomena; introduction to semi-Markov processes, steady-state analysis of birth-death, Markovian, and general single- and multiple-channel queueing systems. P. 520.

528. Maintainability Engineering (3) II Complex systems reliability; maintainability engineering; reliability and availability of maintained systems; operational readiness; system effectiveness; maintainability demonstration. Credit for this course or A.M.E. 577, but not for both. P. 408.


532. Statistical Models in Engineering (3) Statistical distributions applicable in engineering, with emphasis on quality and reliability problems. Topics include model selection, parameter estimation, and approximations for large-scale systems. P. 530.

536. Experiment Design for Engineering I (3) I Design and analysis of experiments for engineering design and manufacture. Topics include classical designs, Japanese approaches, analysis of variance and regression analysis. P. 530 or Stat. 566a.

537. Experiment Design for Engineering II (3) II Continuation of 536. Topics include response surface analysis, related empirical optimization methods, random effects models and nested designs. P. 536.

540. Survey of Optimization Methods (3) II For a description of course topics, see 440. Graduate-level requirements include additional assigned readings and a project paper. P. 340. May be convened with 440.

541. Dynamic Programming (3) II 1991-92 Application of the art and theory of dynamic programming to common stochastic and deterministic sequential decision problems, including equipment replacement, capacity expansion, inventory planning and decision analysis. P. 321, 340.


550. Theory of Linear Systems (3) II An intensive study of continuous and discrete linear systems from the state-space viewpoint, including criteria for observability, controllability, and minimal realizations; and optionally, aspects of optimal control, state feedback, and observer theory. P. 350.

551. Modeling Physiological Systems (3) II Development and validation of models, sensitivity analyses, and applications of systems engineering techniques to physiological systems.


554. Mathematical Systems Engineering Design (3) I Tools for modeling and concurrent engineering of large-scale, complex systems: documentation, a system design language, quality function deployment, system coupling, subsystems, and homomorphisms.

555. Fuzzy Sets in Systems Analysis and Decision Making (3) I 1991-92 Fuzzy numbers' definition, operations, fuzzy regression, interpolation and reliability, fuzzy logic, optimization and control; fuzzy events and decision-making applications in areas such as systems, civil, industrial, electrical, computer engineering and water management.


564. Facilities Layout and Location (3) II For a description of course topics, see 464. Graduate-level requirements include additional assigned readings and an in-depth research paper on a course topic. P. 340, 462. May be convened with 464.

567. Advanced Production Control (3) II For a description of course topics, see 473. Graduate-level requirements include a course project in the subject area. P. 321, 340. May be convened with 473.

573. Concepts in Information and Communication Systems (3) II For a description of course topics, see 473. Graduate-level requirements include a course project in the subject area. P. 321, 340. May be convened with 473.

574. Expert Systems (3) I For a description of course topics, see 474. Graduate-level requirements include a strong testing and validation study of student's expert system. P. familiarity with computers. May be convened with 474.

575. Computational Methods for Games, Decisions, and Artificial Intelligence (3) I For a description of course topics, see 475. Graduate-level requirements include a comprehensive and intensive programming project. P. 270 or C.Sc. 227. May be convened with 475.

576. Numerical Analysis (3) I For a description of course topics, see 476. Graduate-level requirements include extra reading assignments and more sophisticated programming assignments. P. 140, 142, Math. 254, or equivalent. May be convened with 476.

583. Computer Integrated Manufacturing Systems (3) I Modern manufacturing systems with emphasis on information requirements and data management. Includes CAD, CAM, CAP, real time scheduling, networking and system justification.

584. Manufacturing Automation (3) I II Current topics in hardware for automation, selecting and implementing robots, part orientation, computer vision, automated warehousing and material handling, programmable controllers, NC machining, on-line computer control. Laboratory projects.

585. Introduction to Robotics (3) I For a description of course topics, see 485. Graduate-level requirements include two research projects. P. 350. May be convened with 485.

586. Modeling Manufacturing Systems (3) I II For a description of course topics, see 486. Graduate-level requirements include readings from the current literature and an in-depth paper on recent research on a course topic. P. 321, 340. May be convened with 486.

590. Selected Topics in Reliability (3) I In-depth analysis of selected advanced topics in reliability engineering from the recent archival literature. Project required. P. 530, A.M.E. 577.

620. Selected Topics in Probability Modeling (3) I II For a description of course topics, see 520. Graduate-level requirements include additional assigned readings from the current literature and an in-depth paper on recent research on a course topic. P. 321, 340. May be convened with 520.

625. Advanced Queueing Theory (3) Study of complex queueing models of engineering interest. Emphasis on algorithmic methods for the study of such models. P. 525.

631. Digital Systems Simulation (3) Emphasis on current research problems including random variate generation, modeling, language development and statistical analysis of output. P. 431 or M.I.S. 521a or 521b.

644. Numerical Methods for Nonlinear Programming (3) I II Unconstrained and constrained optimization problems from a numerical standpoint. Topics include variable metric methods, quadratic programming, active set methods, penalty function methods and suc-
cessive quadratic programming methods. P. 544.

645. Large-Scale Optimization (3) [1992-93]
Decomposition-coordination algorithms for large-scale mathematical programming. Methods include generalized Benders decomposition, resource and price directive methods, subgradient optimization, and descent methods of nondifferentiable optimization. Application of these methods to stochastic programming will be emphasized. P. 544.


685. Advanced Topics in Robotics (3) [II] Selected topics covering recent advances in robotics, to be chosen from a list including applications, kinematics, dynamics, tactile sensing and vision. P. 485.

686. Advanced Manufacturing System Modeling (3) [I] 1992-93 Current topics in design and analysis of manufacturing systems. Topics include serial processing lines, queuing networks and FMS. Student projects. P. 567 or 586.

695. Colloquium a. Doctoral (1-3) [Rpt. /12 units] I II Consult department before enrolling.

Teaching and Teacher Education

(See Teaching and Teacher Education under Undergraduate)

Theatre Arts (TAR)

University Theatre Building
Room 104
(602) 621-7008

Professors Robert C. Burroughs (Emeritus), Acting Head, Irene F. Comer (Emerita), Harold W. Dixon, J. Michael Gillette, Robert A. Keyworth (Emeritus), Frank K. La Ban, Peter R. Marroney (Emeritus), Sam Smiley
Associate Professors Patricia D. Van Metre, Richard T. Hanson, Peggy Keliner, William A. Lang, Peter Lehman, Mary Z. Maher, Jeffrey L. Warburton, Dianno J. Winslow
Assistant Professors Jerry R. Dickey, Karen K. Hustad, Julie A. Mack, Charles O'Connor, Elizabeth C. Ramirez

The Department of Theatre Arts offers the following degrees: Bachelor of Fine Arts with a major in theatre production with options available in acting/directing, design/technical production, and theatre specialist; Bachelor of Fine Arts with a major in musical theatre; Bachelor of Fine Arts with a major in theatre arts education; Bachelor of Arts in Theatre Arts with a major in dramatic theory; and Master of Arts and Master of Fine Arts with a major in theatre arts. For graduate admissions and degree requirements, consult the Graduate Catalog.

The Department of Theatre cooperates with the Department of Media Arts in providing course work for cinema studies. For additional information regarding studies in cinema, see the Department of Media Arts section of this catalog.

The Department of Theatre Arts is committed to providing professional training at the undergraduate and graduate levels in the theatre arts through a program of performance-centered activities and creative studies, the object of which is to insure that each student acquires a thorough understanding and appreciation of the theatre arts through classroom study, studio-laboratory training, and university theatre production. The program is designed to instill in the student the highest academic standards and professional skills required to initiate a career in educational or professional theatre.

Theatre arts core curriculum: Undergraduate. In the department with a major in theatre production or in theatre arts education are required to take the same curricular base. In addition to the 45 general education units described for the Bachelor of Fine Arts degree in the Faculty of Fine Arts section of this catalog, the following lower-division requirements must be met: T.Ar. 1, 113, 115, 16a or 16b, 118, 120, 145, 151, 220, 222, 223, 225, 245 and 246.

The requirements for the various programs are listed below.

Bachelor of Fine Arts

MAJOR IN THEATRE PRODUCTION: The Bachelor of Fine Arts with a major in theatre production is an extensive professional training program for highly talented and motivated theatre arts students. Admission to the upper division is granted only if the student has demonstrated strong potential for a professional career in the theatre. The faculty in the student's area of specialization will evaluate each student's professional potential, trainability, and talent after an audition, interview, and/or portfolio review. Options are as follows:

Acting/directing option: Admission is by interview and audition at the completion of the theatre arts core curriculum at the end of the sophomore year. The following requirements must also be met: T.Ar. 250, 251, 305, 306, 430, 440, 449, 451, 452, 455, 475, 4 semesters of 497 (4 units minimum); 6 units of dramatic literature; 4 units selected from Ex.S.S. 132a, 132c, Dnc. 112a, 112c, 143a, 152a, 152c, 175; and two units from Mus. 103 or 111 or 205 or Mus. 180v. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this option: 125.

Design/technical production option: Admission is by portfolio review and interview at the completion of the theatre arts core curriculum. The following requirements must be met: T.Ar. 340a, 340b, 401, 415, 416, 420, 421, 423 or 439, 424, 427, 429, 440, 455, 2-4 units of 496a, 4-8 units selected from 497a, 497b, 497c, 497d, or 497e, and 6 units of dramatic literature. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this option: 125.

Theatre specialist option: Admission is by interview with supporting documents and completion of the drama core curriculum. Upper-division course work must be planned at the beginning of the undertaking of a declared specialty with an academic advisor. This option offers the student the opportunity to design a specific curriculum in consultation with a departmental faculty advisor. The course of study may not substantially parallel that offered in any other departmentally administered degree program. The following requirements must be met: T.Ar. 440, 18 units of drama courses, and 6 units of dramatic literature. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this option: 125.

Note: All Bachelor of Fine Arts students must enroll in T.Ar. 497 every semester after admission to the upper division (minimum of four semesters).

MAJOR IN MUSICAL THEATRE: The musical theatre major is an extensive professional training program for those students interested in a career in musical theatre. The course of study, offered in cooperation with the School of Music and Committee on Dance, emphasizes the collaborative process of musical theatre and provides an intensive course of study in music, dance, and theatre arts. Admission to the upper division is granted only if the student has demonstrated strong potential for a professional career in musical theatre. Admission to advanced musical theatre course work is by interview and audition at the completion of the theatre arts core curriculum at the end of the sophomore year. At that time, the faculty will evaluate each student's professional potential, trainability, and talent. Required course work: Lower-division drama courses: T.Ar. 111, 113, 115, 116a or 116b, 118, 149, 151, 203, 250, 251, 255, Music courses: 110a, 110b, 120a, 120b, 130a, 130b, 8 semesters of Voice (to include 4 units of 285v, minimum level of proficiency), and 8 units of 200 (8 units T.Ar. 497 may be substituted for approved production). Dance courses: 112a or 112b, 112c, 143a or 143c, 152a, 175, 241a or 241b, 244a, 244b, 244c, 244d, 244f. Upper-division drama course work: T.Ar. 304, 305, 306, 340a or 340b, 404, 440, 449, 451, 452, 497i (4 units). Minimum total units for a degree with this major: 125.

MAJOR IN THEATRE ARTS EDUCATION: Students may be admitted upon completion of theatre arts core curriculum at the end of the sophomore year and an interview. This major is designed for students preparing for a teaching position in the junior and senior high schools. The student must complete the following theatre arts courses: T.Ar. 410, 440, 445, and 456; and at least 6 units selected from 203, 204, 237, 238, 250, 251, 267, 336, or 468. Admission to the following courses: F.M.S. 109, 203, 311, T.T.E. 225, 329, 330, 338, 435, 493b, and 494b. A teaching minor is not required, but those students anticipating employment in areas where a teaching minor might be advantageous should consult with their advisor. At least 18 units in the major must be taken in
residence. Minimum total units required for the degree with this major: 125.

NOTE: All Bachelor of Fine Arts students are required to take at least one 3-unit course focusing on gender, race, ethnicity, or non-western civilization. This course can be part of the major, general education, or elective course work and must be approved by the major advisor.

Bachelor of Arts in Theatre Arts

MAJOR IN DRAMATIC THEORY: The Bachelor of Arts in Theatre Arts is designed for the theatre generalist and provides an appropriate basis for advanced study of theatre history, theatre criticism, and performance at the graduate level. In addition to the general education units required, as described under the Bachelor of Arts in the Faculty of Fine Arts section of this catalog, the following requirements must be met: T.Ar. 111, 113, 116a or 116b, 118, 149, 245, 246, 340a-340b, 440, 460a or 460b, and 6 units of dramatic literature. A 20-unit minor is also required. (See the Faculty of Fine Arts section for details.) If the minor is in a field other than the fine arts, it is recommended that additional general electives be taken in fine arts. At least 18 units in the major must be taken in residence. Minimum total units required for a degree with this major: 125.

Minors

Theatre arts minor/teaching minor (20 units): Performance/playwriting/management classes (6 units minimum) choose from T.Ar. 100, 103, 410, 431, 432, 336, 460a, 460b; (Theatre arts minors may not take T.Ar. 113 and 116 to satisfy this requirement.) History classes (6 units minimum) choose from T.Ar. 245, 246, 340a-340b, 440; Production classes (6 units minimum) choose from T.Ar. 111, 113, 115, 116a, 116b, 118, 120, 203, 204, 220, 222, 223, 225.

100. Acting for General College Students (3) I I I S The craft of acting with emphasis on body, voice and mind. Theoretical background and practical experience, including in-class performances of selected scenes. Open to non-majors only.

103. Theatre Appreciation (3) I I An introduction to the art used in producing the play: direct, acting, technical production. Open to non-majors only.

111. Stagecraft (3) I I Basic principles of the scenic process: construction and use of materials, shop techniques and practices. 2R, 1L.

113. Stagecraft Crew (1) [Rpt./2] I I S Crew work on building theatrical sets or properties for department productions. P, CR, 116 for majors.

115. Makeup (1) I I History and essentials of makeup; straight, character, and special types; effects of light on makeup; opportunity for experience in production. 2S.

116a-116b. Stage Costume History (3-3) I I Trends of historic dress analyzed in relation to social and economic background; design and execution of costumes, and the organization and care of departmental wardrobes. 116a is not prerequisite to 116b. 2R, 3L.

118. Stage Costume Crew (1) [Rpt./2 units] I I S Crew work involved with costume construction, wardrobe maintenance and storage. P, CR, 116 for majors.

120. Basic Theatre Graphics (2) I I Practical graphic skills essential to theatrical production. 4S.

140a-140b. History of the Theatre and Drama in Western Civilization (3-3) Origins and development of the arts of theatre from primitive ritual to modern times; integrated study of plays, theatre architecture, dramatic styles, and theories of significant periods. 140a is not prerequisite to 140b. Credit will not apply toward theatre arts degree.

148. Acting I (3) I Fundamental techniques of acting, with emphasis on the actor's approach to characterization and the performer's relationship to all parts of the play's production. 2R, 2S. Open to drama majors only.

151. Acting II (3) I Intensive study of text analysis and the actor's approach to characterization as it pertains to modern realism. 2R, 2S, P, 149, audition.

194. Practicum
   a. Performance (1-2) [Rpt./4 units] I I S

203. Voice and Movement for the Actor I (1) [Rpt./1] I I Beginning voice and movement skills for the actor, including the Linklater approach, phonetics, physical isolation and awareness exercises. 2S. Open to drama majors only. P, 151, audition.

204. Voice and Movement for the Actor II (1) [Rpt./1] I I Continued voice and movement skills for the actor with a new focus on stage dialects and physicalization of character. 2S. Open to drama majors only: P, 203, 250, audition.

205. Musical Theatre (2) [Rpt./1] I I American musical theatre: its origins, development and influences. Practical applications. 1R, 2S. Open to majors only.

207. Western Civilization and the Arts: The Twentieth Century (3) I I (Identical with F.A. 207)

215. Sound for the Theatre (2) I I Basic technical and aesthetic principles of theatrical sound production. 2R, 2S.

220. Stage Lighting (3) I Studies in stage lighting equipment, procedures, design techniques, and shop practices. 2R, 1L, P, 120.


223. Scene Design (3) I I Basic principles of scenic design, painting techniques and shop practices. 2R, 1L.

225. Scene Design Crew (1) [Rpt./2 units] I I S Crew work involved with painting and decorating sets for department productions. P, CR, 223 for majors.

237. Oral Interpretation of Classical Drama (3) I Backgrounds in and analysis of structure and content of dramatic masterpieces of world literature from the Golden Age in Greece through the Restoration, with emphasis on oral presentation of selected scenes.

238. Modern Drama Through Performance (3) I Interpretation of modern plays from Ibsen to the present; presentation of speakers in drama, with emphasis on the physical and vocal qualities that project these characters; deals with the modern masters, such as Shaw, Miller, and Williams.

239. Speaking in the Arts (3) I I A studio class for performers in the fine arts who wish to develop skills in appearing on the electronic media, stressing background, current trends and performance techniques. (Identical with M.Ar. 239)

245. Principles of Dramatic Structure (3) I Interpretation of structural elements of major dramatic and styles in relation to stage presentation and film; reading and analysis of representative plays.

246. Dramatic Criticism (3) I Analysis of representative plays from world drama with an emphasis on their theatrical, literary and historical contexts. P, 245.

250. Acting III (3) I Intensive work in expanding the versatility of the actor's instrument. Improvisation, class exercises and scene work. 2R, 2S, P, 151, audition. CR, 203.

251. Acting IV (3) I Nonrealistic styles, including expressionism, absurdism and the contemporary avant-garde; work with select exercises in both representational and presentational modes. Analytical skills, scene analysis and the actor's unique approach to the text. 2R, 2S, P, 230, 250, audition. CR, 204.

267. English Phonetics (3) I Scientific study of the sounds of speech; emphasis on laws and principles determining articulatory features, dialect variation, sound change, and sound as a communication context.

304. Musical Theatre II (3) I Intensive text and score analysis in relation to the process of characterization for the actor, singer, dancer in musical theatre. Individual and group performance. Open to majors only: 2R, 2S, P, 205 and audition.

305. Voice and Movement for the Actor III (1) [Rpt./1] I Intermediate voice and movement skills for the actor including standard stage speech and period manners and movement; emphasis on Shakespearean style. 2S. Open to majors only: P, 204, 251, audition.

306. Voice and Movement for the Actor IV (1) [Rpt./1] I Continued intermediate voice and movement skills for the actor including individualized attention to special voice problems and period manners and movement. Emphasis on Commedia dell'Arte, Moliere and English Restoration styles. 2S. Open to majors only: P, 305.

307. Western Civilization and the Arts: Paleolithic through Renaissance (3) I I (Identical with F.A. 307)

317. Western Civilization and the Arts: Baroque through Nineteenth Century (3) I I (Identical with F.A. 317)

329. Art History of the Cinema (3) I I (Identical with F.A. 307)

336. Introduction to Shakespeare through Performance (3) I Understanding Shakespeare's plays through performance. Performance-oriented analysis compels a thorough comprehension of the ideas, emotions, attitudes, and intent of the plays being studied.

338. Teaching of Theatre Arts (3) I I Carries credit in education only. (Identical with T.T.E. 338)
### THEATRE ARTS 291

**340a-340b. History of the Theatre (3) I II** Origins and development of the arts of theatre from primitive ritual to modern times; integrated study of plays, theatre architecture, dramatic styles, and theories of significant periods. 340a prerequisite is a Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

**396H. Honors Proseminar (3) II**

**397. Workshop**
- a. Writing and the Arts (3) I II P, Engl. 101, 102. (Identical with Ar.E. 397a, Dnc. 397a, F.A. 397a, M.A.R. 397a, Mus. 397a)

**401. Advanced Stagecraft I (3)** I Advanced studies in scenic construction methods and techniques. P, 111. May be convened with 501.

**404. Musical Theatre III (3)** II Intensive scene study and exploration of the major historical styles and genres of the American musical theatre. 2R, 2S. Open to majors only. P, 304 and audition. May be convened with 504.

**410. Creative Drama (3)** I Principles and procedures of improvisation, role-playing, creative movement in creative dramatics applicable to the elementary and secondary school levels. P, 12 units of drama or education.

**414. Advanced Make-up (2) [Rpt./2]** History and practical application of theatrical make-up. Design and construct such items as masks, prosthetic pieces, wigs and beards. P, 115. May be convened with 514.


**416. Theatre Graphics III: Rendering (3) [Rpt./3]** I Advanced practical color theory in pigment and illustration, rendering mediums and techniques. P, 120. May be convened with 516.


**421. Special Effects for Theatre (3)** I Applied theory and techniques associated with sound system and visual effects in the theatre. 2R, 3L. May be convened with 521.

**422. Theatrical Properties (3) [Rpt./2]** I 1991-92 Construction and collection of stage properties. Experimentation with the use of materials and techniques. May be convened with 522.


**427. Advanced Stage Costume Construction I (3)** I II Advanced techniques in costume construction, including period pattern design, cutting and draping techniques. P, 116. May be convened with 527.


**430. Stage Management (2)** I Principles and techniques of stage management, practical applications, problems and analysis of stage managing. P, 111, 151. May be convened with 530.

**431. Theatre Publicity and Box Office (3)** I Publicity, press releases, sales, advertising, display techniques, subscription procedures. P, 12 units of theatre arts or related arts fields. May be convened with 531.

**432. Theatre Management (3)** II Amateur, educational and professional theatre organization and management; theatrical contracts, professional unions and representative organizations. P, 12 units of theatre arts or related arts fields. May be convened with 532.


**441. Advanced Stage Lighting II (3)** I An advanced study of lighting design for opera and dance; theoretical (light plots) and practical (light lab) projects. P, 420/520. May be convened with 542.

**449. Acting V (3)** I Intensive study of classical acting styles with emphasis on Shakespeare. Individual and group performance. 2R, 2S. P, 251 and audition. May be convened with 548.


**452. Acting VII (3)** I [Rpt./1] Audition material, techniques and research into problems of a professional actor seeking employment in the theatre. 2R, 2S. May be convened with 552.

**455. Directing I (3)** I Directing including play analysis, director-actor communication and the completed production; special attention given director-designer communication. P, 452, audition. May be convened with 553.

**461. Artist Collaboration (2) [Rpt./2]** I The development and communication of a visual idea for performance art; exploring all mediums of visual and aural communication. May be convened with 561.

**468. Dialects in Performance (3)** Application of suitable phonetic theory toward a systems approach to acquiring dialects for performance in stage, television with 425, pronunciation. 1R, 4S, P, ability to do close transcription in International Phonetic Alphabet (IPA). May be convened with 568.

**475. Screen Acting Techniques (3)** II Principles and techniques of various performance methods involved in acting for television and motion pictures; basic problems faced by the professional actor seeking employment in these media; on camera experience with directed exercises and dramatic scenes. 2R, 3L. P, 151, audition. May be convened with 575.

**497. Workshop**
- a. Technical Production (1-6) [Rpt./20 units] I II S May be convened with 597a.
- b. Costume Production (1-6) [Rpt./20 units] I II S May be convened with 597b.
- c. Lighting Production (1-6) [Rpt./20 units] I II S May be convened with 597c.
- d. Sound Production (1-6) [Rpt./20 units] I II S May be convened with 597d.
- e. Scenic Production (1-6) [Rpt./20 units] I II S May be convened with 597e.
- f. Performance (1-6) [Rpt./20 units] I II S May be convened with 597f.

**501. Advanced Stagecraft I (3)** I For a description of course topics, see 401. Graduate-level requirements include an additional creative and/or research project. P, 111. May be convened with 401.

**504. Musical Theatre III (3)** II For a description of course topics, see 404. Graduate-level requirements include an additional performance and/or research project. Open to majors only. P, 304 and audition. May be convened with 404.

**514. Advanced Make-up (2) [Rpt./2]** For a description of course topics, see 414. Graduate-level requirements include an additional creative and/or research paper. P, 111. May be convened with 414.

**515. Theatre Graphics II: Drafting (3)** I For a description of course topics, see 415. Graduate-level requirements include an additional creative and/or research project. P, 115. May be convened with 415.

**520. Advanced Lighting Design I (3)** I For a description of course topics, see 420. Graduate-level requirements include an additional creative and/or research project. P, 120. May be convened with 420.

**521. Special Effects for Theatre (3)** I For a description of course topics, see 421. Graduate-level requirements include an additional cre-
Graduate-level requirements include an additional creative and/or research project. May be convened with 421.

522. Theatrical Properties (3) [Rpt./2] 1991-92 For a description of course topics, see 422. Graduate-level requirements include an additional creative and/or research project. May be convened with 422.

523. Scene Painting (3) I 1992-93 For a description of course topics, see 423. Graduate-level requirements include an additional creative and/or research project. May be convened with 423.


525. Advanced Stagecraft II (3) I 1991-92 Advanced study of lighting design for musical theatre and motion pictures. May be convened with 457.

529. Advanced Stage Costume Design I (3) I 1991-92 Advanced study of costume design with a description of course topics, see 453. Graduate-level requirements include an additional performance and/or research project. P, 455. May be convened with 452.

530. Stage Management (2) I For a description of course topics, see 430. Graduate-level requirements include an in-depth research paper or project. P, 12 units of theatre arts or related fields. May be convened with 431.

532. Theatre Management (3) II For a description of course topics, see 432. Graduate-level requirements include an in-depth research paper or project. P, 12 units of theatre arts or related fields. May be convened with 432.

539. Theatre Graphics IV: Model Making (3) I For a description of course topics, see 439. Graduate-level requirements include an additional creative and/or research project. May be convened with 439.

541. Scenography (3) I The integration of scenery, costume, make-up, light and sound into a total production design.

542. Advanced Stage Lighting II (3) I For a description of course topics, see 442. Graduate-level requirements include an additional creative and/or research project. P, 420/520. May be convened with 442.

543. Advanced Stage Lighting III (3) I An advanced study of lighting design for musical theatre; theoretical (light plots) and practical (light lab) projects. P, 420.

546. Dance Program Administration (3) II 1992-93 (Identical with Dnc. 546)

549. Acting V (3) I For a description of course topics, see 449. Graduate-level requirements include an additional performance and/or research project. P, 251 and audition. May be convened with 449.

550. Literary Resources for Choreography (3) II 1991-92 (Identical with Dnc. 550)

551. Acting VI (3) II For a description of course topics, see 451. Graduate-level requirements include an additional performance and/or research project. P, 305, 449, audition. May be convened with 451.

552. Acting VII (3) I [Rpt./1] For a description of course topics, see 452. Graduate-level requirements include an additional performance and/or research project. P, 455, 449, audition. May be convened with 452.

553. Acting VIII (3) II For a description of course topics, see 453. Graduate-level requirements include an additional performance and/or research project. P, 452, audition. May be convened with 553.

554. Directing I (3) I For a description of course topics, see 455. Graduate-level requirements include an additional performance and/or research project. May be convened with 455.

556. Directing II (3) II For a description of course topics, see 456. Graduate-level requirements include an additional performance and/or research project. P, 455. May be convened with 456.

560a-560b. Writing for Stage and Screen (3-3) For a description of course topics, see 460a-460b. Graduate-level requirements include the preparation of full-length scripts for stage and motion pictures. May be convened with 460a-460b.

561. Artist Collaboration (2) [Rpt./2] 1992-93 For a description of course topics, see 461. Graduate-level requirements include an additional creative and/or research project. May be convened with 461.

563. Actors in Performance (3) For a description of course topics, see 463. Graduate-level requirements include a close transcription of a selected director or directors from oral presentation and a suitable analysis of the artistic features. P, ability to do close transcription in International Phonetic Alphabet (IPA). May be convened with 463.

575. Screen Acting Techniques (3) II For a description of course topics, see 475. Graduate-level requirements include an additional performance and/or research project. P, 151, audition. May be convened with 475.

595. Colloquium a. Evaluation of Dance and Body Techniques (2) I (Identical with Dnc. 595a)

596. Seminar d. Dance-Related Art Forms (3) II 1992-93 (Identical with Dnc. 596d, which is home) May be convened with 496d.

597. Workshop a. Technical Direction (1-6) [Rpt./20 units] I II S May be convened with 497a.

600. Introduction to Graduate Study of Drama (3) I Methods and materials for research in theatre and drama; introduction to the bibliography of these fields; organization as form of thesis.

605. Advanced Voice and Movement for the Actor I (3) [Rpt./1] I Advanced study and exercise in voice and movement for the actor: relaxation, breathing, physical and vocal freedom, resonance, articulation and improvisation including the Linklater Approach, I.P.A., and Neutral Mask. 6S, P, audition.

606. Advanced Voice and Movement for the Actor II (3) [Rpt./1] II Continued advanced study and exercise in voice and movement for the actor: standard stage speech, stage dialects, period customs, manners and movement. 6S, P, audition.

640. Dramatic Criticism: Tragedy (3) I Comparative analysis of tragedy and theories of tragedy from antiquity to the present for stage and screen; writing of critical papers.

641. Dramatic Criticism: Comedy (3) I Comparative analysis of comedy and comic theory from antiquity to the present for stage and screen; writing of critical papers.

642. Advanced Studies in Theatre History (3) I II Concentrated study in theatre history, with major emphasis on the physical theatre, standard scholarly works, and source materials.

644. History of the American Theatre: Studies I (3) I For a description of course topics, see 444. Graduate-level requirements include an additional creative and/or research project. May be convened with 457.


651. Experimental Theatre II (3) II Theories, and techniques of avant-garde theatre. Rehearsal and performance of select projects.

655. Advanced Directing (3) I Techniques of stage directing, including play analysis, director-actor communication, director-designer communication, blocking, movement, composition; use of directorial style and the adaptation of directorial philosophies. 2S, 2S.

656. Advanced Directing II (3) I Techniques of analyzing and staging classical texts for a contemporary audience; use of directorial style and the adaptation of directorial philosophies with an emphasis on staging the plays of Shakespeare. 2R, 2S, P, 449, 655.

692* Seminar a. Contemporary Trends (1-3) [Rpt./6 units] I I

b. Special Topics in Acting (1-3) [Rpt./6 units] I I

c. Special Topics in Directing (1-3) [Rpt./6 units] I I

d. Musical Theatre Production (1-3) [Rpt./6 units] I I

e. Special Topics in Writing (1-3) [Rpt./6 units] P, permission of instructor.

f. Documentary and Educational Films (1-3) [Rpt./6 units] I I

h. Special Topics in Stage Costume Construction (1-3) [Rpt./6 units] I I
THEATRE ARTS—VETERINARY SCIENCE

Course requirements for the major, in addition to the basic skills and proficiencies of the general requirements for the Bachelor of Science in Agriculture (see the College of Agriculture section of this catalog), include Math. 117R/S, 118R/S, 213 or 320; or V.Sc. 400a-400b and 495a plus 9 additional units (no more than 3 units of independent study and/or internship in V.Sc.). Highly recommended courses include An.S. 415R, 415L, 430, 436, and any animal production courses; M.C.B. 410a and 456 and additional courses in biological sciences, business or environmental sciences. A minimum of 18 units in human and social sciences must be completed from a college-approved list in three of the four general education study areas. Students should consult a departmental advisor in planning their programs.

No advanced degree is offered in veterinary science. The department cooperates with Microbiology and Immunology to offer a doctoral minor in veterinary sciences.

400a-400b. Animal Anatomy and Physiology (3-3) Physiology, gross and comparative anatomy. 400a: Nervous, musculoskeletal, immune, hemolymphatic, circulatory, and renal systems. 400b: Respiratory, digestive, endocrine and reproductive systems. 400a is not prerequisite to 400b. P: Ecol. 181, 182; Chem. 243a; Math. 117R/S. May be convened with 500a-500b.

403R. Biology of Animal Parasites (3) I Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential. P: 8 units of biology or microbiology. (Identical with Ento. 403R, Ecol. 403R and Micr. 403R) May be convened with 503R.

403L. Parasitology Laboratory (1) I Parasite morphology and diagnostic laboratory techniques. P: Prerequisite to 403R. (Identical with Ento. 403R, Ecol. 403R and Micr. 403R) May be convened with 503L.

405. Animal Diseases (3) I Integration of management, husbandry, and preventive veterinary medicine, as related to animal diseases. May be convened with 505.

415R. Physiology of Reproduction (3) I (Identical with An.S. 415R)

415L. Physiology of Reproduction Laboratory (1) I (Identical with An.S. 415L)

419R. General Immunology (3) I (Identical with Micr. 419R)

420R. Pathogenic Bacteriology (3) II (Identical with Micr. 420R) May be convened with 520R.

420L. Pathogenic Bacteriology Laboratory (2) II (Identical with Micr. 420L) May be convened with 520L.

423R. General Pathology (3) II Pathogenesis, pathophysiology and morphologic changes of human and animal diseases. P: Micr. 420R. (Identical with Micr. 423R and Tox. 423R) May be convened with 523R.

423L. General Pathology Laboratory (1) I Gross and histologic changes occurring in tissues and organs in selected human and animal diseases and disease processes. P: 423R or CR. (Identical with Micr. 423L and Tox. 423L) May be convened with 523L.

437. Vertebrate Physiology (4) I (Identical with Ecol. 437)


443. Research Animal Methods (3) I Regulations, care, diseases and techniques involving common laboratory animals used in research and teaching programs. (Identical with An.S. 443, Bioc. 443, Micr. 443) May be convened with 543.


450L. Medical Mycology Laboratory (2) II (Identical with Micr. 450L) May be convened with 550L.

450R. Medical Mycology (2) II (Identical with Micr. 450R) May be convened with 550R.

452. Medical-Veterinary Entomology (4) II (Rpt. /3) I (Identical with Ento. 452) May be convened with 552.


459. Comparative Vertebrate Histology (4) II I Identification, phylogeny, and function of normal vertebrate tissues, 2R, 6L. P: 12 units of animal biology. A vertebrate anatomy and/or systematics course is strongly recommended. (Identical with Ecol. 459) May be convened with 559.

466. Physiology Laboratory (2) II (Identical with Ecol. 466) May be convened with 566.

468. Comparative Physiology (3) II (Identical with Ecol. 468) May be convened with 568.

495. Colloquium a. Topics in Veterinary Science (1) II Writing Emphasis Course. P: satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).
cal with Ento. 503R, Ecol. 503R and Micr. 503R) May be convened with 403R.

503L. Parasitology Laboratory (1) I For a description of course topics, see 403L. Graduate-level requirements include an in-depth research paper dealing with the differential diagnostic techniques used to identify a single parasite species. P, 9 units of ecology or microbiology, CR. 403R. (Identical with Ecol. 503L, Ento. 503L and Micr. 503L) May be convened with 403L.

505. Animal Diseases (3) I For a description of course topics, see 405. Graduate-level requirements include an in-depth research paper on an animal disease topic. May be convened with 405.

520R. Pathogenic Bacteriology (3) (Identical with Micr. 520R) May be convened with 420R.

520L. Pathogenic Bacteriology Laboratory (2) II (Identical with Micr. 520L) May be convened with 420L.

523R. General Pathology (3) II For a description of course topics, see 423R. Graduate-level requirements include attainment of a higher overall examination score and a research paper. P, Micr. 420R. (Identical with Micr. 523R and Tox. 523R) May be convened with 423R.

523L. General Pathology Laboratory (1) I For a description of course topics, see 423L. Graduate-level requirements include attainment of a higher overall examination score and a research paper. P, 423R or CR. (Identical with Micr. 523L and Tox. 523L) May be convened with 423L.

538. Ecology of Infectious Disease (3) II For a description of course topics, see 438. Graduate-level requirements include in-depth research paper and presentation. P. 419R or 420R. (Identical with Micr. 538) May be convened with 438.

543. Research Animal Methods (3) I For a description of course topics, see 443. Graduate-level requirements include an in-depth research paper on one of the lecture topics presented in the course. (Identical with An.S. 443, Bioc. 443, Micr. 443) May be convened with 443.

549. Diseases of Wildlife (3) II For a description of course topics, see 449. Graduate-level requirements include either a term paper based on assigned reading or a research paper compiling field studies on other research experiences in wildlife disease. (Identical with An.S. 549 and W.F.Sc. 549) May be convened with 449.

550L. Medical Mycology Laboratory (2) II (Identical with Micr. 550L) May be convened with 450L.

550R. Medical Mycology (2) II (Identical with Micr. 550R) May be convened with 450R.

552. Medical-Veterinary Entomology (4) [Rpt./3] II (Identical with Ento. 552) May be convened with 452.

555R. Fishery Management (3) II (Identical with W.F.Sc. 555R)

558. Comparative Vertebrate Anatomy (4) I For a description of course topics, see 458. Graduate-level requirements include a library and/or dissection report. P. 8 units of animal biology. (Identical with Ecol. 558) May be convened with 458.

559. Comparative Vertebrate Histology (4) II For a description of course topics, see 459. Graduate-level requirements include a written report on a selected topic. 2R, 6L, P, 12 units of animal biology. A vertebrate anatomy and/or systems course is strongly recommended. (Identical with Ecol. 559) May be convened with 459.

566. Physiology Laboratory (2) II (Identical with Ecol. 566) May be convened with 466.

568. Comparative Physiology (3) II (Identical with Ecol. 568) May be convened with 468.

601. Experimental Surgery (2) II 1991-92 Exercizes in the surgical procedures commonly necessary in animal experimentation, including aseptic technique, anesthesiology, surgical operations, and care of the postsurgical patient. 1R, 3L, P. 3 units of mammalian anatomy.

630. Immunology (4) II 1992-93 (Identical with Micr. 630)

649. Fishery-Water Quality and Toxicology (3) I (Identical with W.F.Sc. 649)

Watershed Management
(See Renewable Natural Resources)

Wildlife and Fisheries Science
(See Renewable Natural Resources)

Women's Studies (WS)
Douglass Building, Room 102
(602) 621-7338

Committee on Women's Studies

Professors Susan Hardy Aiken (English), Barbara Babcock (English), Gail Bernstein (History), Carren Deming (Media Arts), Paula England (Sociology), Barbara Gutek (Management and Policy), Billie Jo Inman (English), Lynn Smith-Lovin (Sociology), Linda Molm (Sociology), Susan Philips (Anthropology), Eliana Rivero (Spanish and Portuguese), Alice Schlegel (Anthropology), Sheila Slaughter (Higher Education), Monique Wittig (French and Italian)
Associate Professors Karen Anderson, Chair (History), Esther Fuchs (Near Eastern Studies), Donna Guy (History), Ingeborg Kohn (French and Italian), Patricia MacCorquodale (Sociology), Betty Newsom (Counseling and Guidance), Chia-Lin Pao Tso (Near Eastern Studies), Lynda Zwinger (English)
Assistant Professors Anne Betteridge (Adjunct, Center for Middle Eastern Studies), Nira Brown (French and Italian), Jolene Galegher (Man-
WOMEN'S STUDIES 295

396H. Honors Proseminar (3) I (Identical with Fre. 396H, which is home).

406. Gender and Social Identity (3) II (Identical with Anth. 406)

417. Women Authors (3) I (Identical with Engl. 417)

418. Women in Literature (3) II (Identical with Engl. 418)

423. Representation of Gender in the Media (3) I (Identical with M.Ar. 423)


453. History of Women and Work (3) I (Identical with Hist. 453)

458. Feminism: A Comparative History (3) II (Identical with Hist. 458)

459. Sociology of Gender (3) I II (Identical with Soc. 459)

465. Women in International Development (3) II (Identical with Anth. 465)

468. Women in China (3) I (Identical with Chn. 468)

469. History of Women in Latin America (3) II (Identical with Hist. 469)


480. Men, Women and Work (3) I II Open only to students who meet the requirement for Advanced Standing as specified in the College of Business and Public Administration section of the catalog. (Identical with M.A.P. 480)

485. Mexicana/Chicana Women's History (3) I CDT (Identical with M.A.S. 485)

489. Women in East Asia (3) I (Identical with Hist. 489)

490. Women in Middle Eastern Society (3) I (Identical with Anth. 490)

496. Seminar a. Women's Studies (3) [Rpt./2] II c. Women in American Architecture (3) II (Identical with Arch. 496c, which is home)

558. Gender Identities and Interactions (3) (Identical with Soc. 558)

571. Counseling Women (3) II (Identical with Coun. 571)

595. Colloquium e. Advanced Studies in the History of Women (3) [Rpt./5] I II (Identical with Hist. 595e, which is home)

596. Seminar g. Comparative Literature (3) [Rpt.] I II (Identical with Engl. 596g)

n. Comparative Women's History (3) [Rpt./4] P, consult committee before enrolling. (Identical with Hist. 596n, which is home)

w. Women's Studies (3) [Rpt.] I II (Identical with Engl. 596w, which is home)

Zoology

(See Ecology and Evolutionary Biology)
Accreditations and Memberships

ACCREDITATIONS

Accreditation Board for Engineering and Technology; American Assembly of Collegiate Schools of Business; American Association for Accreditation of Laboratory Animal Care; American Association of Museums; American Chemical Society; American Council on Pharmaceutical Education; American Dietetic Association; American Library Association; American Planning Association; American Psychological Association (graduate program in clinical psychology and graduate program for school psychologists); American Speech-Language-Hearing Association; Association of American Law Schools and American Bar Association; Commission on Rehabilitation Education; Council on Education in Journalism and Mass Communications; Council on Rehabilitation Education; Liaison Committee on Medical Education of the American Medical Association and the Association of American Medical Colleges; National Architectural Accrediting Board; National Association of Schools of Dance; National Association of Schools of Music; National Association of Schools of Public Affairs and Administration; National Association of Schools of Theatre; National Council for Accreditation of Teacher Education; National League for Nursing; North Central Association of Colleges and Schools.

MEMBERSHIPS

Accrediting Council on Education in Journalism and Mass Communications; American Anthropological Association; American Association for Higher Education; American Association for Laboratory Animal Science; American Association of Colleges for Teacher Education; American Association of Colleges of Nursing; American Association of Colleges of Pharmacy; American Association of Collegiate Registrars and Admissions Officers; American Association of University Women; American College Dance Festival Association; American College Theatre Festival Association; American Council of Learned Societies; American Council on Education; American Economic Association; American Institute for Iranian Studies; American Institute of Maghribi Studies; American Institute for Yemeni Studies; American Newspaper Publishers Association; American Political Science Association; American Psychological Association; Association for Communication Administration; Association for Gerontology in Higher Education; Association for Public Policy and Management; Association for Theatre in Higher Education; Association for University Business and Economic Research; Association of Academic Health Centers; Association of American Colleges; Association of American Geographers; Association of American Medical Colleges; Association of American State Geologists; Association of American University Presses; Association of Collegiate Schools of Architecture; Association of Collegiate Schools of Planning; Association of Research Libraries; Association of Systematic Collections; Association of Universities for in Astronomy; Association of University Summer Sessions; Border State Universities Consortium for Latin America; Broadcaster Education Association; Center for Arabic Study Abroad; College Art Association of America; College Entrance Examination Board; Consortium of Western Universities and Colleges; Council for Advancement and Support of Education; Council of Graduate Schools in the United States; Council of United States Universities for Soil and Water Development in Arid and Subhumid Areas; EDU-COM, Interuniversity Communications Council; Inter-University Consortium for Political and Social Research; Eisenhower Consortium; Graduate Management Admissions Council; Institute of International Education; International Museum of Photography; Latin American Scholarship Program of American Universities; Middle East Studies...
Academic Divisions

More detailed information may be found under listings for the specific college or department.

COLLEGE OF AGRICULTURE—Schools: School of Family and Consumer Resources (with divisions in Family Studies; Educational and Professional Studies; and Merchandising, Consumer Studies and Design); School of Renewable Natural Resources (with programs of Landscape Resources; Range Resources; Watershed Resources; Wildlife and Fisheries Resources). Departments of: Agricultural and Biosystems Engineering; Agricultural Economics; Agricultural Education; Animal Sciences; Entomology; Nutrition and Food Science; Plant Pathology; Plant Sciences; Soil and Water Science; Veterinary Science. University Departments of: Biochemistry, Microbiology and Immunology; Molecular and Cellular Biology.

COLLEGE OF ARCHITECTURE

COLLEGE OF ARTS AND SCIENCES—Schools: School of Music; Graduate Library School. Departments of: Anthropology; Art; Astronomy; Atmospheric Sciences; Chemistry; Classics; Communication; Computer Science; East Asian Studies, Ecology and Evolutionary Biology; English; French; and Italian; Geography and Regional Development; Geosciences; German; History; Journalism, Linguistics; Mathematics; Media Arts; Near Eastern Studies; Philosophy; Physics; Planetary Sciences; Political Science; Psychology; Russian and Slavic Languages; Sociology; Spanish and Portuguese; Speech and Hearing Sciences; Statistics; Theatre Arts. University Departments of: Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology. Committees on: African-American Studies; Critical Languages; Dance, Judaic Studies; Mexican American Studies; Religious Studies; Russian and Soviet Studies; Women's Studies. Program: Humanities.

COLLEGE OF BUSINESS AND PUBLIC ADMINISTRATION—Schools: Karl Eller Graduate School of Management; School of Public Administration and Policy. Departments of: Accounting; Economics; Finance and Real Estate; Management and Policy; Management Information Systems; Marketing. Committee on: Business Administration.

COLLEGE OF EDUCATION—Divisions of: Educational Foundations and Administration; Language, Reading and Culture; Special Education and Rehabilitation; and Teaching and Teacher Education.

COLLEGE OF ENGINEERING AND MINES—Departments of: Aerospace and Mechanical Engineering; Chemical Engineering; Civil Engineering and Engineering Mechanics; Electrical and Computer Engineering; Hydrology and Water Resources; Materials Science and Engineering; Mining and Geological Engineering; Nuclear and Energy Engineering; Systems and Industrial Engineering. Committee on: Biomedical Engineering.

COLLEGE OF LAW

COLLEGE OF MEDICINE—Departments of: Anatomy; Anesthesiology; Family and Community Medicine; Internal Medicine; Neurology; Obstetrics-Gynecology; Ophthalmology; Pathology; Pediatrics; Pharmacology; Physiology; Psychiatry; Radiation Oncology; Radiology; Surgery. University Departments of: Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology.

History

THE UNIVERSITY—AN HISTORICAL SKETCH

In 1885—nearly three decades before Arizona became a state—the thirteenth territorial legislature approved $25,000 for building the University of Arizona in Tucson. The first classes convened in 1891, when 32 students and six teachers met in the original building now known as Old Main.

The University has developed in accordance with the Act of Congress of July 2, 1862, known as the Morrill Act. This legislation created the land-grant colleges and enabled the institution to obtain federal funds for its original schools of agriculture and mines.

In its early days, there were more students in the preparatory department than in the University proper, and the number of university graduates was never more than ten a year. Then came a decade of rapid expansion. The territory became a state, high schools multiplied, and the preparatory department was closed. In 1915, the University was reorganized as three colleges — the College of Letters, Arts, and Sciences (later Liberal Arts); the College of Mines and Engineering; and the College of Agriculture. The Arizona Bureau of Mines was established the same year.

In 1922 the College of Education was organized, and in 1925 offerings in law, originally established in 1915, were organized under the College of Law. The School of Business and Public Administration, established within the College of Letters, Arts and Sciences in 1934, was reconstituted as a separate college in 1944. In 1934 the Department of Home Economics was enlarged to a school within the College of Agriculture. In 1934 the College of Fine Arts, including the School of Music, and the Graduate College were established. In 1940 the Board of Regents reorganized the College of Mines and Engineering into two separate colleges. In 1967 the School of Earth Sciences was organized within the College of Mines, and became the College of Earth Sciences in 1971. In 1947 the School of Pharmacy was organized within the College of Liberal Arts, and was given separate status as the College of Pharmacy in 1949. The Board of Regents in 1956 authorized the establishment of the School of Nursing as a division of the College of Liberal Arts, and in 1964 the school became the College of Nursing. The Department of Architecture in the College of Fine Arts, authorized in 1958, became the College of Architecture in 1964. The Board of Regents authorized the College of Medicine in 1961. In 1974 the School of Renewable Natural Resources was approved as a new unit of the College of Agriculture. The School of Health-Related Professions was authorized by the Board of Regents in 1977. In 1982 the College of Liberal Arts and the College of Fine Arts were reorganized into the College of Arts and Sciences which includes the Faculty of Fine Arts, the Faculty of Humanities, the Faculty of Social and Behavioral Sciences, and the College of Social and Behavioral Sciences. In 1984, the departments that constituted the former College of Earth Sciences were reorganized to become part of the College of Arts and Sciences and the College of Engineering, and the School of Home Economics was renamed the School of Family and Consumer Resources. In 1985, the College of Mines combined with the College of Engineering to become the College of Engineering and Mines.

The 40-acre campus of the 1890s has grown to 338 acres and 152 buildings. Its purpose remains, in the language of the organic law, "to provide the inhabitants of this state with the means of acquiring a thorough knowledge of the various branches of literature, science, and the arts," and, insofar as possible, to provide a technical education adapted to the development of the resources peculiar to Arizona. The university is maintained by funds appropriated by the State of Arizona and the United States government, and by fees and collections including private grants from many sources.
Research and Special Public Service Units

The following divisions are a part of or are affiliated with the University. Additional information regarding their organization and services may be obtained upon inquiry to the director concerned.

THE AGRICULTURAL EXPERIMENT STATION (1890), one of the divisions of the College of Agriculture, is responsible for the basic and applied research programs in the schools, departments, and other units within the College of Agriculture. It is administered by the Director of the Experiment Station. Modern facilities for laboratory and field research and extension, as well as graduate and undergraduate teaching, are available on the university campus and at agricultural centers throughout the state of Arizona, including the Santa Rita Experimental Range. Research is also conducted on farms, orchards, rangelands, and forests in cooperation with farmers, ranchers, and officials of various state and federal agencies.

THE ARIZONA ARTHRITIS CENTER (1977) is a unit within the University of Arizona College of Medicine which is designed to facilitate multidisciplinary cooperative efforts in arthritis research, education and patient care. Research includes the investigation of internal physiological process related to the nature and treatment of arthritis, as well as surgical procedures, including the use of artificial joints. The center provides education in musculoskeletal examination techniques and in general understandings of the disease to medical students, practicing physicians, other health care professionals, and patients. Clinical care serves both the research and educational functions of the center through the application of drug and other therapies to varied patient populations.

THE ARIZONA CANCER CENTER (1976), a division of The University of Arizona College of Medicine, was established to contribute significantly to research related to the understanding and treatment of cancer. As a National Cancer Institute-designated comprehensive cancer center, the Arizona Cancer Center conducts research activities that include basic laboratory and clinical research, cancer prevention and control research, professional training and continuing education programs, patient and public education activities and community service and outreach programs. The cancer center facilitates and coordinates cancer-related educational programs within the University to provide education and research training opportunities for medical and graduate students.

THE ARIZONA CENTER FOR EDUCATIONAL EVALUATION AND MEASUREMENT (1980) initiates and conducts multidisciplinary research on such topics as nondiscriminatory psychological assessment; assessment of developmental competencies, sequencing of instruction, cognitive skills in children; and evaluation of school effectiveness. The center maintains state-of-the-art technological equipment, prepares graduate students in research methodology; and provides technical assistance to public and private agencies regarding testing, student services, curriculum development and systems for program evaluation.

THE ARIZONA CENTER FOR MATHEMATICAL SCIENCES (1988) has as its primary goal the mission of providing an environment for research and learning in the mathematical sciences. Its basic research themes are the modelling, understanding and applicability of nonlinear processes in optics, fluids, neural networks, and random distributed systems with continuing investigations into pattern dynamics, percolation, behavior of lattice gases, nonlinear stability, low dimensional chaos, turbulence, dynamical systems and the nature of integrable systems of differential equations. The center supports graduate students, postdoctoral fellows, long- and short-term visitors and sponsors various workshops throughout the year. These activities serve to provide an environment for student and faculty interaction. The ACMS is funded through the University Research Initiative of the Air Force Office of Scientific Research.

THE ARIZONA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT (1951) engages in graduate education, research, and extension. The unit is supported by the University of Arizona, the Arizona Game and Fish Department, the U.S. Fish and Wildlife Service, and the Wildlife Management Institute. The facilities and personnel of the unit are available to graduate students who wish to pursue both class work and research programs leading to advanced degrees in fisheries science and wildlife biology. The unit is housed in the School of Renewable Natural Resources.

THE ARIZONA COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT (1973), located in the School of Renewable Natural Resources, is engaged in research to support the national science program of the National Park Service. In cooperation with the University of Arizona, the unit provides graduate research opportunities and instructional support in a broad array of natural resource problem areas.

THE ARIZONA HEART CENTER (1986) is an interdisciplinary organization for research into cardiovascular biology and disease. The center's major objectives include conduct of basic and clinical research, provision of medical and surgical care to individuals, and provision of graduate, postgraduate, and continuing educational programs, both regionally and nationally. Coordination of cardiovascular research in the state and region is a major aim; close ties with investigators will be fostered. Research will include transplant immunology, echocardiography, clinical electrophysiology, molecular biology, experimental pharmacology and cell physiology, all applicable to cardiovascular problems.

THE ARIZONA INSTITUTE FOR NEUROGENIC COMMUNICATION DISORDERS (1986) is a multidisciplinary academic unit designed to promote, coordinate, and administer research programs and a clinical center for speech and language disorders caused by diseases of the nervous system. Initiated by the Department of Speech and Hearing Sciences and the Department of Neurology, this unit includes the participation of cognitive science, exercise and sport sciences, linguistics, neuroscience, pediatrics, physiology, psychology, radiology, surgery and systems and industrial engineering. In addition to its major thrusts involving research programs and a clinical center, the Institute's mission includes fostering doctoral and postdoctoral education, state-of-the-art conferences, continuing education, and public service through advocacy for individuals with neurogenic communication disorders.

THE ARIZONA POISON AND DRUG INFORMATION CENTER (1980) is operated by the College of Pharmacy and is located in the Arizona Health Sciences Center Library. The center provides comprehensive poison information and advice on treatment of poisoning to the public on a state-wide basis. It also offers drug information and therapeutic consultations to health professionals. The center has a toll-free telephone number for poison-related questions and is staffed by poison information specialists.
phone number (listed on the inside cover of Arizona telephone directories) and can be reached 24 hours a day, seven days a week. Full-time clinical pharmacists staff the center and serve as poison and drug information specialists. Serving as consultants are medical toxicologists and specialists in plant and animal poisons, drugs, and environmental and industrial poisons. The Arizona Poison and Drug Information Center also provides for clinical training of pharmacy and medical students in the areas of drug and poison information. The Arizona Poison and Drug Information Center is a component of the Arizona Poison Control System which was established at the University of Arizona by the Arizona State Legislature in 1980. The Arizona Poison Control System is certified as a regional poison control program by the American Association of Poison Control Centers.

THE ARIZONA REMOTE SENSING CENTER (1972), located in the Office of Arid Lands Studies, serves as a focus of remote sensing research in the College of Agriculture. The staff of the center is involved in interdisciplinary remote sensing and computer mapping projects related to agriculture and natural resource management. The center contains equipment for manual analysis of satellite and aircraft imagery and computer systems for digital processing and display of images and maps. These facilities are available to faculty, students and cooperators from outside the University.

THE ARIZONA RESEARCH LABORATORIES (1979) is an interdisciplinary research unit established to provide a mechanism for administering and fostering research which bridges disciplines embraced by departments from more than one collegiate unit. A major thrust of the organization is to form research groups to initiate new programs of high priority to the development of the educational and research mission of the University. The organization of the laboratories also provides a mechanism for serving as an organized research component for those teaching and research units that do not have such a capability.

THE ARIZONA STATE MUSEUM, founded as a territorial museum in 1893, is an educational, research, and service division of the University. Museum exhibits emphasize prehistoric and recent Indian cultures of Arizona and the Southwest. Special temporary exhibits on a variety of subjects are presented throughout the year. The museum is open daily to the public. Closed major holidays.

THE ARIZONA TRANSPORTATION AND TRAFFIC INSTITUTE (1959) is engaged in broad research aimed at developing advanced methods of analysis and obtaining answers to the transportation problems in Arizona. Topics considered include the planning, design, and operation of transportation facilities, including pavement design and highway materials, as well as maintenance of these systems. The institute acts as a technical information center, and its activities are closely tied to those of the Department of Civil Engineering and Engineering Mechanics.

THE ARIZONA VETERINARY DIAGNOSTIC LABORATORY, a section of the Department of Veterinary Science, is supported by a combination of state funds and user fees. Services are provided for livestock and companion animal owners, wild species, and other animals supervised by federal, state, and municipal agencies, and include bacteriology, parasitology, virology, pathology and microbial water testing, and field investigations of range livestock problems referred by practicing veterinarians. Diagnostic faculty members participate in applied research studies involving disease problems of agricultural significance.

THE BOYCE THOMPSON SOUTHWESTERN ARBORETUM (1927) is operated cooperatively by the University of Arizona (College of Agriculture), Arizona State Parks Board, and the Boyce Thompson Southwestern Arboretum Board. This public botanic garden has facilities for teaching and research. Situated on the edge of the low desert near Superior, Arizona, the arboretum is a two-hour drive from the campus. Thirty acres of native and introduced plants from arid and semi-arid regions, together with about 1,000 additional acres of undisturbed fauna and flora, are under arboretum control. Additionally, large tracts of relatively undisturbed habitats in a variety of biomes lie in the surrounding Tonto National Forest. Laboratory facilities and housing are available. The arboretum is open daily except for Christmas Day.

THE BUREAU OF APPLIED RESEARCH IN ANTHROPOLOGY (1952), a division of the Department of Anthropology, is a regional and international center for basic and applied research relating to the resolution of critical problems in human society: culture change, urban and rural living, technological innovation, social and cultural impact assessment, agricultural and institutional development, educational innovation, and research methods. As part of the University, BARA promotes interdisciplinary research efforts. Also, BARA actively involves students of anthropology in its on-going research projects.

THE BUREAU OF MINERAL TECHNOLOGY (1915), formerly the Bureau of Geology and Mineral Technology, was reorganized by the state legislature, effective July 1, 1988, to form the Arizona Geological Survey and a independent state agency. The Arizona Geological Survey replaces the former Geologic Survey Branch of the bureau and continues to serve as the primary source of geologic information in the state.

The mission of the Mineral Technology Branch is maintained through the College of Engineering and Mines. Dissemination of information relating to mining, including health and mine safety and geological engineering, is accomplished by the Department of Mining and Geological Engineering. Information about mineral processing and extractive metallurgy can be obtained from the Department of Materials Science and Engineering.

THE CENTER FOR COMPUTING AND INFORMATION TECHNOLOGY (CCIT) provides campus-wide services in support of the instructional, research, and administrative computing needs of the University. The University's network of shared computers includes a VAXcluster which contains an 8650 in the 621/000, and two 8700s. Other mainframes include a Prime 6350, an IBM 3090-300E, and two CONVEX C24 mini-supercomputers. CCIT also provides access to nearly 200 IBM PC, PC compatible, and Apple Macintosh microcomputers in labs available to faculty, staff, and students.

The CCIT provides a campus-wide data communications network which supports both central and distributed processing. Access to facilities is available 24 hours a day. Additionally, CCIT provides access to external networks such as BITnet and National Internet which provides access to academic institutions and supercomputer centers across the country. The University is a member of Cornell National Supercomputing Facility's Smart-Node Program and has a local allocation of service units.

Interactive access to CCIT's central computers comes through the IDX-3000, a campus-wide data communications network. Users may access these systems from terminal access centers at various campus locations. Remote access is also provided through the following dial-up numbers: 621-4141 and 621-9600.

CCIT offers many services to assist users in taking advantage of available computing resources. Services include mainframe and microcomputer access, software development, program Library (CATS) for microcomputers, workstations, peripherals, and software; Courseware Library for Instructional Computing (CLIC); a wide variety of training; consulting on the use of the University's computers and various microcomputers; communications and networking between user-owned equipment and the University's systems; computing facility planning and preparation; mainframe and microcomputer training facilities; programming and applications support; dissemination of information through user publications, manuals, and program library documentation; and assistance in user acquisition of computing facilities.

The primary source for information and assistance on computing services and facilities is the CCIT Help Desk (621-HELP). The Help desk is located in Room 218 of the Computer Center Building. Computer users can keep informed of changes in and additions to CCIT services by reading the Computing & Communications News.

THE CENTER FOR CREATIVE PHOTOGRAPHY (1975), a division of the University Library, is an internationally acclaimed research museum and study center devoted to the collections and archives of 20th-century photographers. Its collections include over 50,000 master prints, more than 500,000 study prints and negatives, correspondence, manuscripts, artifacts, and related documents. It contains a major research library of over 12,000 volumes and a rare book collection. The center sponsors a lecture series of internationally prominent photographers, historians, critics, and related scholars. The center has an extensive publishing program, which includes a journal entitled The Archive. This publication is a benefit of membership and is also available for purchase at the center's bookstore. Photographs and archive materials...
are available through both exhibition and personal print viewing appointments.

THE CENTER FOR MICROCONTAMINATION CONTROL (1984) is located in the Department of Electrical and Computer Engineering. The center conducts fundamental and applied research that will lead to better control of defects in high density logic and memory technology. It is one of 49 centers throughout the country initiated by the National Science Foundation to increase the rate of technology interchange between the academic community and the scientists and engineers of industry. The center sponsors interdisciplinary research in more than six departments in seven colleges. In addition, the center maintains a class-10 cleanroom, an equipment test-tower, and equipment for measuring low levels of airborne and surface contamination.

THE CENTER FOR MIDDLE EASTERN STUDIES is engaged in a variety of aspects of research on the modern Middle East. It is the headquarters for the University's Egypt Working Group, which promotes research by experts in several disciplines. Other areas of research include Afghanistan, Iran, Israel, North Africa, the Persian Gulf, and the Fertile Crescent. One of only thirteen federally funded Middle East centers in the country, this unit disseminates information about Middle East studies to national and international audiences. It also houses the Middle East Studies Association, which is the primary professional organization of scholars of the Middle East.

THE CENTER FOR PHARMACEUTICAL ECONOMICS (1989) is an interdisciplinary research and service unit of the College of Pharmacy. The center was established to provide national and international leadership in the application of the economic and administrative sciences in health care and pharmaceutical research, education, and service. The center integrates clinical and economic research to achieve a framework for the economic evaluation of new therapies. Services will include economic clinical analyses for individual client's needs; training programs for industry representatives, researchers, and practitioners; software programs to analyze cost and benefits of drugs; and the dissemination of information about pharmaceutical issues in managed health care systems.

THE CENTER FOR THE MANAGEMENT OF INFORMATION (CMI) (1985), partially funded by a grant from IBM, supports interdepartmental research in economic, political, social, and technological aspects of information management. The M.B.A. curriculum parallels these research priorities and was revised in 1986 to include a series of integrated courses which assures that graduates are highly literate and sophisticated users/consumers of information management products. In 1987 the center opened to Collaborative Management Room, a facility which has classes and corporate groups as part of an extensive research program into a variety of group processes such as planning, problem-solving and decision making.

THE CENTER FOR THE STUDY OF COMPLEX SYSTEMS, a multidisciplinary unit bringing together local and external researchers, is designed to identify and explore new concepts and features of complex nonlinear systems in various areas of science. Recent advances in the understanding of fundamental aspects of nonlinear systems, coupled with progress in computer technology, permit new approaches to hitherto intractable scientific problems in diverse fields: climate; cognitive science; computational theory; elementary particle physics; evolutionary biology; materials and condensed matter science; motor control; robotics and prosthetics; neurobiology; vascular physiology; turbulence; and others. The center sponsors research, visiting scientists, workshops, and colloquia, all aimed at encouraging the development of new approaches to complexity at the interfaces between traditional scientific disciplines such as biology, chemistry, mathematics, and physics.

THE CENTER FOR THE STUDY OF HIGHER EDUCATION (1978) in the College of Education conducts research studies and provides services related to service activities to meet state and institutional needs, as well as those of national, international and regional governmental units and other organizations. It develops and disseminates information about higher education policy and operation and facilitates the research of faculty members and students. Special research and service projects are provided through university funds and outside support.

THE CENTER FOR TOXICOLOGY (1988) is an interdisciplinary organization that operates as a unit of the College of Pharmacy. Its mission is to strengthen and enhance university and statewide efforts in toxicology. The goals of the center are to develop new research programs in toxicology, to ensure that these present programs have an interdisciplinary approach; to participate in graduate training at the master's, doctoral and postdoctoral levels; and to interact with local, state and federal agencies as well as with the private sector, to predict and prevent problems associated with exposure to toxic chemicals present in the human workplace and environment. The underlying theme of the research activities of the center is elucidation of mechanisms by which chemicals produce adverse biological reactions.

THE COOPERATIVE EXTENSION SYSTEM (1914) brings information to interested people of Arizona. One of the three divisions of the College of Agriculture, it emphasizes agricultural production and natural resources, family and consumer resources, youth development (4-H), and community leadership and resource development. This informal education system is financed from federal, state, and county appropriations. It operates through the county extension agent, state and area specialist system with faculty trained in their specialty, and in the practical application of scientific information on farms, ranches and in rural and urban nonfarm areas. It is provided to target audiences in problem solving, information dissemination and educational programs.

THE DIVISION OF ECONOMIC AND BUSINESS RESEARCH (1949) is a research and service organization within the College of Business and Public Administration. Its broad objectives are to conduct research relating to business, economics, and public policy in Arizona; to complement the research, training, and professional development needs within the education and business communities; and to disseminate information. To achieve its objectives, DEBR builds and maintains regional economic models for applications in forecasting and impact simulation, conducts research on state and local market conditions, and analyzes the effects of public policy alternatives. It publishes the semi-annual Arizona Review, the monthly Arizona's Economy, and the Arizona Statistical Abstract. It also produces forums and seminars for the public. In addition, DEBR answers requests from government, and the general public for tabular information and maps showing local demographic and business patterns and, as a member of the State Data Center, for computerized census information.

THE DIVISION OF MEDIA SERVICES (1939) provides a wide range of instructional media, production, and public broadcasting services to the University, community and state. The division operates three maximum-power public broadcasting stations: KUAT-TV Channel 6 and KUAAT-TV Channel 27 (in the Catalina Foothills), KUAAT-FM (95.5 MHz and Translator Frequency, 89.7 MHz in northwest Tucson and Sierra Vista; and 97.5 MHz in Phoenix). The stations are affiliated with the Public Broadcasting Service (PBS), National Public Radio (NPR) and American Public Radio (APR). Professional production facilities are maintained in the Modern Languages Building and the Harvill Building. Production capability includes color studio and EFP remote facilities.

The VideoCampus produces and distributes University of Arizona credit and noncredit courses to business and industry in the Tucson area through a 16-channel ITFS system called the Tucson Education Delivery System (TEDS), across the nation by videotape and live satellite transmission. The University is a member of the National Technological University (NTU) consortium.

The Educational Telecommunications department provides production and engineering support for the campus including: Pre-production and post-production consultation, video production, television distribution nationwide via KU Band uplink facilities, locally through the TEDS system, microwave transmission to Ft. Huachuca and Sierra Vista. The department also provides satellite reception and recording, videoconference viewing facilities and videoconference origination facilities.

As time and facilities permit, television equipment maintenance and repair for departments is available.

THE DIVISION OF NEUROBIOLOGY (1985) of the Arizona Research Laboratories is an interdisciplinary research unit devoted to the neurobiology and behavior of insects. Investigations under way in the division, probing experimentally favorable insect neural preparations at the cellular, developmental, molecular, and systems levels, seek to reveal...
fundamental neurobiological processes and mechanisms common to many animal species including human beings. These studies also promise to advance our understanding of agriculturally and medically harmful insects.

THE ECONOMIC SCIENCE LABORATORY (1985) is a research unit of the College of Business and Public Administration. Its purpose is to support innovative research and instruction through the use of laboratory economics experiments. Recent areas of investigation include the performance of asset markets, comparative behavior of different auctions and forms of market organization, incentive systems in hierarchies, and comparative evaluation of processes for the provision of public goods, and the design of new exchange institutions to meet the challenges and opportunities at the interface of engineering and economics. The primary objective of the center is to provide ERL's faculty with opportunities to design and conduct experiments on economic, political, and business and government policy experiments. The center offers courses in teaching and research in all aspects of microeconomics and macroeconomics, and its activities are open to students in the College of Business and Public Administration. It has three broad objectives: (1) to promote research in basic market processes, (2) to sponsor an Entrepreneurial Studies Program, and (3) to provide for business/academic exchange. Research is supported through the recruitment of Karl Eller Chair holders in the disciplines represented in the college. Faculty research fellowships are also available. The Entrepreneurial Studies Program offers both academic courses for students interested in entrepreneurship and practical courses on the development of business plans. Approximately 35 students are included in the program annually.

THE LABORATORY OF TREE-RING RESEARCH (1937) is an outgrowth of the pioneering tree-ring studies initiated by Andrew Ellicott Douglass at the University of Arizona in 1936. A division of the College of Arts and Sciences, the Laboratory conducts a unique program of teaching and research in all aspects of dendrochronology. Graduate-level instruction is offered through cooperating academic departments, and a limited number of graduate research assistantships are available to qualified students. Current research efforts are directed toward the quantification of tree-ring parameters, the establishment of new tree-ring chronologies throughout the world, the understanding of basic tree growth and environmental relationships, the reconstruction of palaeohydrologic, paleoclimatic, and paleoecological variables, and the documentation and development of prehistoric chronological controls. Along with the world's largest collection of tree-ring specimens from living trees and ancient timbers, the laboratory maintains a variety of specialized equipment for the analysis of data from tree-rings, including dendrochronologies, relevant climatic and hydrologic records, and archaeological tree-ring dates and site information.

THE INSTITUTE OF ATMOSPHERIC PHYSICS (1954) conducts research on the fundamental processes that are important in the study of weather, climate, and earth systems science. Particular emphasis is given to investigations in radiative transfer, remote sensing, atmospheric aerosols, atmospheric chemistry, cloud and precipitation physics, lightning and atmospheric electricity, atmospheric dynamics, mesoscale meteorology, and the mathematical modeling of climate.

THE JEFFREY M. GOLDFING CLINICAL RESEARCH UNIT (1984) is a specially equipped facility located in the College of Pharmacy. Its primary objective is to provide clinical scientists at the University of Arizona with the opportunity to study the action of drugs in humans with the ultimate goal of developing improved methods of treatment. The research unit has three rooms: a patient waiting room, a private office for conducting patient interviews or preliminary examinations, and the main room which houses two hospital beds and is equipped with specialized medical equipment.

THE KARL ELLER CENTER FOR THE STUDY OF THE PRIVATE MARKET ECONOMY (1983) is a research and education organization within the College of Business and Public Administration. It has three broad objectives: (1) to promote research in basic market processes, (2) to sponsor an Entrepreneurial Studies Program, and (3) to provide for business/academic exchange. Research is supported through the recruitment of Karl Eller Chair holders in the disciplines represented in the college. Faculty research fellowships are also available. The Entrepreneurial Studies Program offers both academic courses for students interested in entrepreneurship and practical courses on the development of business plans. Approximately 35 students are included in the program annually.
laboratory, and a noble gas mass spectrometry laboratory. The nu-
merous telescopes of the University of Arizona Observatories are avai-
larable for research projects, including instruments on Kitt Peak and in
the Santa Catalina Mountains, as well as the Multiple Mirror Telescope on
Mt. Hopkins; all are within easy reach of the University campus. Labo-
ratory staff and students also make use of major observatories around
the world, including the NASA Infrared Telescope Facility on Mauna
Kea, Hawaii, and conduct a regular program of planetary, solar, and
stellar infrared spectroscopy using the NASA Kuiper Airborne Observa-
tory. The University is developing a new observatory site on Mt.
Graham, northeast of Tucson. The laboratory participates in inter-
departmental programs in theoretical astrophysics and in applied math-
ematics. The laboratory is housed in the Gerard P. Kuiper Space
Sciences Building, with additional facilities in the Gould-Simpson
Building.

THE MEXICAN AMERICAN STUDIES AND RESEARCH CENTER en-
gages in research, publication, public service, and undergraduate and
graduate educational activities which enhance the study of the Mexican
American experience and related issues. Major objectives of inter-
disciplinary research and publication include such areas as expressive
culture, adaptations of the Mexican-born into U.S. society, educational
practices and policies, minority entrepreneurship, and health care be-
vavior and intervention strategies. Special research and service pro-
jects are provided through university funds and outside support. Funds
of sponsored grants support training of students in a variety of inter-
disciplines. The center disseminates information of concern to the Hispanic
community, sponsors lectures and forums and provides assistance to
and linkage with the University and greater Mexican American
community, as well as regional, national and international private and public
sectors.

THE MINERAL MUSEUM (1919) emphasizes Arizona's unique mineral
heritage in a spectacular collection of minerals, fossils, and gems. The
museum, a part of the collections of the Department of Geosciences
since its establishment, is open to students and the general public.

THE OFFICE OF ARID LAND STUDIES (1964), administratively located
within the College of Agriculture, is active in international studies, natu-
ral resources development and management, environmental studies,
economic botany, new crop development, water and energy conserva-
tion, farming systems research, information services, remote sensing,
hydric information systems, publications and education. Activities
are conducted within the framework of the arid environment. The office
provides interdisciplinary project management and works closely with
local and campus communities as well as with local, state, federal, and
international government agencies. The office administers the inter-
disciplinary Doctor of Philosophy degree with a major in arid lands
resource sciences.

THE OPTICAL SCIENCES CENTER (1967) is a graduate center for
research in applied and theoretical optics. Areas in which research is
currently being conducted include electro-optics, image formation, im-
age processing, laser physics, materials, medical optics, nonlinear optics, optical bistability, optical design, optical fabrication
and testing, optical properties of materials, pattern recognition,
quantum optics, remote sensing, spectroscopy, surface physics, thin-
film technology, and X-ray optics. Interdisciplinary programs in progress
involve the departments of Applied Mathematics, Astronomy, Chemis-
try, Electrical and Computer Engineering, Physics, and Radiology, as
well as the Arizona Research Laboratory, the Optical Circuity Cooper-
active and the Optical Data Storage Center.

Special facilities of the Optical Sciences Center include MBE, CVD
and vacuum-deposition thin-film facilities, dark rooms, an electronics
shop, infrared laboratory, instrument shop, massive-optics shop, small-
optics shop, student/faculty machine shop, and teaching laboratories. In
addition, a multitude of computing facilities are available for use in both
research and training programs.

THE RUTH E. GOLDING CLINICAL PHARMACOKINETICS LABORA-
TORY (1977) in the College of Pharmacy is primarily an analytical labo-
ratory where new assays are developed to quantify drugs and their
metabolites from biological fluids. These assays are used in conjunc-
tion with animal and clinical research projects to better define the dis-
position of and response to drugs. The results of these studies along
with the monitoring of drug plasma concentrations in patients are used
to optimize therapy by individualizing drug administration.

SEMATECH CENTER OF EXCELLENCE FOR CONTAMINATION/
DEFECT CONTROL AND ASSESSMENT (1988) is a joint effort by
industry and the federal government to reverse a decline in U.S. com-
petitiveness in semiconductors, particularly in the production of inte-
grated circuits. Centers of Excellence established at universities repre-
sent SEMATECH's external research arm and are selected based on
the industry's need for the programs proposed. They will bring graduate students into semiconductor manufacturing and will create
major academic manufacturing research capability. In May 1988, the UA
became one of the first five universities selected to become a center of
excellence. Engineers working in the center are developing methods
for measuring and removing impurities, contamination, and defects that
are a major problem for semiconductor manufacturing.

The Department of Electrical and Computer Engineering, home to
the SEMATECH Center of Excellence, provides a director that coordi-
nates the efforts of principal investigators from Electrical and Computer
Engineering, Materials Science and Engineering, Chemical Engineer-
ing, and Systems and Industrial Engineering. Part of the research is
being carried out with Sandia National Laboratories in Albuquerque.
The technical objectives of the center are to understand and utilize chemical processes and electrical effects to develop methods
and systems for removal of gaseous impurities and particulates from
process gases and liquids; (2) to understand and develop control tech-
niques for contaminants and defects originating from vacuum-related
processes/equipment; and (3) to understand through test structures the
role of specific contaminants in generating defects that limit yield, and
the centers help to support the capability to reduce defect generation.

THE SOCIAL AND BEHAVIORAL SCIENCES RESEARCH INSTITUTE
promotes basic and applied research in the social sciences. The insti-
tute supports basic research on individual behavior (including linguis-
tic and psychological aspects), social organization, theory and values,
and public policy. Knowledge gained through research can be used to
address practical social problems. The institute's mission is directed
toward assisting faculty research development. The research of many
disciplines and interdisciplinary programs in the Faculty of Social and
Behavioral Sciences. One of the institute's services is the SBSRI Data
and Software Library, which helps with statistical support and research
design, maintains an extensive data library, and supplies technical sup-
port in computer software. In addition, the institute provides survey
design expertise (fee-based), computerized data entry equipment, and
trained survey interviewers. This service helps meet the needs of the
departments, organizations, and individuals who need to conduct
through telephone surveys. Cognitive Science, a research unit in
SBSRI, coordinates research in linguistics, psychology, and philosophy.
Research in cognitive science seeks to link theories of human mental
capabilities with experimental approaches and to discover how the hu-
man mind operates. This research is supported by laboratories for
studying experimental psycholinguistics and human perception and
cognition.

THE SOUTHWEST CENTER (1982) is a unit of the Faculty of Social
and Behavioral Sciences that fosters research, teaching, academic develop-
ment, publication, and public programming on the history, culture, and
development of the Greater Southwest (including northwestern Mex-
ico). Associated with the center is the Bloom Southwest Jewish Ar-
chives, a national research center for Southwest pioneer Jewish history.
Southwest Center initiatives are designed for their multiplier effects on
the research and service mission of the University, creating new oppor-
tunities for interdisciplinary scholarship. As an agency dedicated to
the enhancement of regional scholarship and intellectual service, the
Southwest Center acts as a liaison to funding sources; creates and
implements interdisciplinary regional research projects; pursues a vig-
orous publishing program; and engages in a broad range of public
outreach and programming: conferences, seminars, lectures, speakers
bureaus, cultural events. In partnership with the UA Press, the center
publishes Journal of the Southwest, a scholarly regional quarterly, and
sponsors the Southwest Center book series.

THE SOUTHWEST INSTITUTE FOR RESEARCH ON WOMEN
(SIROW) (1979) is a regional research and resource center within the
Committee on Women's Studies. The institute develops and conducts research on women in the Southwest (Arizona, Colorado, New Mexico, and Utah) or of interest to scholars in the region. SIROW publishes a newsletter and a working paper series, links researchers with community organizations and policy makers through a research clearinghouse, and provides professional development and training for people in education, research, business, and government.

THE STEWARD OBSERVATORY (1916) was established by the generous gift from Lavinia Steward, in honor of her husband, George Steward. For many years, the observatory's principal telescope was its 36-inch (91-cm) reflector, constructed with the aid of the Steward bequest. At this time, the primary research telescopes of the observatory include the Multiple Mirror Telescope (MMT), located on the Mt. Hopkins summit in the Santa Rita Mountains, the 90-inch (2.3-m) Ritchey-Chretien reflector at the Kitt Peak site, and the 61-inch (1.55-m) Cassegrain reflector found at the Mt. Bigelow station in the Santa Catarina Mountains. The MMT, operated jointly with the Smithsonian Astrophysical Observatory, represents an innovative and highly successful concept for construction of large optical telescopes; it has become the prototype for future large-aperture telescopes. The major telescopes are used with a wide variety of instrumentation and detectors and are supported by several smaller instruments used for teaching or special research projects.

The Steward Observatory offices and laboratories are located on the northeastern part of the University campus adjacent to the original 36-inch dome which now houses a 21-inch instructional telescope. The main areas of research at the observatory include extragalactic and galactic astronomy, with major specializations in the areas of quasars, degenerate stars, infrared sources, novae, radio galaxies, galaxy formation, and cosmology. Observational work is concentrated in the optical and infrared but includes work at radio, ultraviolet and x-ray wavelengths using other facilities. The observatory is developing facilities for work at mm and sub-mm wavelengths in collaboration with the Max Planck Institute for Radio-astronomy in Bonn, West Germany. The observatory's Large Mirror Lab is collaborating in the development of optics for the next generation of giant optical/infrared telescopes. The research programs also include a new initiative in theoretical astrophysics, and an active involvement in astronomy in space, such as the Infrared Astronomy Satellite (IRAS), Space Infrared Telescope Facility (SIRTF) and Space Telescope.

Located across North Cherry Avenue from Steward Observatory are the administrative offices and laboratories of the National Optical Astronomical Observatories. The two optical observatories and the National Radio Astronomy Observatory jointly sponsor a weekly series of professional colloquia. Steward Observatory also maintains close working relationships with the University's Lunar and Planetary Laboratory, the Department of Planetary Sciences, the Optical Sciences Center, the Department of Physics and the Grace M. Flandrau Planetarium. In addition, close collaboration is maintained through Steward facilities shared by the Vatican Observatory, Smithsonian Astrophysical Observatory, and the National Radio Astronomy Observatory.

THE UNIVERSITY OF ARIZONA MUSEUM OF ART—The University of Arizona is exceptionally fortunate in that it possesses several outstanding art collections. House in our modern building are the masterpieces of the Samuel H. Kress Collection, which include the surviving panels of the Retablo of Ciudad Rodrigo by Fernando Gallego and one of the finest university collections of Renaissance sixteenth- and seventeenth-century art in the United States. Contemporary international painting and sculpture are well represented in the Edward Joseph Gallagher III Memorial Collection; 61 sketches and models by Jacques Lipchitz which comprise one of the largest collections of his work in the world; the C. Leonard Pfeiffer Collection includes American paintings from the 1930s and was the first collection of art donated to the University. An active exhibition and educational program is available throughout the year. The Museum of Art is open to the public five weekdays from nine to five and on Sunday from noon to four. There is no admission fee.

The University of Arizona, Arizona State University, and Northern Arizona University. The press publishes scholarly books in anthropology and archaeology, space sciences, Latin American studies, American Indian studies, environmental studies, Western history, women's studies, and other fields. Also on the UA Press list are trade books on the Southwest borderlands, including accounts by scholars and professional writers of the natural history, geography, history, folklore, and life-ways of the region. The UA Press does not publish children's books.

The University of Arizona Press invites inquiries from the authors of works—whether scholarly books or works of general interest—that are appropriate to its list.

Also appearing under the press imprint is the quarterly Journal of the Southwest, with separate editorial and subscription offices at the Southwest Center.

THE VIDEOCAMPUS (1972) delivers University of Arizona courses to students in a live interactive mode via broadcast, campus feed, or satellite, and by videotape. Using video technology and other delivery methods, The University of Arizona can serve students anywhere in the world.

The Extended University develops educational programs using distance-learning technologies. Programs now available through VideoCampus include fully accredited undergraduate and graduate courses carrying regular University of Arizona credit; graduate degree programs; courses for individual and professional development; customized courses developed for clients' specific needs; and video conferences on topics such as managerial and technical training, professional development, and office management.

Video taped courses can be mailed to any location. VideoCampus also uses a live microwave signal to transmit class presentations between the campus and sites in the Tucson area. Courses are also available through The University of Arizona's affiliation with National Technological University and the Association for Media-Based Continuing Education for Engineers.

THE WATER RESOURCES RESEARCH CENTER (1965), an interdisciplinary organization is primarily devoted to assistance to water-related research activities at the three state universities. This assistance is in the form of federal Water Resources Research Act funds for research on water-related issues, providing access to water data and publications, bringing water research findings to the attention of potential users, and facilitating interdisciplinary research. The center is also responsible for the dissemination of results of water-related research in the state.

The University of Arizona Alumni Association

The University of Arizona Alumni Association was organized June 2, 1897. It is incorporated under Arizona state law and operates in accordance with the Articles of Incorporation and By-Laws adopted by the membership in open meeting at Homecoming October 27, 1956, and amended October 20, 1981 and October 17, 1987.

Membership

All persons who have received a degree from the University of Arizona or former students who have completed at least 30 units are members of the Alumni Association and receive all of the publications and services afforded by the association.

In 1982 the Alumni Association initiated the Endowed Membership Program. The principal of the endowment will remain intact and only the interest will be used toward essential Alumni Association programs. An endowment contribution is not required for the former student to receive the services afforded by the Alumni Association.

Objectives

The objectives of the Alumni Association generally are to promote the interest and welfare of the State of Arizona and the cause of education. More specifically they are "to promote the objectives of the University Association of Engineers, the Institute for Radio Astronomy in Bonn, West Germany. The observatory is developing facilities for work at mm and sub-mm wavelengths in collaboration with the Max Planck Institute for Radio-astronomy in Bonn, West Germany. The observatory's Large Mirror Lab is collaborating in the development of optics for the next generation of giant optical/infrared telescopes. The research programs also include a new initiative in theoretical astrophysics, and an active involvement in astronomy in space, such as the Infrared Astronomy Satellite (IRAS), Space Infrared Telescope Facility (SIRTF) and Space Telescope.

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THE UNIVERSITY OF ARIZONA PRESS (1959), a department of the University of Arizona, is a nonprofit publisher of scholarly and regional books. As a delegate of the University of Arizona to the larger world, the press publishes the work of scholars wherever they may be, concentrating upon scholarship that reflects the special strengths of the University of Arizona, Arizona State University, and Northern Arizona University.

The press publishes scholarly books in anthropology and archaeology, space sciences, Latin American studies, American Indian studies, environmental studies, Western history, women's studies, and other fields. Also on the UA Press list are trade books on the Southwest borderlands, including accounts by scholars and professional writers of the natural history, geography, history, folklore, and life-ways of the region. The UA Press does not publish children's books.

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Objectives

The objectives of the Alumni Association generally are to promote the interest and welfare of the State of Arizona and the cause of education. More specifically they are "to promote the objectives of the University
of Arizona, Tucson, Arizona, through the establishment and maintenance of contact between the University, its graduates and its students — present, former, prospective, and otherwise. The Association operates as a liaison between the University and former students. It is the former student's immediate and direct contact with his or her alma mater. Its basic motivating principle is service, both to the former student and the University. Because of the large number of alumni in Phoenix and southern California, offices are maintained in both geographic areas.

Structure
The Alumni Association is guided by a board of directors. Vacancies on the board are filled through a general election held each summer and by appointment by the president. The activities of the association are managed by a full-time Director of Alumni responsible to the board of directors and a staff of 25. The director manages the central alumni office on campus, the Phoenix office, and an office in southern California. The campus office, headquarters for all alumni activities, houses computerized record files of more than 340,000 graduates, former students, and donors.

Activities
The Alumni Association fosters the involvement of alumni with their alma mater in several ways:

CLUBS—There are active University of Arizona alumni clubs in 38 cities throughout the United States, with plans to organize in an additional 20 cities. The clubs assist the University in its student recruitment efforts, raise funds for and award scholarships, and support university events in their cities. The Alumni Office provides speakers from campus, video tapes, and films for club meetings, as well as mailing event notices. Students and former students may obtain information about the club in their home area from the Alumni Office.

COUNCILS—Within the University of Arizona, 9 colleges have organized alumni councils, which serve to strengthen the ties between the college's students, its faculty, and its alumni. The councils provide service both to the community and to the college.

HOMECOMING AND REUNIONS—Alumni are encouraged to return to the University to interact with other alumni and students and to view the progress of their alma mater.

LIFELONG LEARNING AND TRAVEL—The Association sponsors an international and action travel program designed to meet educational objectives of alumni, while generating revenue for the Alumni Association.

AWARDS AND RECOGNITION—Each year alumni are honored for outstanding service to the University and/or for outstanding personal achievement.

PUBLICATIONS—The Alumni Office publishes the Arizona Alumnus, the official publication of the Alumni Association. Published two times a year, it is sent to all members. This publication represents the most immediate contact for alumni with university programs and progress, with news of former classmates, all alumni activities, and news about the University and its faculty and staff. An alumni club newsletter is published quarterly and the association also produces a weekly radio program and monthly T.V. show.

The Alumni Association, recognizing the need to inform current students about the mission of the association, sponsors a student alumni organization. The objective of the organization is to involve current students in alumni activities, thereby promoting the concept of a lifelong commitment to the University through Alumni Association programs. All students and alumni are invited to visit the alumni office at 1111 N. Cherry Ave. on the UA campus. Their opinions, suggestions and needs will receive full attention.

The University of Arizona Foundation

Every institution of higher learning, whether supported by public or by private funds, needs a group of friends who have a special interest in its welfare. The need is great and the opportunities are many for contributions of private funds to improve and develop educational and research programs outside the limited scope of state funds and tuition income.

In Arizona and elsewhere many people, aware of these needs, are assisting the University of Arizona. In order to unite these efforts, the University of Arizona Foundation was established in 1958 as a private nonprofit corporation intimately associated with the University. The foundation is governed by a board of directors.

The President's Club came into being in 1967 to recognize the generosity of especially dedicated donors and to provide the framework for substantial and continuing support. Membership in the President's Club is by invitation only, and nominees may become eligible with a gift of $10,000 or more in a variety of other ways involving deferred gifts, including bequests.

The principal objectives of the foundation and the President's Club are:

1. To acquaint its members and the public with programs, plans, and needs of the University, and
2. To attract gifts and bequests to the foundation which may be directed into the University's activities as advantageously as possible.

Foundation luncheons are held where members of the University faculty and administration discuss topics of concern and interest to the University and to foundation members.

The foundation assists prospective donors and testators in planning trusts and will arrangements for the foundation. The foundation invests, manages, and controls the gifts in accordance with the terms of the trust instruments and deeds of gift. This united effort of friends of the University is helping to meet the changing requirements of education and to enrich higher education for the ultimate benefit of the people of Arizona.

THE UNIVERSITY OF ARIZONA FOUNDATION

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Cedric W. Dempsey
Kent Rollins
Joel D. Valdez

Emeritus Director
J. Harry Wood
Arizona Board of Regents—Administrative Officers

Ex Officio
F. Robert Paulsen (1964), Dean Emeritus, College of Education; B.A., 1947, Utah State University; M.S., 1953, University of California, Berkeley.

Appointed
Danny Siciliano, May, 1991
Edith S. Auslander, Ph.D., January, 1992
Herbert R. Kingdon (1937), President, State University of New York at Stony Brook.

Administrative Officers

Year of first University appointment in parentheses after each name

Manuel T. Pacheco (1991), President of the University B.A., 1963, New Mexico Highlands University; M.A., 1967, University of Arizona.

Larry L. Clark (1985), President Emeritus, College of College of Science, Engineering and Mines; B.S., 1942, South Dakota State College; M.S., 1947, Stanford University; D.Sc., 1950, Purdue University.

Henry Koffler (1982), President Emeritus, College of Agricultural Sciences; B.S., 1938, University of Arizona; M.S., 1941, University of Wisconsin.


John R Schaefer (1960-85), President of the University B.A., 1953, Polytechnic Institute of Brooklyn; Ph.D., 1958, University of Illinois.


Winlock H. Ladd (1989), Director, Research and Development; B.S., 1943, Cornell College; M.A., 1947, University of Wisconsin.


Bernard E. Basha (1983), President Emeritus, College of Commerce and Industry; B.A., 1942, Arizona State University; M.A., 1948, Ohio State University.

Robert Leslie Hull (1964), Dean Emeritus, College of Agriculture; B.S., 1954, Northwestern State College; M.S., 1955, University of Wisconsin.

Eugene C. Glickman (1958), Dean Emeritus, College of Arts and Sciences; B.A., 1951, University of Arizona; M.D., 1961, University of Arizona.

Robert S. Swoob (1942-44; 1946-83), Dean of Students; B.A., 1942, M.A., 1950, University of Arizona.


Arthur J. Chapa, J.D. (1985), President Emeritus, College of Education; B.S., 1943, University of Arizona; M.S., 1947, University of Utah; Ph.D., 1959, University of Arizona.


John R. Schaefer (1960-85), President of the University B.A., 1953, Polytechnic Institute of Brooklyn; Ph.D., 1958, University of Illinois.

Michael A. Cusanovich (1989), President for Research; Dean of the Graduate College; B.A., 1963, University of the Pacific; Ph.D., 1967, University of California at San Diego.


Gerald L. Leichty (1987), President Emeritus, College of Business; B.A., 1959, New Mexico Highlands University; M.Ed., 1961, University of Arizona; Ph.D., 1963, University of California, Berkeley.


Bert G. Landau (1985), Associate Vice President for Research; Director of Research Communications; A.B., 1965, Boston University.

Ralph E. Deal (1937), Director Emeritus, Purchasing; B.S., 1929, University of Arizona.

L. Claire Parsons (1987), Dean, College of Nursing; B.S., 1954, Northwestern State College; M.S., 1964, University of Houston; Ph.D., 1968, University of Texas.

Herbert D. Rhodes (1943-77), Dean Emeritus, Graduate College; B.S., 1935, M.S., 1936, University of Arizona; A.B., 1937, Princeton, Ph.D., 1939, University of Illinois.

Don A. Aripoli (1986), Assistant Vice President for Student Affairs; B.A., 1967, Cornell College; M.Ed., 1969, Indiana University; Ph.D., 1971, University of North Carolina.
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Faculty of the University 1990-91

Aamodt, Agnes M. (1957-68), Professor Emerita of Nursing; B.S., 1944, R.N., 1944, College of St. Scholastica; A.B., 1950, University of Minnesota; Ph.D., 1969, University of Washington.


Abraham, Midhat D. (1988), Middle East Librarian; Associate Librarian in the University Library; B.A., 1964, Washburn College; M.S., 1964, University of Illinois; M.S., 1968, University of California; M.D., 1970, Harvard University.


Adam, Julianne C. (1990), Agent in 4-H; B.S., 1969, Oklahoma Baptist University.

Adamczewski, Ludwik (1987), Assistant Professor; Ph.D., 1979, Warsaw University; Ph.D., 1977, Institute of Physical Chemistry of the Polish Academy of Sciences.

Adamson, Linus (1990), Assistant Professor of Molecular and Cellular Biology; B.A., 1978, Trinity College; Ph.D., 1983, University of Wisconsin; M.D., 1986, University of Texas.


Alcorn, Stanely (1963-89), Professor Emeritus of Physical Therapy; B.S., 1946, Ph.D., 1954, University of California at Berkeley.

Alesamoni, Lawrence M. (1957), Professor of Educational Psychology; B.A., 1961, Westminster College; M.A., 1964, University of Utah; Ph.D., 1966, Michigan State University.

Alap, Paul F. (1957), Professor of Internal Medicine; Associate Professor of Pediatrics; B.S., 1954, Lebanon Valley College; M.D., 1958, Georgetown University.


Allen, Adela (1968), Associate Dean of the Graduate College; Associate Professor of Reading and Culture; B.A., 1952, University of the Americas; M.A., 1964, University of Houston; Ph.D., 1974, University of Texas.


Allen, Ronald E. (1980), Professor of Animal Science; B.S., 1972, Texas A & M University; Ph.D., 1976, Iowa State University.

Allen, Rupert C. (1956-1960, 1962-85), Professor Emeritus of Spanish and Portuguese; A.B., 1951,

Altman, Ellen (1979), Professor of Library Science; A.B., 1975, University of California at Los Angeles; M.S., 1980, University of Southern California.

Alverson, William H. (1968 -77), Assistant Professor of Business; B.S., 1965, University of Wisconsin; Ed.D., 1972, University of Wisconsin.


Alvi, Eskander (1984), Assistant Professor of Economics; B.A., 1980, DePaul University; M.A., 1982, Ph.D., 1985, University of Illinois.

Ames, Wilbur S. (1972), Associate Dean of the College of Education; Professor of Teaching and Teacher Education; B.S., 1961, M.S., 1962, University of Maine.

Angell, Neil M. (1985), Assistant Professor of International Medicine; B.S., 1975, Oregon State University; M.D., 1977, University of Oregon.

Anders, Patricia L. (1976), President of Language, Reading, and Culture; B.S., 1971, M.S., 1972, Ph.D., 1976, University of Wisconsin.


Anderson, Jon V. (1980), Associate Professor of English; B.S., 1963, Northeastern University; M.F.A., 1967, University of Iowa.

Anderson, Warren H. (1952), Director of Women's Studies and the Southwest Institute for Research on Women; Associate Professor of History; B.S., 1969, University of Kansas; Ph.D., 1972, University of Washington.


Anderson, Robert M. (1978-86), Associate Professor Emeritus of Economics; B.A., 1946, Marquette University School of Medicine.


Anderson, Waldo K. (1966-88), Professor Emeritus of Higher Education; A.B., 1945, Ottawa University; M.Ed., 1953, University of South Dakota; Ph.D., 1963, University of Minnesota.

Anderson, Warren H. (1956-86), Professor Emeritus of Art; B.S., 1950, Western Illinois State College; M.A., 1951, University of Iowa; Ph.D., 1961, Stanford University.


Andrews, Gregory R. (1979), Head of the Department of Computer Science; Professor of Computer Science; B.A., 1977, Ph.D., 1982, University of Washington.

Angel, Roger P. (1973), Regents Professor and Professor of Agricultural and Atmospheric Sciences; Astronomer in the Steward Observatory; B.A., 1963, St. Peter's College; M.A., 1967, University of California at Los Angeles; Ph.D., 1970, University of Washington.

Angeline, Jay B., Jr. (1967), Professor of Anatomy; Adjunct Instructor in Neurology; B.A., 1949, Williams College; M.D., 1952, Cornell University; M.D., 1959, University of California at Los Angeles; Ph.D., 1961, Stanford University.


Arnett, W. David (1986), Professor of Physics, Astronautics, and Ocean Sciences; B.S., 1967, University of Kentucky; M.S., 1969, Ph.D., 1973, University of Tennessee.

Arnold, Robert G. (1986), Assistant Professor of Civil Engineering and Engineering Mechanics; B.S., 1986, Texas A&M University; M.S., 1986, Ph.D., 1990, University of Texas at Austin.

Arnold, Dennis V. (1973), Research Scientist and Specialist in Animal Sciences; B.S., 1957, Colorado State University; M.S., 1964, Michigan State University.

Arnold, Neal R. (1978), Head of the Department of Exercise and Sport Sciences; B.A., 1970, University of California at Los Angeles; Ph.D., 1974, University of New Mexico.


Askin, Ronald G. (1985), Associate Professor of Systems and Industrial Engineering; B.S., 1985, University of Arizona; M.S., 1986, Ph.D., 1990, University of California at Berkeley.

Ascher, Mark L. (1982), Professor of Law; B.A., 1975, New York University; M.A., 1979, Ph.D., 1982, University of California at Los Angeles.

Atwood, Harry (1955 -87), Associate Professor Emeritus of Engineering and Engineering Mechanics; B.A., 1953, University of Oregon; Ph.D., 1960, University of California at Berkeley.

Atwood, Jay B., Jr. (1967), Professor of Anatomy; Adjunct Professor of Computer Science; B.A., 1968, University of Arizona; M.S., 1970, University of California at Berkeley.


Bailey, Andrew D. Jr. (1986), Head of the Department of Accounting; Professor of Accounting; Management Information Systems; B.S.B., 1964, M.S., 1966, University of Minnesota; Ph.D., 1970, Ohio State University.

Bailey, Daniel E. (1979), Coordinator of Academic Computing for the Faculty of Science Administration; B.S.B., 1964, University of Arizona; Ph.D., 1961, University of California at Berkeley.

Bahill, Andrew T. (1984), Professor of Systems and Industrial Engineering; B.S., 1984, University of California at Los Angeles; M.S., 1990, University of California at Berkeley.


Baker, Paul B. (1985), Associate Specialist in the College of Extension Services; B.S., 1958, Oregon State University; M.S., 1962, Ph.D., 1968, University of Washington; University of California at Berkeley.


Baker, Susan G. (1960), Assistant Professor in the Social Sciences; B.A., 1960, University of California at Berkeley; Ph.D., 1963, University of Arizona.

Baldwin, Dariel M. (1984), Head Map Collection Librarian; Librarian in the University Library; B.A., 1970, Colby College; M.S., 1973, University of Chicago.

Balek, Roger C. (1985), Associate Professor of Hydrology and Water Resources; B.S., 1974, Purdue University; M.S., 1975, University of California at Berkeley; Ph.D., 1984, California Institute of Technology.


Barrick, Colin R. (1976), Associate Head of the Department of Nutrition; Associate Professor of Nutrition; B.S., 1966, M.D., 1971, Royal College of Surgeons in Ireland.

Bannister, Bryan (1953-72), Director Emeritus of the Tree Ring Laboratory; Professor of Dendrochronology and Tree Ring Science; B.S., 1953, University of Arizona; M.A., 1953, Ph.D., 1960, University of Arizona.

Barbee, Robert A. (1969), Professor of Internal Medicine; Assistant Director of Respiratory Sciences; B.A., 1964, Yale University; M.D., 1968, University of California at Los Angeles.

Barber, William D. (1973), Professor of Anatomy; B.V.M., 1964, Colorado State University; Ph.D., 1972, University of California at Los Angeles.

Barbosa, Maria J. (1990), Assistant Professor of Spanish and Portuguese; B.A., 1983, Universidade Federal de Uberlandia; M.S., 1989, Ph.D., 1990, University of Texas at Austin; M.D., 1983, State University of New York; Ph.D., 1986, University of Wisconsin.

Bailey, Andrew D. Jr. (1986), Head of the Department of Accounting; Professor of Accounting; Management Information Systems; B.S.B., 1964, M.S., 1966, University of Minnesota; Ph.D., 1971, Ohio State University.
Burke, James J. (1967), Director of the Optical Data Storage Laboratory, B.S., 1954, M.S., 1959, University of Chicago; Ph.D., 1972, University of Arizona.
Burks, Thomas F., II (1977), Associate Dean of Research in the College of Medicine; Head of the Department of Pharmacology, B.S., 1962, M.S., 1964, University of Texas; Ph.D., 1967, University of Iowa.
Byers, James M., III (1975), Associate Professor of Philosophy; B.A., 1971, M.A., 1972, Pacific Union College; Ph.D., 1985, Stanford University; M.D., 1985, University of Arizona.
Byrman, Samuel M. (1985), Associate Professor of Internal Medicine; B.S., 1972, M.D., 1976, McGill University; M.D., 1985, University of Illinois.
Byers, James M., II (1975), Associate Professor of Pathology; A.B., 1959, New York State College; M.D., 1963, Washington University; M.D., 1970, Stanford University.
Byrne, David N. (1977), Associate Research Scientist, Horticulturist in the Agricultural Experiment Station; B.A., 1982, Utah State University; M.S., 1984, Utah State University.
Butman, Samuel M. (1985), Associate Professor of Internal Medicine; B.S., 1972, M.D., 1976, McGill University; M.D., 1985, University of Illinois.
Byers, James M., III (1975), Associate Professor of Pathology; A.B., 1959, New York State College; M.D., 1963, Washington University; M.D., 1970, Stanford University.
Byers, James M., II (1975), Associate Professor of Pathology; A.B., 1959, New York State College; M.D., 1963, Washington University; M.D., 1970, Stanford University.
Byers, James M., II (1975), Associate Professor of Pathology; A.B., 1959, New York State College; M.D., 1963, Washington University; M.D., 1970, Stanford University.
Byers, James M., II (1975), Associate Professor of Pathology; A.B., 1959, New York State College; M.D., 1963, Washington University; M.D., 1970, Stanford University.
Byers, James M., II (1975), Associate Professor of Pathology; A.B., 1959, New York State College; M.D., 1963, Washington University; M.D., 1970, Stanford University.
Cronin, Constance (1970), Associate Professor of American Civil War History, U. Missouri, M.A., 1962, Ph.D., 1967, University of Chicago
Crosby, Leanna J. (1987), Assistant Professor of Nursing, M.N., 1986, Virginia Commonwealth University, Ph.D., 1990, University of Delaware
Crow, Steven C. (1989), Head of the Department of Atmospheric and Oceanic Sciences, University of Wisconsin
Dahlgran, Roger A. (1985), Associate Professor of Public Health Policy, Ph.D., 1989, University of California
Dalton, William S. (1981), Associate Professor of Information Sciences and Technology, B.A., 1969, San Diego State College; M.S., 1972, Rutgers University; Ph.D., 1981, University of Minnesota
Davis, James W. (1964), Associate Professor of Microbiology, B.A., 1959, Wesleyan University; M.S., 1961, University of California; Ph.D., 1964, University of California
Davis, Jack Emory (1949 -78), Professor Emeritus of Neurology, B.A., 1956, Oberlin College; M.D., 1961, Harvard Medical School; Ph.D., 1964, University of Michigan
Davis, John L. (1967), Professor of Biology, B.S., 1953, California Polytechnic State University; M.A., 1954, Ph.D., 1959, University of California
Dawson, George A. (1966), Professor of Atmospheric Sciences, B.A., 1951, Brown University; M.S., 1954, University of Arizona; Ph.D., 1957, University of California
Day, Daniel C. (1985), Professor of Psychology, B.A., 1953, Ohio State University; M.A., 1955, Ph.D., 1959, University of Michigan
Cushing, Jim M. (1966), Professor of Mathematics, B.A., 1959, Oberlin College; M.A., 1960, University of Chicago; Ph.D., 1964, University of Michigan
Cusano, Michael A. (1968), Vice President for Academic Affairs, B.A., 1965, M.A., 1966, California State University
Davis, Russell P. (1961-62), Associate Professor of Environmental Sciences, B.A., 1950, University of Nebraska; M.A., 1959, University of Minnesota
Davis, Stanley N. (1975), Professor of Hydrology, B.S., 1968, California State University; M.S., 1972, University of Arizona; Ph.D., 1978, University of California
Davis, Thomas P. (1980), Associate Professor of Psychiatry, B.A., 1952, M.A., 1954, University of California; Ph.D., 1957, University of California; Ph.D., 1962, Stanford University
Dawson, George A. (1966), Professor of Atmospheric Sciences, B.S., 1953, University of Missouri; M.S., 1955, University of California; Ph.D., 1959, Stanford University
Dahood, Roger G. (1970), Acting Director of the University Press Board of Directors, B.A., 1957, University of Washington; M.A., 1959, University of California; Ph.D., 1971, University of California
Daid, Roger J. (1962-88), Professor of Environmental Sciences, B.A., 1949, Massachusetts Institute of Technology; M.A., 1950, University of California; Ph.D., 1955, University of California
Dahl, Jeffrey E. (1967), Professor of the History of Science, B.A., 1957, University of Pennsylvania; M.S., 1958, University of California; Ph.D., 1967, University of California
Dent, David (1961), Professor of History, B.A., 1956, Williams College; M.A., 1958, University of California; Ph.D., 1961, University of California
Dunlop, Donald W. (1986), Chief of Experimental Surgery and Clinical Services in University Animal
Ervin, A. Elizabeth (1973), Associate Professor of Music, B.M.E., 1965, University of Michigan; M.M., 1968, Arizona State University

Ervin, R. (1977), Associate Professor of Music; B.S., 1949, Central Michigan University; M.F., 1956, University of California at Los Angeles

Escalera, Ernesto (1966), Assistant Professor of Journalism; B.A., 1971, University of Arizona

Espinoza, Leslie G. (1987), Associate Professor of Law; B.S., 1965, University of Redlands; J.D., 1979, Harvard Law School

Esser, Michael J. (1960), Assistant Professor of Surgery; B.S., 1957, University of Arizona; M.D., 1963, Medical College of Wisconsin

Evans, Daniel D. (1963-82), Professor Emeritus of Nuclear and Energy Engineering; B.A., 1947, Ohio State University; M.S., 1949, Ph.D., 1952, Iowa State University

Evans, Donald J. (1979), Assistant Professor of English; B.S., 1975, Cornell College; M.F.A., 1979, University of Iowa

Evans, Genevieve J. (1985), Director of Purchasing and Stores; B.S., 1959, Ohio University

Evans, Gilbert E. (1964), Associate Professor of Spanish and Portuguese; B.A., 1952, M.A.T., 1956, Ph.D., 1964, Yale University

Evans, Robert R. (1967-89), Associate Professor; B.S., 1962, University of Notre Dame; Ph.D., 1967, University of California at Berkeley

Evans, Robert W. (1958-82), Professor Emeritus of Sociology; B.S., 1956, M.S., 1960, Utah State University; Ph.D., 1957, University of Arizona

Evans, William H. (1979-84; 1985), Assistant Professor of Materials Science and Engineering; B.S., 1976, State University of New York at Stony Brook; M.S., 1977, University of California at Berkeley; Ph.D., 1981, University of Illinois

Evanoff, Robert D. (1964), Professor of Chemistry; B.S., 1951, University of Arizona; Ph.D., 1960, University of California at Berkeley

Evpik, A. Elizabeth (1973), Associate Professor of English; B.S., 1975, Cornell College; M.F.A., 1979, University of Iowa

Ewan, John A. (1969), Associate Head of the Department of Internal Medicine; Professor of Internal Medicine; B.A., 1955, M.D., 1961, University of Washington

Eubanks, Henry L. (1978), Professor of Communication; B.A., 1947, M.A., 1948, Ph.D., 1952, University of Wisconsin

Ewy, Richard D. (1969), Associate Professor of Materials Science and Engineering; B.S., 1967, University of California at Los Angeles

Ewy, Shirley N. (1970), Associate Dean of Admissions in the College of Medicine; Affirmative Action Officer in the College of Medicine; Director of the Division of Social Perspectives in Medicine; Coordinator of Human Behavior and Development; Assistant Professor of Psychiatry; B.A., 1957, Vanderbilt University; M.A., 1963, Ph.D., 1964, University of Rochester

Ewy, Walter J. (1969-90), Professor Emeritus of Electrical and Computer Engineering; B.S., 1957, M.S., 1959, Institute of Technology

Ewy, Terry W. (1986), Head Acquisitions Librarian; Assistant Librarian in the University Library; B.A., 1967, University of Iowa; M.L.S., 1983, University of Texas

Fain, Barbara S. (1969), Lecturer in Exercise and Sport Sciences; B.S., 1973, Northern Arizona University; M.S., 1981, South Dakota State University

Fain, Samuel S. (1946-76), Professor Emeritus of Music; B.M., 1940, University of Michigan; M.A., 1951, University of Arizona; A.Mus.D., 1956, University of Southern California

Fairchild, Patricia C. (1970), Associate Professor of Exercise and Sport Sciences; B.S., 1962, M.A., 1965, Sam Houston State University; Ph.D., 1970, University of Arizona


Pajaro, Laurie L. (1990), Assistant Professor of Radiology; M.D., 1984, University of California

Falco, Charles M. (1982), Professor of Physics, and Optical Sciences; Ph.D., 1978, Arizona Research Laboratories; B.A., 1950, M.A., 1951, Ph.D., 1974, University of California at Irvine

Finch, William L. (1983), Professor Emeritus of Nuclear and Energy Engineering; B.S., 1941, National Central University of China; Ph.D., 1942, University of Chicago

Fann, Patricia S. (1973), Assistant Professor of Mathematics; B.S., 1973, Ph.D., 1984, University of California at Berkeley

Fano, Paolo (1976), Associate Professor of Music; B.M., 1973, University of Arizona; M.M., 1974, University of Southern California at Los Angeles

Fangmeier, Delmar D. (1968), Professor of Agricultural and Biosystems Engineering; B.S.C., 1954, B.S., 1960, M.Sc., 1961, University of Nebraska; Ph.D., 1967, University of California at Davis


Fatzar, Eve (1942-83), Professor Emeritus of Plant Science; B.S., 1940, M.S., 1951, University of Arizona

Fasanella, Hanzel L. (1967), Associate Professor Emeritus of Nuclear and Energy Engineering; B.Ch.E., 1954, City College of New York; M.S., 1963, Ph.D., 1967, University of California

Feinberg, Joel (1977), Regents Professor and Professor of Philosophy; B.A., 1949, M.A., 1951, Ph.D., 1957, University of Michigan

Fenning, William M. (1978-84), Assistant Professor of Neurology; B.S., 1974, Stanford University; M.D., 1978, University of California at San Francisco

Feldmann, Kenneth A. (1990), Assistant Professor of Plant Sciences; B.A., 1977, M.A., 1978, University of Northern Iowa; Ph.D., 1985, The Ohio State University

Felix, William L., Jr. (1983), Professor of Accounting; B.S., 1975, M.S., 1980, University of Montana, Ph.D., 1980, Ohio State University

Felltham, Robert D. (1964), Professor of Chemistry; B.S., 1960, University of New Mexico; Ph.D., 1967, University of California

Fennerty, M. Brian (1989), Assistant Professor of Internal Medicine; B.S., 1984, University of New York at Albany; M.D., 1990, Creighton University

Fenster, Paul E. (1975), Associate Professor of Internal Medicine; B.S., 1968, University of Arizona; M.D., 1974, State University of New York

Fenstermacher, Gary D. (1985), Dean of the College of Education; Professor of Education; B.A., 1961, Ph.D., 1969, Cornell University

Ferdon, Edwin N. (1961-83) Ethnologist and Lecturer Emeritus; B.S., 1947, University of Iowa; M.A., 1970, University of Arizona

Ferguson, E. (1982), Assistant Professor of Music; B.S., 1954, Murray State University; M.A., 1957, Memphis State University

Ferkel, Sandra Lane (1968), Director of the Family and Community Health Division in the College of Nursing; Associate Professor of Nursing; B.S., 1976, Ph.D., 1982, University of Arizona; B.S.N., 1966, University of New Mexico

Fernandez, Cesileino (1976), Vice President for Undergraduate Affairs; Associate Professor of Sociology; B.A., 1973, Sonoma State College; M.A., 1974, Ph.D., 1976, Stanford University

Fernandez, Nelson (1976-82), Associate Professor of Music; B.M., 1965, DePaul University; M.M., 1966, Northwestern University; D.M.A., 1962, Stanford University

Fernando, Quintus (1961), Professor of Chemistry, and Toxicology and Forensic Sciences; B.Sc., 1949, University of Ceylon; Ph.D., 1954, Ph.D., 1955, University of Chicago

Ferril, Edith H. (1970), Central Reference Librarian; Assistant Professor of Library Science; B.A., 1954, Swarthmore College; M.Ed., 1966, Boston University; M.S., 1968, Simmons College


Ferril, Ureil R. (1969), Professor of Systems and Industrial Engineering; B.A., 1954, Swarthmore College; S.B., 1964, Massachusetts Institute of Technology

Ferris, Wayne R. (1958-89), Professor Emeritus of Molecular Biology and Cellular Biology; B.S., 1958, M.D., 1969, University of Chicago

Ferry, Peggy C. (1970), Professor of Pediatrics, and Neurology; B.S., 1956, M.D., 1969, University of Arizona


Follit, Peter F. (1966-70, 1971), Professor of Water- shed Resources and Land Use Planning; B.A., 1966, University of Arizona; Ph.D., 1971, University of Arizona

Flegen, Ann M. (1988), Catalog Librarian; Associate Librarian; B.S., 1967, University of Arizona; M.S.L.S., 1988, University of Arizona

Fife, Paul C. (1968-88), Professor Emeritus of Mathematics; A.B., 1950, University of Chicago; A.B., 1953, University of California at Berkeley; Ph.D., 1959, New York University
Gibbs, Hyatt M. (1965), Professor of Optical Sciences; B.S., 1960, North Carolina State University; Ph.D., 1965, University of California
Gibson, Lay J. (1968), Professor of Geography and Regional Planning; Adjunct Professor of Arid Lands Studies; B.S., 1962, Oregon State University; M.A., 1966, Ph.D., 1968, University of California at Los Angeles
Gibson, Margaret L. (1946-49, 1973-1976), Head of the Department of Russian and Slavic Languages; Associate Professor of Russian and Slavic Languages; B.S., 1946, M.A., 1947, 1970, University of Arizona; Ph.D., 1960, University of California at Berkeley
Gibson, Ursula J. (1982), Adjunct Associate Professor of Optical Sciences, and the Arizona Research Laboratories; A.B., 1975, Dartmouth College; M.S., 1978, Ph.D., 1982, Cornell University
Giebner, Robert C. (1966), Professor of Architecture; B.A., 1963, University of Houston; B.S., 1966, George Washington University
Goldberg, Jeffrey B. (1985), Assistant Professor of Systems and Industrial Engineering; B.S., 1979, M.Eng., 1980, Cornell University; Ph.D., 1984, University of Michigan
Goldstein, Ronald J. (1970), Professor of Pediatrics; A.B., 1956, M.D., 1959, Indiana University
Golden, Judith (1973), Executive Director of Art; B.A., 1973, School of the Art Institute of Chicago; M.F.A., 1975, University of California at Davis
Goldman, Steven (1975), Professor of Internal Medicine; B.A., 1964, Cornell University; M.D., 1968, University of Washington
Goldner, Andreas M. (1975), Associate Dean for Student Affairs and Facilities Management; Director of Alumni Affairs and Multidiscipline Laboratories in the College of Medicine; Associate Professor of Physiology; B.A., 1956, Oberlin College; M.A., 1957, Stanford University; Ph.D., 1966, George Washington University
Goldbary, Mary E. (1981), Assistant Director of Home Economics; Associate Professor in Home Economics; Associate Professor of Family and Consumer Resources; B.S., 1961, Wayne State University; M.S., 1966, Ohio University; Ph.D., 1981, Ohio State University
Goll, Darrel E. (1970), Professor of Animal Science, and Multi-Discipline Laboratories in the College of Medicine; Adjunct Professor of Media Arts; B.A., 1963, University of California at Los Angeles; Ph.D., 1966, Catholic University
Gold, Robert S. (1970), Professor of Economics; B.B.A., 1930, University of Michigan; M.B.A., 1938, University of Arizona
Gortler, Ronald (1978-90), Dean Emeritus of Architecture; Professor Emeritus of Architecture; B.Arch., 1943, University of Minnesota; M.Arch., 1949, Harvard University
Graham, Anna R. (1978), Professor of Pathology; B.S., 1973, Ohio State University; M.D., 1974, Ph.D., 1977, University of Washington
Graham, Gordon J. (1968-90), Professor Emeritus of Agricultural Education; B.S.A., 1948, M.S., 1952, Purdue University
Graham, James E. (1920), Professor of Water Resources; B.S., 1914, Texas A&M University; A.B., 1920, Texas at Richardson; Ph.D., 1929, University of California
Grainger, Byrd H. (1953-78), Professor Emeritus of English; A.B., 1934, Goucher College; M.A., 1953, University of Arizona; Ph.D., 1962, University of California
Granum, Lisa J. (1988), Assistant Professor of Developmental Psychology, and Renewable Natural Resources; Adjunct Assistant Professor of Geography and Regional Development; B.A., 1975, M.S., 1976, University of Wisconsin; Ph.D., 1986, University of Washington
Green, Ellery C. (1961), Professor of Architecture; B.A., 1955, University of Michigan; M.Arch., 1971, Harvard University
Green, Jerrold (1985), Director of the Center for Middle Eastern Studies; Assistant Professor of History in Anthropology; B.A., 1975, University of Massachusetts; M.A., 1977, Ph.D., 1981, University of Chicago
Green, Shoshona (1967), Lecturer in Near Eastern Studies; B.A., 1963, Ph.D., 1967, University of Michigan
Greenberg, James B. (1985), Associate Research Anthropologist; B.A., 1975, University of Arizona; M.A., 1976, University of Arizona
Greenberg, Jeff (1982), Associate Professor of Psychology; B.A., 1976, University of Pennsylvania; M.A., 1978, Southern Methodist University; Ph.D., 1982, University of Kansas
Greenberg, Richard J. (1966), Professor of Planetary Science; B.S., 1963, Ph.D., 1972, Massachusetts Institute of Technology
Greene, Dennis I. (1959-89), Associate Professor Emeritus of Geography; B.A., 1966, Ph.D., 1973, University of Arizona
Greene, John G. (1966), Professor of Anthropology; Adjunct Professor of Anthropology; B.A., 1969, M.A., 1971, Ph.D., 1978, University of Arizona
Greenfield, Louise W. (1982), Head Librarian, Instructors, Library, 20, College of Medicine; B.A., 1968, Temple University; M.S., 1971, Drexel University
Greenfield, Wilfred M. (1971), Professor of Mathematics; B.A., 1958, M.A., 1959, Ph.D., 1967, University of Kansas
Green, William F. (1980), Professor of Journalism: B.A., 1990, University of Arizona
Gregg, Karl C. (1955), Associate Professor of Spanish; B.A., 1970, University of Arizona; M.A., 1954, University of Arizona; Ph.D., 1968, Syracuse University
Green, William F. (1983), Professor of Renewable Natural Resources; Adjunct Professor of Political Science; B.A., 1949, University of Colorado
Green, William J. (1980), Associate Professor of Optical Sciences; B.A., 1976, Thomas More College; M.S., 1975, Ph.D., 1980, University of Arizona
Green, William J. (1984), Assistant Professor of Anthropology; B.S., 1981, University of Arizona
Griffin, Gary A. (1989), Professor of Teaching and Learning; B.A., 1956, M.D., 1956, Ph.D., 1970, University of California at Los Angeles
Griffith, James S. (1979), Coordinator and Director of the Department of Physics; B.A., 1970, California State College; M.A., 1971, University of Michigan; Ph.D., 1971, University of Arizona
Griffith, Terri L. (1969), Assistant Professor of Management and Policy, School of Public Administration; B.A., 1972, University of California at Berkeley; M.S., 1968, Ph.D., 1969, Carnegie Mellon University
...111111111111i.
Hazzard, Mary E. (1973-89), Associate Professor of Watershed Management; B.S., 1957, B.S., 1959, University of California, Davis; Ph.D., 1965, University of California, Berkeley.


Head, Daniel N. (1989), Associate Professor of Exercise and Sport Sciences; B.S., 1981, Florida Atlantic University; M.S., 1983, Ohio State University; Ph.D., 1987, University of Arizona; M.Ed., 1990, Arizona State University.


Hedrick, David L. (1963), Professor of Nuclear and Energy Engineering; B.S., 1947, M.S., 1950, Rensselaer Polytechnic Institute; Ph.D., 1954, University of California, Berkeley. This information seems to be related to a different page or document and is not included in the provided text. It appears the text may be incomplete or incorrect.


Heckman, Paul E. (1987), Assistant Professor of Music; B.A., 1964, Ph.D., 1969, University of California, Berkeley.


Heck, Gordon (1956-86), Professor Emeritus of Architecture; B.A., 1946, University of Minnesota; M.A., 1951, University of Washington.

Heckman, Donald G. (1971), Associate Professor of Economics; B.A., 1962, DePaul University; Ph.D., 1967, Massachusetts Institute of Technology.

Heckler, Susan E. (1990), Assistant Professor of Management; B.A., 1982, Eastern Michigan University; A.B., 1986, University of Minnesota.

Heider, Paul E. (1987), Assistant Professor of Educational Foundations and Administration; B.A., 1966, The King’s College; M.Ed., 1970, Boston University; Ph.D., 1972, University of California at Los Angeles.


Heimer, Karen V. (1990), Assistant Professor of Sociology; B.A., 1981, Florida Atlantic University; M.S., 1983, University of Wisconsin, Madison.

Heine, Melvin W. (1989), Head of the Department of Obstetrics & Gynecology, Professor of Obstetrics & Gynecology; B.A., 1956, The King’s College; M.D., 1961, Grinnell College; B.D., 1965, Yale University; M.L.S., 1966, Rutgers University; Ph.D., 1972, Princeton University.

Higley, Julia L. (1985), Assistant Professor of Systems Engineering; B.S., 1973, Ohio State University; Ph.D., 1985, University of Michigan.

Hildebrand, John G. (1985), Director of the Division of Agricultural and Life Sciences; Regents Professor and Specialist of Plant Pathology; B.A., 1957, B.S., 1958, University of California at Los Angeles; Ph.D., 1962, University of California at Berkeley.

Hinkshaw, Ada S. (1975), Director of Research Nursing in the College of Nursing; Professor of Nursing; B.S., 1957, University of Kansas; M.S., 1961, Yale University; Ph.D., 1965, Columbia University.

Hinton, Harwood (1961-89), Professor Emeritus of History; B.A., 1948, University of Texas, M.A., 1953, University of Michigan; Ph.D., 1960, University of Wisconsin.

Hirschfield, W. E. (1981), Regents Professor and Director of the Bioresearch Institute; B.S., 1957, M.S., 1958, University of Utah; Ph.D., 1968, University of California at Los Angeles.

Hirst, Edmund V. G. (1986), Associate Professor of Music; B.A., 1964, University of Nevada, Reno.

Hoff, John B. (1984), Professor of Material Science and Engineering; Research Professor of Mineral Technology; Assistant Director of the Bureau of Mines, Technology, and Development; Ph.D., 1980, Stanford University; M.S., 1976, M.S., 1979, Ph.D., 1974, University of Utah.

Hinman, Charles V. (1972), Professor of Art; B.S., 1962, Middle Tennessee State University; M.F.A., 1968, Southern Illinois University.


Hodgson, William R. (1971), Professor of Speech and Hearing Science, and Assistant Professor of Psychology; A.B., 1957, Southwest Missouri State University; M.A., 1959, University of Arkansas; Ph.D., 1961, Ohio University.

Hodges, David E. (1971), Associate Professor of Home Economics; B.S., 1973, Ohio State University; M.A., 1977, Michigan State University.


Hoff, Elizabeth R. (1988), Associate Dean of the Karl Eller Graduate School of Management, Professor of Economics; B.A., 1968, Smith College; M.A., 1971, University of Wisconsin; Ph.D., 1978, California Institute of Technology.

Hoffman, Jack L. (1960), Coordinator of Registration; B.A., 1958, University of California, Berkeley.


Hoffman, Joseph J. (1975), Assistant Director of And Lands Studies; Associate Professor of And Lands Studies; Associate Professor of Pharmaceutical Sciences; B.S., 1971, St. Norbert College; Ph.D., 1975, University of Arizona.


Hogran, Lemoine (1964-66), Professor Emeritus of Plant Science; B.S., 1953, M.S., 1957, Louisiana State University; Ph.D., 1964, University of Maryland.


Hohmann, George W. (1963-83), Professor Emeritus of Plant Science; B.A., 1950, University of California, Berkeley; Ph.D., 1955, University of California at Los Angeles.


Hood, George H. (1972), Assistant Area Agent, Agriculture and Natural Resources/Integrated Pest Management; B.A., 1965, Oklahoma Panhandle State University; M.S., 1990, Colorado State University.
Marsh, Ozan (1967-89), Professor Emeritus of Music; "Magna Cum Laude" 1939, Fontainbleau School of Music (Fr); Post Graduate Study (Egon Petri) 1941, Munich Conservatory of Music, Germany; Eml. Sauer (Fritz Litz-pupil), Robert Casadesus, Egon Petri, Vladimir Horowitz, Serge Prokofiev, Ferruccio Busoni, Aaron Copland, Paderewski, etc.

Marsh, Stuart E. (1988), Associate Director of the American Center in Paris; Associate Professor of the Arab Lands Studies Resource Sciences, and in Geography and Regional Development; B.S. 1976, University of Nevada, M.A., 1975, Ph.D. 1976, Stanford University.


Marsh, Thomas H. (1982), Catalog Librarian; Associate Professor of Chemistry; Assistant Professor of Chemistry; B.S. 1973, Ohio State University; M.A., 1976, Ph.D. 1978, University of California at Los Angeles.

Marsh, Wesley B. (1968), Associate Professor of Media Arts; B.S.J., 1957, M.F.A., 1959, Ohio University.

Marton, Sallie (1866), Assistant Professor of Geography and Regional Development; B.A. 1974, Clark University; M.A., 1982, Ph.D. 1986, University of Colorado.


Martin, S. Clark (1966-86), Professor Emeritus of Management; B.S. 1942, Michigan State University; M.B.A., 1946, University of Colorado; M.S., 1960, University of Arizona.

Martin, Jeffrey P. (1950), Catalog Librarian; Assistant Librarian; B.A. 1973, University of California at Los Angeles; M.A., 1975, M.L.S., 1990, Syracuse University.


Martin, Robert N. (1987), Associate Astronomer and Scientist and Associated Specialist in Plant Pathology; B.S. 1969, California State University at Los Angeles; M.S., 1973, Ph.D. 1979, University of Arizona.


Martin, Robert N. (1987), Associate Astronomer and Scientist and Associated Specialist in Plant Pathology; B.S. 1969, California State University at Los Angeles; M.S., 1973, Ph.D. 1979, University of Arizona.


Matsuoka, Kaoru (1943-63), Associate Professor of Molecular and Cellular Biology; B.S. 1952, M.S., 1958, Ph.D. 1962, University of Arizona.

Matter, Fred S. (1967), Director of Graduate Programs in Architecture; Professor of Architecture; B.A. 1962, University of Massachusetts; M.Arch., 1967, University of Oregon.

Matter, William J. (1978), Associate Professor of Wild- life Management; B.S. 1953, M.A., 1956, California Polytechnic Institute and State University.


Mathitng, Althea S. (1935-74), Professor Emeritus of Speech Communication; A.B., 1924, M.A. 1931, University of Wisconsin; Ph.D. 1954, Northwestern University.


McKendry, Edward F. (1969-70), Agent in Home Economics; Coordinator of the State EFNEP Program; B.S., 1951, Illinois State University.


Maxwell, Margaret F. (1971), Professor of Library Science; B.A. 1948, Pomona College; B.L.S., 1950, University of California at Berkeley; M.S., 1953, Ph.D. 1956, University of Oregon.


Mayersohn, Michael (1976), Professor of Pharmaceutical Sciences; B.S., 1966, Columbia University; Ph.D., 1971, State University of New York.

McBride, Laurence C. (1966), Professor Emeritus of Paleontology; B.S. 1940, University of Arizona; M.A., 1945, Ph.D. 1948, University of California at Berkeley.

McCracken, Betty J. (1969-86), Associate Professor Emerita of Nursing; B.S. 1953, University of California at Berkeley, M.S. 1959, University of Colorado.


McClellan, Donald L. (1983), Professor Emeritus of Aerospace and Mechanical Engineering; B.E. 1952, Yale University; M.S.E., 1958, University of Washington; Ph.D. 1968, Massachusetts Institute of Technology.

McCoy, Robert B. (1967), Professor of Plant Science; A.B. 1963, Ph.D. 1967, West Virginia University.

McCoy, Robert B. (1967), Professor of Plant Science; A.B. 1963, Ph.D. 1967, West Virginia University.

McCoy, Robert B. (1967), Professor of Plant Science; A.B. 1963, Ph.D. 1967, West Virginia University.

McCoy, Robert B. (1967), Professor of Plant Science; A.B. 1963, Ph.D. 1967, West Virginia University.
Mullen, Steven L. (1990), Assistant Professor of Marketing; B.S., 1969, Indiana University; M.S., 1971, Ph.D., 1974, Stanford University.

Muller, Edward N. (1977), Professor of Political Science; B.A., 1960, Massachusetts Institute of Technology; M.A., 1968, Ph.D., 1971, University of Iowa.
Richardson, Jose M. G. (1990), Professor of Entomology, M.D., 1974, State University of Rio de Janeiro; Ph.D., 1980, Biopolis Institute.

Rice, Richard (1950), Professor of Specialist of Animal Science; B.S., 1953, M.S., 1958, University of Nebraska; Ph.D., 1960, Michigan State University.

Rice, Ronald A. (1956), Associate Professor of Radiology, M.D., 1957, University of Washington; M.Sc., 1968, University of Colorado.


Richardson, Randall M. (1978), Associate Professor.

Richardson, Randall M. (1978), Associate Professor of Geosciences; B.A., 1972, University of California at Santa Barbara; Ph.D., 1976, Massachusetts Institute of Technology.

Richardson, Virginia (1986), Professor of Teaching. 

Rieber, Michael (1978), Professor of Mining and Geological Engineering; A.B., 1952, Syracuse University; M.A., 1962, University of Chicago; Ph.D., 1972, Syracuse University.


Riddle, Carl (1977), Professor of Family and Consumer Resources, and Psychology; B.S., 1964, M.A., 1965, Ph.D., 1969, Georgia; M.S., 1954, University of Tennessee; Ph.D., 1959, Ohio State University; Ph.D., 1969, University of Harvard.


Rieke, Robert B. (1981), Professor of Aerospace and Mechanical Engineering; Associate Professor of Radiation Oncology, Adjunct Professor of Electrical and Computer Engineering; B.S.M.E., 1963, University of Wisconsin; M.S.M.E., 1965, Ph.D., 1969, Stanford University.


Rieman, William L. (1959-91), Professor Emeritus of Astronomy; Associate Professor of Physics; B.S., 1942, University of Notre Dame; M.S., 1951, Ph.D., 1959, The Ohio State University.

Rogers, Barbara J. (1990), Professor of Art; B.S.C., 1969, University of California at Berkeley; M.A., 1979, Stanford University.

Rogers, Edward O. (1981), Professor Emeritus of Microbiology and Medical Technology; Adjunct Professor of Communication; B.S.M.E., 1942, Iowa State University; M.S.E., 1949, North-western University; Ph.D., 1960, Stanford University; Ph.D., 1969, Stanford University.

Rollins, Patricia (1962), Professor Emeritus of Nutrition and Food Science; B.S., 1950, M.S., 1951, University of Massachusetts; Ph.D., 1959, The Ohio State University.


Rosenblum, Sandra (1990), Director of the Roy P. Cohn - Wallerstein Institute; Professor of Religious Studies & Research Center; B.A., 1975, University of Washington.

Rosenbloom, Sandra (1990), Director of the Roy P. Cohn - Wallerstein Institute; Professor of Religious Studies & Research Center; B.A., 1975, University of Washington.

Rosenzweig, Michael L. (1975), Professor of Ecology and Evolutionary Biology; B.S., 1974, University of California at Berkeley; M.A., 1975, Ph.D., 1975, Stanford University.


Rossi, Rosemary A. (1975), Associate Professor of Psychology; B.A., 1967, University of California at Santa Barbara; M.A., 1973, Ph.D., 1976, University of Arizona.

Rossie, Sandra S. (1989), Assistant Professor of Pharmacology and Toxicology; B.A., 1978, Johns Hopkins University; Ph.D., 1984, University of Chicago.

Rowe, David C. (1988), Associate Professor of Family and Consumer Resources, and Psychology; A.B., 1972, Harvard University; Ph.D., 1977, University of Colorado.

Rowenbrenner, Jerry W. (1986), Associate Professor of Exercise and Sport Sciences; B.S., 1983, Arizona State University; M.S., 1983, Arizona State University; Ph.D., 1985, Wayne State University.

Rubenwitz, Sheryl (1988), Adjunct Professor in the Department of Neurology; Professor of Biology; B.S., 1958, Pennsylvania State University; M.D., 1972, Jefferson Medical College.

Rubi, David D. (1956-86), Professor Emeritus of Plant Science; B.S., 1948, University of Minnesota; M.S., 1950, Ph.D., 1954, Iowa State College.

Rubin, Solomon (1965), Professor Emeritus of Geosciences; B.S., 1977, University of Miami; M.S., 1983, University of California at Irvine.

Ruin, Richard (1986), Associate Professor of Language; Reading and Culture; A.B., 1970, Harvard University; M.L.S., 1973, University of Washington.

Rue, Amy E. (1981), Photographic Archives Librarian; Associate Librarian in the University Library; B.A., 1969, University of California at Irvine; M.L.S., 1977, University of California at Berkeley.

Rund, Jan (1980), Professor of Mathematics in the Committee on Advanced Mathematics; B.S.C., 1945, Ph.D., 1950, University of Cape Town.

Rund, John V. (1963), Associate Professor of Chemistry; B.A., 1956, Illinois Wesleyan University; Ph.B., 1956, University of Washington.


Ruttenberg, George (1973), Professor of Political Science; B.S., 1963, Brigham Young University; Ph.D., 1968, University of Michigan.


Ruttenberg, George (1973), Professor of Political Science; B.S., 1963, Brigham Young University; Ph.D., 1968, University of Michigan.


Ruttenberg, George (1973), Professor of Political Science; B.S., 1963, Brigham Young University; Ph.D., 1968, University of Michigan.


Ruttenberg, George (1973), Professor of Political Science; B.S., 1963, Brigham Young University; Ph.D., 1968, University of Michigan.

Swetnam, Thomas W. (1988), Assistant Professor of

Swalin, Richard A. (1984), Professor of Materials

Swaim, Donna E. (1987), Senior Lecturer in Human-

Svob, Robert S. (1942 -44; 1946 -83), Dean of Stu-

Sutherland, Ronald A. (1982), Lecturer in Exercise

Supalla, Samuel J. (1989), Assistant Professor of

Sundareshan, Malur K. (1981), Professor of Electrical

Sumner, John S. (1963 -83), Professor Emeritus of

Summers, George W. (1956-68), Professor Emeritus of

Tellman, Stephen G. (1965), Lecturer in Mathemat-

Teague, Lynn S. (1982), Curator of Archaeology in

Taylor, Shirley H. (1974), Specialist in 4-H; B.S., 1953;

Teague, Lynn S. (1982), Curator of Archaeology in

Thomas, Violet S. (1967 -82), Associate Professor

Thomas, Joann (1987), Assistant Professor of Medi-

Thaler, Harold B. (1979), Professor of Electrical En-

Thompson, Ethel M. (1938-65), Professor Emerita of

Thompson, Hugh C. (1970-86), Professor Emeritus of

Thompson, Raymond H. (1956), Director of the Ar-

Thomson, Richard B. (1967), Associate Professor of

Tipton, Charles M. (1984), Director of the School of

Tipton, Jimmy L. (1989), Associate Specialist in Plant

Tizard, Alan J. (1976-86), Professor Emeritus of Wild-

Tobin, Lawrence A. (1980), Professor of Statistics;

Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;

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Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;

Tobin, Lee R. (1972), Professor of Plant Pathology;
Young, Lai-sang (1986), Professor of Mathematics; B.S., 1973, University of Wisconsin; M.A., 1976, Ph.D., 1978, University of California at Berkeley
Younggren, Newell A. (1962-80), Professor Emeritus of Ecology and Evolutionary Biology; B.S., 1937, Western State College of Wisconsin; M.P.H., 1941, University of Wisconsin; Ph.D., 1956, University of Colorado
Zagona, Salvatore V. (1959-82), Professor Emeritus of Psychology; B.A., 1951, M.A., 1954, Ph.D., 1959, University of Arizona
Zajac, Edward E. (1983), Head of the Department of Economics; Professor of Economics; B.M.E., 1950, Cornell University; M.S.E., 1952, Stanford University
Zapotocky, Joseph A. (1953-82), Professor Emeritus of Pharmaceutical Sciences; B.S., 1940, Ph.D., 1948, Ohio State University
Zaug, Ned L. (1985), Associate Agent in Agriculture; B.S., 1970, Utah State University; M.S., 1972, Pennsylvania State University
Zegura, Stephen L. (1972), Associate Professor of Anthropology; B.A., 1965, Stanford University; M.S., 1971, Ph.D., 1974, University of Wisconsin
Zehnder, Joseph A. (1986), Professor of Atmospheric Physics, and Atmospheric Sciences; B.S., 1980, M.S., 1982, Ph.D., 1986, University of Chicago
Zeigler, Bernard P. (1985), Professor of Electrical and Computer Engineering; B.S., 1962, McGill University; M.S., 1964, Massachusetts Institute of Technology; Ph.D., 1968, University of Michigan
Zeilinski, Brian J. (1987), Assistant Professor of Materials Science and Engineering; B.S., 1978, Ohio State University; Ph.D., 1988, Massachusetts Institute of Technology
Zepeda, Ofelia (1986), Assistant Research Social Scientist in the Social and Behavioral Sciences Research Institute; Director of American Indian Studies; Assistant Professor of Linguistics; B.S., 1980, M.A., 1981, Ph.D., 1984, University of Arizona
Ziolkowski, Richard W. (1990), Associate Professor of Electrical and Computer Engineering; Sc.B., 1974, Brown University; B.S., 1975, Ph.D., 1990, University of Illinois at Urbana-Champaign
Zube, Ervin H. (1977), Professor of Renewable Natural Resources; Adjunct Professor of Geography and Regional Development; B.S., 1954, University of Wisconsin; M.L.A., 1959, Harvard University; Ph.D., 1973, Clark University
Zukoski, Charles F. (1969), Professor of Surgery; A.B., 1947, University of North Carolina; M.D., 1951, Harvard University
Zumbro, Nicholas (1976), Professor of Music; B.A., 1954, University of Tennessee; M.S., 1960, Juilliard School; 2nd Prix Debussy, Institute Debussy
Zurbrick, Phillip R. (1971), Professor of Agriculture Education; B.S., 1961, Oregon State University; M.A., 1965, University of Arizona; Ph.D., 1971, Ohio State University
Zweig, Bella (1987), Senior Lecturer in Humanities; B.A., 1973, Columbia University; Ph.D., 1982, Stanford University
Zwingar, Lynda M. (1984), Associate Professor of English; B.A., 1977, University of Minnesota; Ph.D., 1984, State University of New York
Zwolinski, Malcolm J. (1985), Associate Director of the School of Renewable Natural Resources; Professor of Watershed Management; B.S., 1959, University of New Hampshire; M.F., 1961, Yale University; Ph.D., 1966, University of Arizona
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## Academic Programs at The University of Arizona

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