The General Catalog provides illuminating insights into the character of the University. As such it is of value not only to current students but also to individuals who contemplate enrolling.

You will find that these pages demonstrate the impressive depth and breadth of the University of Arizona’s endeavors. They extend through the entire spectrum of the arts and sciences and embrace a wide range of professional fields. In all areas you will find both introductory courses, which outline the intellectual challenge of a field, and sequences of more advanced courses designed to develop a solid grasp of the issues involved.

Impressive as it is in length, variety and depth, this catalog still cannot tell the full story of our intellectual endeavors. It does not fully describe our graduate programs, for they are left largely to a separate volume. Nor does it cover the myriad specialized research activities of our faculty members, activities that underpin and invigorate their classroom teaching. Nor, again, does this catalog indicate our program of innumerable lectures, discussions, exhibitions and artistic performances. All of these, together with recreational and athletic activities, and the beauty of our setting, add to the vitality of campus life. All of these elements are valuable portions of the educational process and all of them contribute to our academic worth.

As you use this catalog I hope that you find not only the specific information that you seek but also additional information that opens doors into exciting new worlds as yet unsampled, but intriguing.

Henry Koffler
President
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 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 will 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 should be addressed to:

Director of Admissions
The University of Arizona
Tucson, Arizona 85721
(602) 621-3237

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#### First Semester

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<tr>
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<th>1989-90</th>
<th>1990-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degrees awarded as of this date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>for students completing requirements at close of summer session</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residence halls open</td>
<td>Aug. 10 Th</td>
<td>Aug. 9 Th</td>
</tr>
<tr>
<td>New student orientation program (Last session)</td>
<td>Aug. 20 Su</td>
<td>Aug. 19 Su</td>
</tr>
<tr>
<td>Freshman Convocation</td>
<td>Aug. 19-22</td>
<td>Aug. 18-21</td>
</tr>
<tr>
<td>Classes begin</td>
<td>Aug. 23 W</td>
<td>Aug. 22 W</td>
</tr>
<tr>
<td>Labor Day—no classes</td>
<td>Aug. 24 Th</td>
<td>Aug. 23 Th</td>
</tr>
<tr>
<td>Last day for dropping courses resulting in deletion of course enrollment from record</td>
<td>Aug. 31 Th</td>
<td>Aug. 30 Th</td>
</tr>
<tr>
<td>Sept. 4 M</td>
<td>Sept. 3 M</td>
<td></td>
</tr>
<tr>
<td>Veterans’ Day—no classes</td>
<td>Sept. 20 W</td>
<td>Sept. 19 W</td>
</tr>
<tr>
<td>Honors Convocations—no classes</td>
<td>Oct. 1 W</td>
<td>Oct. 31 W</td>
</tr>
<tr>
<td>Thanksgiving recess</td>
<td>Nov. 1 W</td>
<td>Nov. 16 Th</td>
</tr>
<tr>
<td>Applications for bachelor’s degree candidacy must be filed for degrees to be awarded at close of the following summer session</td>
<td>Nov. 10 F</td>
<td>Nov. 15 Th</td>
</tr>
<tr>
<td>Classes and laboratory sessions end</td>
<td>Nov. 23-26</td>
<td>Nov. 22-25</td>
</tr>
<tr>
<td>Winter Commencement</td>
<td>Th-Su</td>
<td>Th-Su</td>
</tr>
</tbody>
</table>

#### Second Semester

<table>
<thead>
<tr>
<th></th>
<th>1989-90</th>
<th>1990-91</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residence halls open</td>
<td>Jan. 7 Su</td>
<td>Jan. 6 Su</td>
</tr>
<tr>
<td>New student orientation program (last session)</td>
<td>Jan. 7-9</td>
<td>Jan. 6-8</td>
</tr>
<tr>
<td>Classes begin</td>
<td>Su-Tu</td>
<td>Su-Tu</td>
</tr>
<tr>
<td>Martin Luther King Holiday</td>
<td>Jan. 10 W</td>
<td>Jan. 9 W</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>Jan. 15 M</td>
<td>Jan. 16 W</td>
</tr>
<tr>
<td>Martin Luther King Holiday</td>
<td>Jan. 18 Th</td>
<td>Jan. 21 M</td>
</tr>
<tr>
<td>Last day for dropping courses resulting in deletion of course enrollment from record</td>
<td>Feb. 5 Tu</td>
<td>Feb. 6 Tu</td>
</tr>
<tr>
<td>Applications for bachelor’s degree candidacy must be filed for degrees to be awarded at close of the following fall semester</td>
<td>Mar. 1 Th</td>
<td>Mar. 1 F</td>
</tr>
<tr>
<td>Veterans’ Day—no classes</td>
<td>Mar. 10-18</td>
<td>Mar. 9-17</td>
</tr>
<tr>
<td>Last day for dropping courses</td>
<td>Sa-Su</td>
<td>Sa-Su</td>
</tr>
<tr>
<td>Applications for bachelor’s degree candidacy must be filed for degrees to be awarded at close of the following spring semester</td>
<td>Mar. 27 Tu</td>
<td>Mar. 26 Tu</td>
</tr>
<tr>
<td>Class and laboratory sessions end</td>
<td>May 1 Tu</td>
<td>May 1 W</td>
</tr>
<tr>
<td>Semester examinations begin</td>
<td>May 2 W</td>
<td>May 1 W</td>
</tr>
<tr>
<td>Semester examinations end</td>
<td>May 4 F</td>
<td>May 3 F</td>
</tr>
<tr>
<td>Spring Commencement</td>
<td>May 11 F</td>
<td>May 10 F</td>
</tr>
<tr>
<td></td>
<td>May 12 Sa</td>
<td>May 11 Sa</td>
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</table>

#### Presession

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<tr>
<th></th>
<th>1990</th>
<th>1991</th>
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<tbody>
<tr>
<td>Classes begin</td>
<td>May 14 M</td>
<td>May 13 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>May 16 W</td>
<td>May 15 W</td>
</tr>
<tr>
<td>Classes end</td>
<td>June 2 Sa</td>
<td>June 1 Sa</td>
</tr>
</tbody>
</table>

#### Summer Session

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>1991</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classes of first term begin</td>
<td>June 4 M</td>
<td>June 3 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>June 7 Th</td>
<td>June 6 Th</td>
</tr>
<tr>
<td>Classes of first term end</td>
<td>July 5 Th</td>
<td>July 3 W</td>
</tr>
<tr>
<td>Classes of second term begin</td>
<td>July 9 M</td>
<td>July 8 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>July 12 Th</td>
<td>July 11 Th</td>
</tr>
<tr>
<td>Classes end</td>
<td>Aug 8 W</td>
<td>Aug 7 W</td>
</tr>
</tbody>
</table>
Admission to the University

The University of Arizona welcomes applications for admission from all individuals who qualify. Students with a record of success or high motivation to succeed will find the rich blend of academic and social opportunities for learning available at the University particularly well suited to their needs.

The Office of Admissions offers numerous opportunities for visiting the University which include campus tours, personal interviews, and meetings with faculty members. Prospective students should call the Office of Admissions at (602) 621-3641 for information about campus visitation programs, and to arrange for personal appointments and for student-conducted campus tours.

General Information

Equal Opportunity—The University of Arizona is committed to providing equal educational opportunity for all without regard to sex, race, religion, color, national origin, age, Vietnam Era veterans’ status, or handicapping condition. Inquiries may be referred to the Affirmative Action Officer, Administration Building, Room 501, (602) 621-3081.

Application for Admission—Applications for admission may be obtained by writing or calling:

Office of Admissions
University of Arizona
Tucson, AZ 85721
(602) 621-3237

Inquiries regarding admission policies and procedures for undergraduate programs should be directed to the Office of Admissions. Information about admission to the Graduate College, the College of Law, and the College of Medicine may be obtained from the admissions office of the respective college.

Admission Application Fee—No fee is required of applicants from the state of Arizona. Applicants for admission from states other than Arizona must pay an application fee of $25. The application fee is also required of undergraduate foreign students. This should be paid in check or money order made payable to the University of Arizona and must be submitted with the application for admission. Applications are not considered unless accompanied by this nonrefundable fee.

Deadline for Application—Applications and supporting transcripts must be received in the Office of Admissions by June 1 for the fall semester and December 1 for the spring semester. However, to be eligible for the Priority Service Program (financial aid, scholarships, residence hall accommodations, and summer orientation and pre-registration), applicants should submit complete applications and supporting transcripts by April 1 for the fall semester. Earlier applications are recommended. High school seniors may submit their applications any time during the first semester of their senior year. A description of the Priority Service Program is below.

Priority Service Program—The University of Arizona has received unprecedented national recognition over the past several years for its academic excellence in teaching and research, its athletic programs, and its outstanding quality of life. This has led to a growth in applications and a demand for student services which has placed it among the nation’s most popular universities. It is now essential that students interested in attending the University of Arizona apply for admission and services for new students (financial aid, scholarships, residence hall space, and summer orientation) early as possible. To encourage early application, the University of Arizona has established the Priority Service Program.

Under the Priority Service Program, students applying for admission and services for new students by April 1 (for fall semester) will receive priority service from participating offices. While April 1 is the priority service date, students may apply much earlier, and they are encouraged to do so. A brochure which details each priority service function can be obtained through the Office of Admissions.

ACT or SAT Requirements—All entering freshman students must take the American College Test (ACT) or the Scholastic
Aptitude Test (SAT) of the College Board, and have their scores sent to the Office of Admissions. Information regarding these tests may be obtained from high school counselors. Transfer applicants who have earned less than 36 semester hours of credit must also submit results from either the ACT or SAT examinations.

Domicile Affidavit—A student enrolling in the University of Arizona for the first time, or a student returning after an absence of one or more semesters, must file a Domicile Affidavit. This form is furnished to students with the admission or readmission application. 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 and students absent from the University more than two semesters must submit a completed Student Health Questionnaire to the Student Health Service. This form will be mailed to all admitted students. 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—Applicants who have graduated from high school and who do not wish to work toward a degree may enroll for on-campus courses as a nondegree student. Applicants for admission to this program must be 19 years of age or older, except for the summer terms. Students may register 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. Nondegree students are not required to file official transcripts. A disqualified student may not attend the University as a nondegree student.

Summer Sessions—The University of Arizona offers numerous summer learning opportunities. Students wishing to attend summer sessions may apply for summer sessions only or for continuing enrollment beginning with the summer terms. Please contact the Office of Admissions for application materials.

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 for admission who meet the following general aptitude and academic competency requirements may be admitted.

General Aptitude—Applicants must demonstrate general aptitude through meeting one of the following requirements:

A. For resident applicants:
1. Ranks in the upper 50 percent of the applicant's high school graduating class or has a cumulative high school grade-point average of at least 2.50 on a 4.0 scale; or
2. Obtains a composite score of at least 21 on the American College Test or at least 930 on the Scholastic Aptitude Test.

B. For nonresident applicants:
1. Ranks in the first quartile (upper 25 percent) of the applicant's high school graduating class or has a cumulative high school grade-point average of at least 3.0 on a 4.0 scale; or
2. Obtains a score of at least 23 on the American College Test or at least 1010 on the Scholastic Aptitude Test.

Basic Competencies—Applicants must demonstrate academic competency in each of the subjects listed below. Students who choose to demonstrate their competency in a subject by completing appropriate high school or college courses must attain an overall grade-point average for courses in that subject of at least 2.0 on a 4.0 scale. A high school unit is defined as one year of study.

English: 4 units
High school English courses taken to satisfy this competency requirement must include literature and substantial emphasis on grammar and composition. Courses such as journalism, business communications, speech, and others that often include some emphasis on grammar or composition may improve a student's ability in English. However, they are not devoted exclusively to the study of English and may not be substituted for a regular English course.

Mathematics: 3 units
Algebra I; Plane Geometry; Algebra II.

Social Studies: 2 units
One unit in American history and an additional unit in another social science field such as: world history, economics, sociology, geography, government, psychology, or anthropology.

Laboratory Science: 2 units
One unit from any two of the following: biology, chemistry, or physics.
A laboratory science course is defined as a course in which at least one class period each week is devoted to providing an opportunity for students to manipulate equipment, materials, or specimens, to develop skills in observation and analysis, and to discover, demonstrate, illustrate, or test scientific principles or concepts.

Additional Subject Units Recommended—In addition to the above required course work, applicants are strongly recommended to complete two years of a single foreign language; a third year of laboratory science and social studies; and other electives in music, art, drama, speech, or any other college preparatory subjects commonly offered for credit by secondary schools. A minimum of 5 credits of recommended additional course work is desirable.
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 American College Test (ACT); the Scholastic Aptitude Test (SAT) and the ATP Achievement Tests.

Meeting Academic Competency Requirements

Applicants may meet the Academic Competency Requirements in English, mathematics, laboratory science, and social studies by using any combination of the methods shown in the following chart.

<table>
<thead>
<tr>
<th>Subject Areas</th>
<th>High School Course Work (&quot;C&quot; average required)</th>
<th>ACT Scores</th>
<th>SAT &amp; Achievement Scores</th>
<th>College Course Work (Credits based on semester system)</th>
</tr>
</thead>
<tbody>
<tr>
<td>English 4 Units (Composition &amp; Literary Analysis only)</td>
<td>English I, English II, English III, English IV</td>
<td>English subscore of 19 or above</td>
<td>Verbal subscore of 450 or above</td>
<td>One transferable 3-credit English course</td>
</tr>
<tr>
<td>Mathematics 3 units</td>
<td>Algebra I, Plane Geometry, Algebra II</td>
<td>Mathematics subscore of 18 or above</td>
<td>Mathematics subscore of 500 or above</td>
<td>Two 3-credit pre-college math courses or one transferable 3-credit algebra course</td>
</tr>
<tr>
<td>Laboratory Science 2 units</td>
<td>One unit from any two of the following: Biology, Chemistry, Physics</td>
<td>Natural Science subscore of 20 or above</td>
<td>ATP Achievement Test Scores: Chemistry: 575 or above Biology: 550 or above Physics: 590 or above</td>
<td>Two 4-credit transferable laboratory science courses</td>
</tr>
<tr>
<td>Social Studies 2 Units</td>
<td>American History, One additional unit from: European/World History, Economics, Sociology, Geography, Government, Psychology, Anthropology</td>
<td>Social Studies subscore of 18 or above. Meets any social studies requirements with the exception of American History</td>
<td>ATP Achievement Test Scores: American History/Social Studies: 510 or above European Hist/World Culture: 545 or above</td>
<td>One 3-credit transferable American History course and one additional 3-credit transferable social science course</td>
</tr>
</tbody>
</table>

Admission Exceptions

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 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, one unit of physics or chemistry, and one unit of foreign language. Students are strongly advised to include among their electives additional courses in mathematics such as trigonometry, advanced algebra, or solid geometry.

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—New students in the pre-education program will be admitted to the College of Arts and Sciences. 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 for admission to the College of Education. Those 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) For further information, 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 3.5000 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-a-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 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 and career goals, and integrate academic majors with career opportunities. ACES is based 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 Freshman Placement

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 supporting materials, to the students' colleges, enabling the University to grant appropriate placement and credit. For University of Arizona credit policies, 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, 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, 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
University of Arizona
Tucson, AZ 85721
(602) 621-3237

Students transferring from other colleges and universities are required to file with the Office of Admissions 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—Transfer applicants for admission are required to present the following:

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

B. Nonresident transfer applicants: a cumulative grade-point average on their previous college work of 2.00 (C) on a 4.00 scale.

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.

Students’ Copies of Transcripts—Transfer students are urged to bring with them to registration unofficial transcripts of their records at colleges and universities previously attended. These will be helpful for advising when the official transfer evaluation has not yet been completed by the Office of Admissions.

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 on 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 accepted for credit.

Inquiries concerning the acceptance of transfer credit from foreign institutions should be directed to the Office of Admissions, which is responsible for the evaluation of foreign credit transfer.

Credits from Community Colleges—A maximum of 72 units may be transferred from accredited community colleges, provided these units are in courses acceptable for transfer credit. 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 which are rejected for transfer 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 therefore consult the Colleges section of this catalog 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 direct their inquiries about undergraduate admission to the Office of Admissions, Nugent Building. Foreign students are expected to have above average grades, must demonstrate proficiency in the English language, and must satisfy the financial guarantee requirements 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. For test registration information, write: Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08541.

Results of the TOEFL are valid for two years. Applicants should request that TOEFL (Box 899-TR, Princeton, New Jersey 08541, USA) 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 writing proficiency 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 will meet the English proficiency requirement for admission. Request further information by writing to CESL,
Room 104, CESL Building. It is recommended that a statement of academic admissibility be requested from the Office of Admissions before application is made for CESL study. Admission to CESL study does not guarantee admission to any academic program at the University of Arizona.

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 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.

Foreign students on nonimmigrant visas are required by the University to have University of Arizona Student Accident and Sickness Insurance coverage. Information and costs of this coverage are sent to those foreign students who are accepted for admission. 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 University of Arizona insurance plan only when their government or sponsoring agency has submitted accident and sickness insurance plans acceptable to the University of Arizona, or when the student can show proof of having health insurance comparable with that available through the University (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, which is responsible for the evaluation of foreign credit in transfer.

Application Deadlines—May 15 for fall; September 15 for spring; April 1 for summer. To meet the deadlines, the application and other required official credentials and statements must be received in the Office of Admissions by the above dates.

Admission of Immigrant and Refugee-Status Students

Application inquiries about undergraduate admission should be directed to the Office of Admissions, 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. For test registration information, write: Test of English as a Foreign Language, Box 899, Princeton, New Jersey 08541.

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 Disabled Student Services Program, 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, Bear Down Gym, Room 1A, 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, no failing grades received by such veteran at any Arizona university or community college prior to military service 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 reenrolled at 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.

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 veterans' responsibility to notify the Veterans' Services Office of any changes occurring in their 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

A. 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 another postsecondary institution since last attendance at the University should contact the Office of the Registrar to apply for readmission. Students who have attempted course work at another postsecondary institution since last attendance should contact the Office of Admissions to apply for readmission.

3. Students who have attempted 12 semester hours or more at another postsecondary institution 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 readmission application. Transcripts should be sent to the Office of Admissions.

4. Students planning to enroll in a new college must obtain written approval from the dean of that college prior to readmission.

5. Students who have previously attended the University in a nondegree status must apply for regular admission if intending to enter a degree program. Application should be made through the Office of Admissions.

Note: Students who withdraw from the University for more than two consecutive semesters must meet degree requirements as outlined in the catalog in effect at the date of their re-enrollment for university credit or any subsequent catalog in effect during their dates of registration for university credit.

B. 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 course work 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 course work 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 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 on first disqualification are eligible to return to the University upon application for readmission if no additional college-level course work was completed at another postsecondary institution.

4. Students seeking readmission who left the University on academic probation or on first disqualification and who attempted any college-level course work at another college or university must receive approval from the dean of the college prior to readmission. An official transcript of all course work completed at other institutions since last attendance is required.

5. Students seeking readmission who left the University on permanent disqualification must receive approval from the dean of the college prior to readmission.

The Traveling Scholars Program

The Traveling Scholars Program is designed so that students may take advantage of programs or special resources available at one of the three state universities 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, nondegree, or audit.

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.

Audit—Auditing students do not take courses for credit. Such students are not required to meet admission standards but must obtain permission from the instructor before enrolling in a course. Auditing students pay the same fees as credit students.

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 $4. The replacement charge for a lost or stolen I.D. card is $10.

**Clearance of Accounts**—No student whose record indicates indebtedness to the University shall be permitted to register.

**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 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 Graduate Council (in the case of graduate 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 officially enrolled. If this official registration record does not agree with the student's own rec-
Student Retention

An average of 75 percent of entering freshmen return to register the first semester of the following year. After four or five years and in the subsequent semesters to follow, approximately 55 percent of the entering class have 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 act 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</th>
<th>Minimum grade-point average based upon university credit at University of Arizona</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 credit by examination (whether or not for a grade). 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 student 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 or a University of Arizona cumulative grade-point average between 1.750 and 2.000, or who have completed from 14 through 26 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. Probation status will be indicated on the student's permanent record.

Disqualification—Disqualification is of two types: from a particular college in the University, or from the University, the type to be established by the Deans' Council on the recommendation of the dean of the college in which the student was enrolled.

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
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 calendar 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.

**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>
<th>College or School</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>19 Engineering &amp; Mines</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Architecture</td>
<td>19 Graduate</td>
<td>16</td>
<td></td>
</tr>
<tr>
<td>Arts &amp; Sciences</td>
<td>19 Health-Related Professions</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Business &amp; Public Administration</td>
<td>19 Law</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>Education</td>
<td>19 Nursing</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pharmacy</td>
<td>19</td>
</tr>
</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 standing does not necessarily relate to the number of semesters or units required to complete degree requirements. Class standing is determined by the college in Medicine and Pharmacy.

<table>
<thead>
<tr>
<th>College or School</th>
<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>1-25</td>
<td>26-57</td>
<td>58-90</td>
<td>91+</td>
</tr>
<tr>
<td>Architecture</td>
<td>1-29</td>
<td>30-60</td>
<td>61-94</td>
<td>95+</td>
</tr>
<tr>
<td>Arts &amp; Sciences</td>
<td>1-24</td>
<td>25-55</td>
<td>56-86</td>
<td>87+</td>
</tr>
<tr>
<td>B.S. in Geo.</td>
<td>1-27</td>
<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>Education</td>
<td>1-24</td>
<td>25-55</td>
<td>56-86</td>
<td>87+</td>
</tr>
<tr>
<td>Engineering &amp; Mines</td>
<td>1-27</td>
<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>Health-Related Professions</td>
<td>1-27</td>
<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>Nursing</td>
<td>1-21</td>
<td>22-49</td>
<td>70-103</td>
<td>104+</td>
</tr>
<tr>
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</tbody>
</table>

*Note: The units listed above are for regular semester load. For summer session, the maximum units allowed are 8 for freshmen, 12 for sophomores, 15 for juniors, and 18 for seniors.*

*Senior includes junior year and senior year.*
**Full-Time Student Status**—Full-time status for an undergraduate student varies with the college and study program, but ordinarily requires a load of at least 12 units per semester. Full-time status for graduate students is more widely variable, depending upon assistantship or associateship duties and the composition of the individual student’s program. Students in doubt about their standing should check with the dean of the college.

**Declaration of Major**

Students must declare a major by the beginning of their junior year. For information regarding the number of units required for junior status, see “Class Standing” in the Enrollment Policies section elsewhere in this catalog.

**Grading System**

The grading system used by the University of Arizona follows:

- **A** - Excellent
- **B** - Good
- **C** - Fair
- **D** - Poor
- **E** - Failure
- **P** - Passing (see section on “Pass-Fail Option”)
- **F** - Failure (see section on “Pass-Fail Option”)
- **S** - Superior (see paragraph on “Special Grades”)
- **I** - Incomplete
- **K** - Course in progress
- **W** - Approved withdrawal
- **O** - Audit
- **CR** - Credit

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

**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**—Prior to the end of the fourth week of classes, official withdrawal (drop) of a course cancels the registration for the course; dean’s signature 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 signature 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 “Formal Withdrawal.”

**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 Program” 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 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 grade-change 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.

**Appeal of Grade**—A student who feels that a grade has been unfairly awarded may appeal. To initiate the appeal procedure, the student must contact the course instructor no later than the end of the fifth week of classes of the first regular semester after the semester or summer term in which the grade was awarded. The entire procedure to be followed is described in detail in the Student Handbook and in the University Handbook for Appointed Personnel.

**Repeating a Course**—Undergraduate students may repeat courses in which they have not earned credit as many times as necessary to establish credit. They may repeat only once any courses in which they previously earned grades of C, D, or F, and may not repeat courses in which they have earned grades of A or B, except as specifically provided by departments on a course-by-course basis. All units and grades for repeated courses will be included in computing the grade average. Credit will be allowed only once, however, for successful completion of a course, unless the course is designated “repealable for credit” by the department.

**Pass-Fail Option**—For certain courses, a qualified student may elect to register under the pass-fail option. Under such registration, the only final 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 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 procription 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 courses 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 if 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.

Note: Pass/fail grades are the only grades available for T.T.E. 493a 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 computerational 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 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 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 as they pertain to specific courses, see the Colleges 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

<table>
<thead>
<tr>
<th>Category</th>
<th>A &amp; S</th>
<th>AG</th>
<th>ARCH</th>
<th>BPA</th>
<th>ED</th>
<th>E&amp;M</th>
<th>FA</th>
<th>NURS</th>
<th>PHARM</th>
<th>HRP</th>
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<tbody>
<tr>
<td>I. Basic Skills and Proficiencies</td>
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</tr>
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<td>0-15</td>
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<td>11</td>
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<td>Mathematics</td>
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<td>5</td>
<td>9</td>
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<td>II. Study Areas</td>
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<tr>
<td>Bio. &amp; Phys. Sciences</td>
<td>8</td>
<td>16</td>
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<td>10</td>
<td>6-8</td>
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<td>0-11</td>
<td>3-12</td>
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<td>3</td>
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<tr>
<td>Inst. Soc. &amp; Individuals</td>
<td>6</td>
<td>9</td>
<td></td>
<td>6-15</td>
<td>12</td>
<td>9</td>
<td>0-11</td>
<td>6-9</td>
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<td>6</td>
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<tr>
<td>Western Civ.</td>
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<td>9</td>
<td></td>
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<td>12</td>
<td>9</td>
<td>0-11</td>
<td>6-9</td>
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<td>6</td>
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<td>Non-West Civ.</td>
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<td>3</td>
<td>0-11</td>
<td>6-12</td>
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<td>Other</td>
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<td>6-6</td>
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<td>6</td>
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<td>-3 Units</td>
<td>0</td>
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<td></td>
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<tr>
<td>Totals</td>
<td>41-57</td>
<td>50-61</td>
<td>45-78</td>
<td>66-70</td>
<td>41-57</td>
<td>49-58</td>
<td>36-51</td>
<td>59</td>
<td>67</td>
<td>45-53</td>
</tr>
</tbody>
</table>

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 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. 101-102, Engl. 103H-104H, Engl. 106-107-108, Engl. 107-108. 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.

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 register for the exam with the University Composition Board.

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 examinations during the regular class period, the following requirements for offering the examination at an alternate time must be met: (1) the course shall be identified in the schedule of classes as requiring combined hourly examinations at a time different from the regular class period; (2) the times at which combined hourly examinations will be given shall be listed in the schedule of classes; (3) the controlling academic dean shall approve such action in advance; and (4) students whose schedules conflict with the time scheduled for the combined examination shall be provided an alternate time for taking the examination.

Examinations Required—All courses offered for credit shall include a final examination given at the regularly scheduled examination time. Examinations are prohibited on scheduled class days during the week in which regularly scheduled final examinations begin. Specific exceptions for certain courses may be granted by obtaining prior approval from the appropriate department and academic dean. Students shall be informed of any such exceptions prior to the end of the fourth week of classes.

Proficiency and Exemption Examinations, Credit by Examination

Students may establish credit or proficiency in various disciplines at the University under any of several modes; they are:

I. The Advanced Placement program administered by the College Board;
II. The College-Level Examination Program (also administered by the College Board);
III. Departmental exemption or proficiency examinations;
IV. Special Examination for Credit or Grade.

In no case may the sum of credits earned through the above examinations and/or University of Arizona correspondence courses exceed 60 units toward an undergraduate degree. No graduate credit may be established in this manner.

I. Advanced Placement from High School

The Advanced Placement program recognizes that certain students are often able to complete college-level courses while attending high school. The College Board provides course descriptions and professional consultants to help schools establish college-level courses. The program administers and grades the examinations and sends the results to the students' prospective colleges.

Successful completion of these examinations, which are administered in the student's high school, entitles the student to be considered for advanced placement, or to be granted college credit, or both depending upon the area and the examination scores. Advanced Placement without credit never reduces the total units remaining to be earned for the bachelor's degree, but allows the student to commence studies in the particular field at a higher level than otherwise possible. Advanced placement with credit reduces the units remaining to be completed for a degree. Final decision regarding credit or placement is in all cases the prerogative of the department concerned. The three top scores on Advanced Placement examinations are 5, 4, and 3; in many cases, a placement score of at least 3 will suffice for advanced placement and credit.
The following is a list of the Advanced Placement examinations offered and their course equivalents at the University:

<table>
<thead>
<tr>
<th>AP Exams &amp; Grades</th>
<th>U of A Courses</th>
<th>Credit</th>
<th>AP Exams &amp; Grades</th>
<th>U of A Courses</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>American History</strong></td>
<td>Hist. 106 &amp; 107</td>
<td>6 Units</td>
<td><strong>Latin: Vergil</strong></td>
<td>Clas. 201b</td>
<td>4 Units</td>
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<tr>
<td>5</td>
<td>None</td>
<td>None</td>
<td>3</td>
<td>Advanced Placement: Automatic satisfaction of the foreign language requirement</td>
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<tr>
<td>4</td>
<td>None</td>
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<tr>
<td>1, 2 or 3</td>
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<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Art (History)</strong></td>
<td>Art 101 &amp; Art 102</td>
<td>6 Units</td>
<td><strong>Latin: Cat/Horace</strong></td>
<td>4 or 5</td>
<td>None</td>
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<tr>
<td>3, 4 or 5</td>
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<td>None</td>
<td>1</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>1, 2</td>
<td>None</td>
<td>None</td>
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<tr>
<td><strong>Biology</strong></td>
<td>Ecol. lower-division credit</td>
<td>8 Units</td>
<td><strong>Mathematics AB</strong></td>
<td>Math. 125a or 123</td>
<td>3 Units</td>
</tr>
<tr>
<td>4 or 5</td>
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<td>3</td>
<td>Ecol. lower-division credit</td>
<td>4 Units</td>
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<td>Placement by department</td>
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<tr>
<td><strong>Chemistry</strong></td>
<td>Chem, 103a-103b, 104a-104b</td>
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<td><strong>Mathematics BC</strong></td>
<td>Math. 125a-125b</td>
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<td>3</td>
<td>Chem, 103a &amp; 104a</td>
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<td><strong>Computer Sciences</strong></td>
<td>C.Sc. 115</td>
<td>3 Units</td>
<td><strong>Music Literature</strong></td>
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<tr>
<td><strong>English Lit./Comp.</strong></td>
<td>Engl. Comp. (lower-division credit), 3 units, and 3 units, Engl. 267</td>
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<td><strong>Music Theory</strong></td>
<td>Mus. 120a-120b</td>
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<td>Proficiency met at 16-unit level</td>
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<td>3</td>
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<td><strong>English Lang./Comp.</strong></td>
<td>Engl. Comp. (lower-division credit)</td>
<td>6 Units</td>
<td><strong>Physics B</strong></td>
<td>Phys. 102a-102b</td>
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<td>Phys. 116</td>
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<td><strong>Physics C - Mechanics</strong></td>
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<td><strong>Spanish Language</strong></td>
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<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Proficiency met at 16-unit level</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>German</strong></td>
<td>Ger. 401a-401b, 201a-201b</td>
<td>14 Units</td>
<td><strong>Spanish Literature</strong></td>
<td>Span. 201a-201b, 320, 3 upper division credit</td>
<td>14 Units</td>
</tr>
<tr>
<td>5</td>
<td>None</td>
<td>None</td>
<td>4</td>
<td>Span. 201a-201b, 320</td>
<td>11 Units</td>
</tr>
<tr>
<td>4</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Proficiency met at 16-unit level</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 or 4</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>None</td>
<td>None</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*A 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 LIT./COMP. OR ENGLISH Lang./Comp., BUT NOT BOTH.*

No grades are recorded for courses credited through the Advanced Placement program.

University policy encourages prospective students to avail themselves of any Advanced Placement programs suitable to their college goals, since successful achievement in them will substantially increase students' freedom in designing their university programs of study.
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. Students should consult their academic advisors or the offices of their college deans for information as to how their examination credits can be most effectively applied.

All CLEP examinations are available through the Student Affairs Research, Evaluation, and Testing Office (SARETO) in Tucson. A limited list of CLEP examinations is available also through the testing centers in Tempe and Flagstaff. Resident students at the University of Arizona should contact SARETO at the Student Resource Center for additional information regarding these examinations.

The University of Arizona accepts for college credit both the General and the 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 & 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, II (8)
College German I, II (8 or 16)
College Spanish I, II (8)
Freshman English (6)
General Biology (8)
General Chemistry (6)
General Psychology (3)
Human Growth & Dev. (3)
Introduction to Business Mgmt. (3)
Introductory Accounting (6)
Introductory Business Law (3)
Introductory Macroeconomics (3)
Introductory Microeconomics (3)
Introductory Micro- & Macro-economics (6)
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 their native language only for those courses taken during the years equivalent to the United States college years.

The completion of the course levels set in this paragraph satisfies the requirement: Or S. 404b (Arabic); Or S. 406b (Modern Chinese); Fre. 202, 302b; Ger. 201b; Grk. 202; Or S. 403b (Hebrew); Ita. 202, 302b; Or S. 402b (Japanese); Lat. 202; Or S. 405b (Persian); Port. 301b, 206; Russ. 201a or 201b; Span. 202, 206, or 373.

Passing 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 that 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 for 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.
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, 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 3.00 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.

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 absence from class is insufficient 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 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, which is composed of faculty and student members representing all colleges of the University. Additional information or a copy of the complete code may be obtained from the Office of the Dean of Students.
Leaving the University

Formal Withdrawal—Formal withdrawal from the University is initiated in the Office of the Dean of Students. The effective date of withdrawal is the date withdrawal papers are taken from that office. Seven class days are allowed for completion. No withdrawal may be initiated after the last day of classes of any semester.

Dismissal from Courses or 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 is 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 incapacitated must have their readmittances 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 transcripts are issued to other institutions, offices or agencies designated by the student. When the student is required by the institution or agency to present an official transcript personally, it will bear the notation “issued to 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>126</td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
</tr>
<tr>
<td>in Art</td>
<td>125</td>
</tr>
<tr>
<td>in Drama</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>123</td>
</tr>
<tr>
<td>Bachelor of Fine Arts (except major in Art</td>
<td>125</td>
</tr>
<tr>
<td>Education, 127 units)</td>
<td></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>128</td>
</tr>
<tr>
<td>Major in Performance (Keyboard)</td>
<td>130</td>
</tr>
<tr>
<td>Major in Performance (String Instrument)</td>
<td>130</td>
</tr>
<tr>
<td>Major in Performance (Voice)</td>
<td>130</td>
</tr>
<tr>
<td>Major in Performance (Wind Instrument and Percussion)</td>
<td>130</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 as 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. Correspondence credit and/or credit by examination is not university credit.

**Upper-Division Unit Requirement**—All students are required to have a minimum of 42 upper-division units (300, 400, or 500 level courses) for graduation, effective for students graduating in December 1991 and thereafter. It is recommended that these units be included among the final units taken toward the degree (see section on University Credit Requirement).

**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 (at the close of the summer session), and in December (at the close of the fall semester). 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>Dec. 1 of the year preceding graduation</td>
</tr>
<tr>
<td>December</td>
<td>March 1 of the year of graduation</td>
</tr>
</tbody>
</table>

A fee of $15 (nonrefundable) is required to be paid when the application is filed. A fee of $2 will be charged for late filing. Late applications will not be accepted after the last official day to register for credit for the semester/term in which the degree is to be awarded.

Each senior is provided with an official check of remaining degree requirements, following filing of the application for degree candidacy, under the curriculum designated in such application. A fee of $5 will be charged for any additional degree check necessitated by a student's subsequently changing catalog or curriculum.

**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, as originally submitted: (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 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 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.

**Averaging of Grade for Final Non-University Credit Course**—Students who lack not more than one semester course toward the fulfillment of curriculum and minimum-graduation-average requirements, 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 2.000 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.

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**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 should contact the Office of Admissions.

The University cannot extend credit. Therefore, all students must have sufficient funds upon entering to defray their immediate expenses. An estimate of the amount required for the first month in residence, covering board for one month, room for one semester on the campus, registration, tuition, incidental fees, books, supplies, etc., is $2324.00 for residents of Arizona. For nonresidents, the estimated amount is $4118.00.

**Expenses and Fees—Per Semester 1989-90**

<table>
<thead>
<tr>
<th>Registration fee</th>
<th>$681.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>One through six units</td>
<td>$71.00 per unit</td>
</tr>
</tbody>
</table>

**Nonresident tuition**

| Twelve or more units | $2061.00 |
| Seven units | $1202.00 |
| Eight units | $1374.00 |
| Nine units | $1546.00 |
| Ten units | $1717.00 |
| Eleven units | $1889.00 |
| One through six units | waived |

*1990-91 fees were not available at the time of catalog printing. All fees are subject to change.
**In addition to the registration fee required of all students.

**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—do not send checks in advance—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 $12.50 fee will be assessed. Late and collection fees are also assessed if payment is not received within 12 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.

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

**Late 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.

**Classification of Persons for Tuition Purposes**

The Arizona Board of Regents is required by law to establish for all 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. 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.

**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.

**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.

**Legal Residents of Arizona:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration fee</td>
<td>$1362.00</td>
</tr>
<tr>
<td>Residence halls, average rate</td>
<td>($681.00 per semester)</td>
</tr>
<tr>
<td>Meals in university cafeteria</td>
<td>$1732.00</td>
</tr>
</tbody>
</table>
I. Residence Halls:

Nonresidents of Arizona:
- Nonresident registration fee $1362.00 (per semester)
- Nonresident tuition fee $4122.00 (per semester)
- Residence halls, average rate $1400.00
- Meals in university cafeteria $1792.00
- Books and supplies $550.00
- Total minimum annual expense $9226.00

*The registration fee for seven or more units includes services and facilities of student activities, Student Union, Health Service, Alumni Association and Drama Series. Students taking fewer than seven units pay $50.00 per unit per semester. The fee includes Health Service.

Residence hall rates range from $984.00 to $1705.00 per student per year and are subject to increase for the 1990-91 academic year.

**Residential hall reservation deposit is $25.00.

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 License Agreement. A rent prepayment is required for fall applicants within two weeks of the current semester’s Schedule of Classes for specific billing and payment instructions.

Residence Hall Rates, effective 1988-89
(Subject to increase for 1989-90 and 1990-91)

<table>
<thead>
<tr>
<th>Entire Year</th>
<th>Fall</th>
<th>Spring Academic Semester</th>
<th>Semester Year</th>
<th>Payment Payment ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Residence Halls:*</td>
<td>Coconino, Manzanita/Mohave, Maricopa, Apache/ Santa Cruz, Graham, Greenlee, Kaibab/Huachuca, Gila, Cochise, Navajo, Yavapai, Yuma</td>
<td>$1240.00</td>
<td>$744.00</td>
<td>$496.00</td>
</tr>
<tr>
<td>Arizona/Sonora, Billman, Interna-</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>tional House, Comstock</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cotonado</td>
<td>$1190.00</td>
<td>$714.00</td>
<td>$476.00</td>
<td>$595.00</td>
</tr>
<tr>
<td>Hopi, Papago</td>
<td>$1455.00</td>
<td>$873.00</td>
<td>$582.00</td>
<td>$728.00</td>
</tr>
<tr>
<td>Sierra</td>
<td>$895.00</td>
<td></td>
<td>$358.00</td>
<td>$448.00</td>
</tr>
<tr>
<td>Babcock (std. double occupancy)</td>
<td>$920.00</td>
<td></td>
<td>$368.00</td>
<td>$460.00</td>
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<tr>
<td>Sun Terrace</td>
<td></td>
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<td>$578.00</td>
<td>$723.00</td>
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<tr>
<td>Summer Rates: Five-Week Summer Session</td>
<td>Babcock (std. double occupancy)</td>
<td>$184.00</td>
<td>$200.00</td>
<td>(minimum)</td>
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Conference Groups:
- Daily and Weekly (over four weeks) Rates Available on Request.

III. Family Housing Rates:
Effective July 1, 1988 (Subject to increase for 1989-90 and 1990-91)

Family Housing Complex (Per Month)—Includes Utilities:
- Efficiency Unfurnished: $215.00
- Efficiency Furnished: $246.00
- One-Bedroom Unfurnished: $309.00
- One-Bedroom Furnished: $333.00
- Two-Bedroom Unfurnished: $366.00
- Two-Bedroom Furnished: $407.00

*Rates for single rooms when available: 160% of the regular rental rate in all halls except Arizona and Sonora. Guaranteed double rooms, when available, in Arizona and Sonora: 140% of the regular rental rate.

Board—The University cafeterias, located in the Student Union Memorial Building and the Park Student Center, are operated on a self-sustaining basis for the convenience of students. The cost of food for the average student is approximately $190 a month. Students and members of the University staff may purchase meal tickets, or may pay in cash at the time the meal is served. No credit, however, will be extended. The University charges for board only a sufficient amount to cover its cost and reserves the right to increase the cost to meet any increase in the prices of foodstuffs and services.

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

Military Uniforms and Equipment—The departments of Army, Navy and Air Force of the United States government supply uniforms without cost to students taking military training. Each student in military science or aerospace studies must deposit $50.00 to cover damage to or loss of uniform or equipment. This deposit, less any charge for damage or loss, is refunded at the close of the year or upon withdrawal from the course. To obtain refund, property must be turned in to the Military Property Custodian within seven days after withdrawal from or completion of the military course. Property must be turned in or its total value money be paid to the Military Property Custodian.

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.

Laboratory Penalty Fee—Students who, upon the termination of their work in a course, fail to check their desks and clear their accounts with the department concerned will be assessed a penalty of $5.

Field-Trip Fees—Trips to nearby mines, mills, smelters, and power plants are made during the year by students in mining, metallurgy, and geology, and in mechanical, civil, and electrical engineering. Trips to ranches and ranges are made by students in agriculture courses, and to points of historic and prehistoric interest by students in anthropology. Students in economics may make trips to industrial plants and business houses. Students pay their transportation and personal expenses.

Students registered for Chemical Engineering 304 pay a field trip fee of approximately $150 to cover transportation and lodging.
Credit-By-Examination Fee—A fee of $21 per unit is charged for all special examinations for credit.

College-Level Examination Fee—The fees for examinations administered under the College-Level Examination Program (CLEP) are $35 each for the Subject examinations and $35 for each General examination; plus a $5 administration fee.

Foreign Language Examination Fee—A fee of $10 is charged to take any one foreign language examination. Examinations in French, German, Russian, and Spanish are administered nationally by the Educational Testing Service. The fee is paid to ETS at the time of registration. For other foreign language examinations, the fee is paid to the university cashier at the time of registration.

Music Fees—A fee of $40 each semester for one half-hour per week or $60 per semester for a one-half-hour-per-week private lesson in applied fields of piano, organ, voice, band, or orchestral instrument is charged. A music major registering for instruction may rent instruments, a lesson in applied fields of piano, organ, voice, band, or orchestral instrument is charged. A music major registering for instruction may rent instruments,

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."

Student Teaching Fee—The student teaching experience is scheduled only during the fall or spring semester. It will not be available during the summer session. For those exceptional circumstances when a student teaching placement is approved at a site outside of the Tucson area, the student may be assessed an additional fee to cover costs of supervision

Library Identification Card Replacement Fee—Library borrower identification cards, if lost or stolen, must be reported to the librarian's office.

Transcript Fee—Students may order copies of their official academic record (transcript) from the Office of Student Information, Registration, and Records. The fee for regular transcript service is $3 per copy. The fee for urgent service or special handling is $4 per copy. An unofficial copy of a transcript costs $1. Transcripts will not be issued for students whose records indicate indebtedness to the University.

Photo I.D. Replacement Fee—The replacement fee for lost or stolen I.D. cards is $10. Students must report to the Office of Student Information, Registration, and Records for replacement.

Graduation Expenses

Degree Candidacy—Every candidate for a degree is required to pay a fee of $15 (nonrefundable) at the time of filing application for degree candidacy. A fee of $2 will be charged, in addition, for late filing for bachelor's-degree candidacy (see Graduation Requirements section). Each senior is provided with an official check of remaining degree requirements, following filing of the application for degree candidacy, under the curriculum designated in such an application. A fee of $5 will be charged for any additional degree check necessitated by a student's subsequently changing catalog or curriculum. A fee of $1 will be charged for duplicate copies furnished.

Processing Thesis—A fee of $15, to cover the cost of binding two copies of the thesis or dissertation for the library, is required of each graduate student at the time of submitting the thesis or dissertation.

Dissertation Microfilm Fee—$25

Cap and Gown Fee—Degree candidates participating in the commencement exercises are required to wear the prescribed academic costume, which may be purchased through the University Bookstore.

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—See Schedule below.

Schedule of Refunds*  

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*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 fees before refunds will be made.

Cancelled Registration—A student whose registration is cancelled because of scholarship failure the preceding semester will be refunded his or her 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 the College Scholarship Service (CSS) application entitled The Financial Aid Form or the American College Testing (ACT) application for student financial aid entitled The Family Financial Statement. In addition, the University of Arizona Scholarship Application must be completed to apply for scholarships.

In 1988-89, the Office of Student Financial Aid administered $74 million in aid, which assisted 14,928 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 CSS 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 80 percent of the total aid available through the University of Arizona. For undergraduate students, the base of funding begins with the Pell Grant Pro-
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 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 at the level appropriate 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. Applications are available from the Office of Student Financial Aid or from local lenders.

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 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—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.

Temporary Loans—The Temporary Loan Program is intended to assist students with short-term funding problems. Generally, loan amounts are limited to $150 for 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 makes 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.

Waivers—Waivers of resident registration fees are offered to a number of students each year based on academic achievement, talent and/or need. Students are encouraged to apply using the CSS Financial Aid 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.

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 29 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 personalized educational opportunities that focus 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, an honors semester abroad program where students spend five months studying in London, England, 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 most Arizona residents, admission to the 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, Stonaker Building, 621-6901.

**Academic Honors and Awards**

**University Academic 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 we are 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. 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. 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 3.250; **cum laude**, to candidates whose average is 3.249 to 3.000. 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** 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** 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.

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**Student Services**

**Counseling and Advising**

The University offers a variety of academic support services for students. The faculty, the faculty advisors, the heads of departments, and the deans of the colleges keep regular office hours for consultation. The Health Service provides health counseling; the Student Resource Center provides orientation programs, counseling, testing, study skills assistance, job placement and career planning; and the Office of Student Information, Registration and Records registers students, keeps cumulative files of student achievements, and issues the Schedule of Classes which students should read in order that they may plan their courses and obtain necessary information about the University.

**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 learning a sense of belonging, developing knowledge and skills, choosing informed attitudes in a diverse community, and developing self-responsibility. Programs in this area include residence life, recreation, student activities, Greek life, international student services, disabled student services, off-campus center, student publications, bookstore, and veterans affairs.

Additionally, the Dean of Students Office is responsible for the enforcement of university policies and procedures, includ-
ing the Code of Conduct and the Code of Academic Integrity. Students seeking to withdraw from the University must do so through 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 five separate programs 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:

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**Orientation, Advising, Retention**—The Orientation, Advising, and Retention Office (OAR) administers all campus-wide orientation programs. Orientation programs include placement examinations in English, math, and most foreign languages, survival seminars that clarify processing, advising, and disability. OAR administers the Transfer Assistance Peer Program (TAPP), to aid new transfer students. Students, parents, and academic colleagues with questions related to entry to the many campus academic and support programs can seek initial assistance in the OAR office.

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**Learning Skills**—The Academic Learning Skills Center (ALSC) offers classes in effective textbook strategies and seminars promoting efficient study habits. These classes start near the beginning and middle of each semester. Advanced learning skills in math and science are also available, as well as individual study counseling.

For students with learning disabilities, a special program called Strategic Alternative Learning Techniques (SALT) provides assistance in academic planning, study skills, research and writing skills, special test administrations, computer-assisted learning and word processing, personal and group counseling, career counseling and job search skills. Special admission consideration is given when the university application indicates the diagnosis of a learning disability. Application for the SALT program is made directly to ALSC, Old Main. SALT is a fee-based program.

The Tutoring Center provides information about tutoring services across campus. The UA Tutoring Clearinghouse links students with appropriate tutors. The Tutoring Program for High Risk Courses focuses on high risk freshmen and sophomores.

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**Counseling**—The Student Counseling Service (SCS) is staffed by psychologists who provide services to students seeking help with career, personal or relationship problems. These services are offered through individual and group counseling, couples counseling, short courses and workshops dealing with skill development, and consultation with student groups and organizations. SCS staff members also offer consultation to university faculty and staff regarding matters relating to student development, welfare and well-being, in or out of the classroom.

These services are confidential and free to registered university students. Regular hours of SCS operation are 8:00-5:00, Monday through Friday, and evenings by special appointment. Students are welcome to stop by SCS, Second Floor, Old Main, or call for an appointment at 621-7591.

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**Testing and Research**—Student Affairs Research, Evaluation, and Testing Office (SARETO) provides many out-of-class testing services needed by students. SARETO administers two credit-by-exam programs (CLEP and DANTEST) with which students receive college credit by demonstrating college-level proficiency in various areas of study. Qualifying exams, such as the Law School Admissions exam, Graduate Record exam, Pre-professional skills test, Medical College Admissions test, as well as preparation courses for some of these exams, are available through SARETO. Math placement testing is also provided. Other services include career planning testing and information about dates and locations of off-campus testing of interest to university students. SARETO is also responsible for research on student behavior, including retention studies, outcomes assessment, and surveys.

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**Placement**—The Career and Placement Service (CPS) provides a centralized university career development and placement center for students and alumni. The office assists individuals with: (1) career exploration and decision making, (2) acquisition of experiences to test their career interests and develop employment skills, (3) development of job seeking skills, and (4) facilitation of contact with prospective employers. Numerous programs are offered to meet these comprehensive career development objectives.

Career exploration may be conducted through the use of various media in the Career Resources Center, including the computer-based DISCOVER program, videotapes and printed occupational materials. Individual assistance is available through counseling sessions with staff.

Career interests may be explored and tested further through full- and part-time summer and semester positions. The Cooperative Education Program (CO-OP), the Summer Co-op, the Internship program and the job listings in the Job Center provide several means to obtain career-related experiences.

Over 450 school districts, government agencies and businesses interview candidates for permanent positions as well as part-time, cooperative education and summer employment. In addition, referral of credentials to employers and publicity of vacancy announcements to students and alumni are offered.

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**Advising Center for Exploratory Students (ACES)**—The Advising Center for Exploratory Students (ACES) is a university-wide support unit created to meet the advising needs of undecided students at the University of Arizona. ACES is an intrusive, developmental advising system that systematically will assist students in their individual exploration of self, prospective majors, and possible careers. ACES is designed to guide students to career resources that will offer them skills assessment, academic and career information, and needed support in their endeavor to choose a major.

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**Developmental Advising**—ACES developmental advising program is a process which assists students in the clarification of their life and career goals and in the development of educational plans for the realization of these goals. It is a decision-making process by which students realize their maximum educational potential through communication and information exchanges with an advisor, it is ongoing, multifaceted, and the responsibility of both student and advisor.

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**Major and Career Exploration**—ACES helps students to explore their own interests, skills and abilities, and to integrate academic majors with career opportunities. To indicate interest in the ACES Program, undecided students may mark "No College Selected" on their application form or contact the ACES Program directly prior to registration or during the first semester of their freshmen year. Major exploration should begin as early as possible. Students should plan to register for exploratory courses during their first semester. ACES advisors can help students select courses that both explore majors and fulfill general education requirements in several colleges at once. This allows students to keep valuable options open and at the same time know that they are progressing in their degree program. After participation in the ACES program, students should
emerge with a solid major choice that fits their personalities, interest and life-style requirements, a choice that is translatable into clearly defined career goals.

—ACES' Mentor Program—Under ACES' mentoring program, faculty members and administrators at the University serve as mentors for incoming undecided students. The mentor is the director of the student’s exploration and the chief agent of referral to various campus resources. The mentor explains the developmental process and, in collaboration with students, helps draw up a four-semester major exploration "map" that will include learning about their own growth processes, academic majors, possible careers and the integration of each of these with an understanding of the value of their education.

—ACES' Peer Advising Program—Under ACES' peer advising program, undecided students who do not have a mentor have access to peer advisors who are trained to work with them. Peer advisors staff the ACES office daily to help undecided students in several areas: as mentors, as academic advisors aiding freshmen in course selection, and as friends and role-models. They are the main components of the ACES intrusive advising system: they make phone calls to ACES students to inquire about their academic progress and troubleshoot the emotional well-being of new freshmen during their first semester. They also present seminars and workshops on major exploration during the semester in residence halls and Greek houses. Peer advisors are available in the ACES office. Students are welcomed to drop in and meet with a peer advisor five days a week. For further information telephone or write to:

Advising Center for Exploratory Students
Modern Languages Building, Room 347
University of Arizona
Tucson, Arizona 85721
(602) 621-3336

The Office of Minority Student Affairs (OMSA)—The purpose of the Office of Minority Student Affairs is to significantly increase the number of minority students who enroll and graduate from the University. Through the OMSA recruitment component, prospective minority students may receive assistance with the completion of admission and financial aid applications and with other procedures leading to enrollment at the University. The OMSA retention component provides on-campus support through tutoring, peer advising, career resources, study skills programs, information on financial assistance, and other related services. OMSA is located in Old Main, Room 235.

Assistant Deans of Black, Hispanic and Native American Affairs—These officials assist students in their transition from the high school environment into the University community by counseling at both the academic and personal-adjustment level, and by soliciting wider campus involvement in the programs and affairs of the black, Hispanic, and Native American student. This office, located in Nugent, Room 204, provides support for successful progress through the University.

The Summer Programs—The New Start Summer Program and the UA Summer Bridge Program are designed for graduating high school seniors intending to enroll as freshmen at the UA. Through a variety of activities, these six-week programs offer students an opportunity to become better prepared to meet the challenges awaiting them and to help ease the transition to the college environment. The program's eligibility criteria and costs vary. For further information, contact the Assistant Director of Summer Programs located in Old Main, Room 235.

Early Outreach Programs—The Academic Preparation for Excellence program (APEX) is a partnership of community members, public schools, and the University of Arizona, which seeks to increase the numbers of southern Arizona minority and economically disadvantaged students who are prepared to participate successfully in higher education. APEX emphasizes better preparation in junior and senior high schools, career information, and motivation as keys to achieving success in higher education in a period of increased standards. The Mathematics, Engineering, Science Achievement Program (MESA) opens doors to minority students in the fields of math, engineering, and the physical sciences, which historically have attracted a small percentage of blacks, Mexican Americans and Native Americans. MESA was formed to stimulate greater interest in those fields among minority groups, so as to make new career opportunities apparent and, ultimately, to create for minority students a larger pool of qualified potential employees for companies to hire.

Director of the International Student Office—The Director of the International Student Office is generally responsible for coordinating services to international students and scholars. The director works closely with students in the areas of adjustment to campus and community life and adjustment in academic procedures and requirements. Individuals are referred, when appropriate, to academic advisors, counseling staff, health staff, and others. The International Student Office is located on the second floor of the Nugent Building.

Disabled Student Services Program—Through its support services, this program seeks to expand opportunities for disabled students to participate fully in the educational process and broader campus life. Individualized services promote independence and responsibility. Ongoing programs provide the campus and the community with opportunities for increased understanding of disabling conditions.

Off-Campus Student Center—The Off-Campus Student Center introduces off-campus students to the academic, social, cultural, and recreational programs offered through the University community. 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 at the Off-Campus Student Center which is located in the Student Union, Room 107.

Switchboard—Supported by ASUA, this service is designed to help people help themselves by providing them with resources upon which they can draw. Switchboard 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 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 who were registered during the spring semester but are 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 meet the requirement of having been administered measles vaccine during 1968 or later and rubella vaccine during 1969 or later, and must have been at least one year old at the time of vaccination. These vaccines are available at no cost at the Student Health Center. Additionally, every entering student is requested to submit a completed Health Evaluation form together with a record of immunizations.

—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. Nominal charges are made for laboratory tests, x-ray services, and prescriptions filled at the Student Health Service pharmacy. While immediate payment for charges is recommended, delayed payment can be arranged. In addition, Visa and MasterCard are accepted for payment. During regular school sessions, general medical care is provided; however, the Student Health Service is unable to provide all services during academic holidays, vacation periods, summer sessions, and semester breaks.

Special clinics available at the Student Health Center include orthopedics, gynecology, dermatology, allergy, immunization 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 short-term individual, couple, and group therapy, as well as workshops in health and mental health-related areas.

Health Promotion and Education — The Student Health Service places a strong emphasis on health promotion and lifestyle management. Health educators are available for individual counseling and group presentations on a wide variety of health education, promotion, and prevention subjects. Special programs on self care are offered through the Self Care Center. Fitness and Nutrition Drop-In Services as well as Cardiopulmonary Resuscitation courses are available.

Insurance — Medical Insurance for Students, Arizona Universities System, is available to all students regularly enrolled at the University. 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 physician 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.

Services in the Hearing Clinic include assessment of hearing, selection, dispensing and troubleshooting of hearing aids; counseling relative to alternate communication devices and procurement of earmolds.

For information regarding fees, consult the Speech-Language and Hearing Clinics. The clinics may be reached at 621-1644.

Student Union Post Office (SUPO)

Students living in campus dormitories will be assigned a Student Union Post Office box after being assigned to a dorm. Returning residence hall students who had Student Union Post Office 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 Post Office.

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 Post Office. 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 Post Office.

The University Libraries

The University Library system contains more than 5,000,000 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 18th and 19th century British and American literature. Through the library the University 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 loan. The library offers reference service, online searching of computerized data bases, and bibliographic course-related instruction.

The University Library system consists of the Main Library which houses the Central Reference Department, Government Documents, the Media Center, the Map Collection and the Current Periodicals, Newspapers, and Microforms Room; the Science-Engineering Library; and the following Branch Collections: the Oriental Studies Collection, the Music Collection, the Center for Creative Photography, the Southwest Folklife Center, Special Collections, and the Library Science Library. Four large but separate library facilities are the College of Law Library, the Architecture Library, the Arizona Health Sciences Center Library and the Arizona State Museum Library. In addition, several other departmental libraries, such as the Division of Economics and Business Research Library, the Steward Observatory Library, the Herbarium, and the Lunar and Planetary Sciences Library, have been established to serve special research needs.

Central Reference — Houses the library's main card catalog and reference materials for the social sciences, fine arts and humanities.

Government Documents — A regional depository for U.S. government documents; houses almost a million items.

Media Center — Houses all the library's nonbook materials except microforms and music tapes and records.
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. Inherent 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, including pillows. Students are requested not to bring additional furniture with them but do need to provide their own blankets, sheets, pillowcases, bedspread and towels. Students care for their own rooms. Custodial service is provided for other portions of the halls.

Five residence halls are accessible for wheelchairs and have other special equipment for handicapped students: Coconino, Yuma, Papago, Hopi and Yavapai.

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 both 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 Sun Terrace. 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 late May. Failure to provide required rent confirmation payment within two weeks of assignment notification will result in cancellation of reservation and forfeiture of deposit. Demand regularly exceeds available space and, 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.

Housing For Married Students and Single-Parent Families—The Family Housing Complex of 418 apartments is located in northeast Tucson about 15 minutes from the University. Applications may be submitted after a person has been officially admitted to the University. Additional information and application forms may be obtained from The Family Housing Office, 3401 N. Columbus, Tucson, AZ 85712.

Temporary Housing—Temporary housing at the beginning of the fall semester is available through "Gimme Shelter," ASUA Switchboard, Student Union.

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 Code of Conduct available in the Office of the Dean of Students.

Use of Narcotic Drugs—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, psychedelic agents of any variety, prescription drugs other than such 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.

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arrangements are provided by notice in UA publications and by placement of fliers on vehicles in restricted parking areas.

The demand for parking on campus is high, but the supply is limited. Therefore, parking is not guaranteed. Short-term parking is available at parking meters and in pay lots located on campus.

**Issuance of Permits**—Parking and Transportation Services is the sole campus unit authorized to issue parking permits. Parking permits are valid for a full year beginning on August 15. To obtain a parking permit students must provide: (1) a valid UA student picture identification card, (2) a completed parking permit application along with State of Arizona Emission Compliance for every vehicle registered, including out-of-state vehicles, and (3) payment of fee.

Because parking is limited, a preregistration program is available to current permit holders first, followed by non-permit holders and new students/employees. Questions should be directed to the Parking Permit Division, 1508 E. Sixth Street, Building 98, Tucson, AZ 85721, (602) 621-3137.

**Alternative Modes of Transportation**—Parking and Transportation Services encourages students to consider the following alternative methods of reaching campus:

1. Sun Tran bus program (subsidized by the UA).
2. Carpooling and Rideshare programs.
3. UA Parking Shuttle. Park at the Arizona Health Science Center Pay Lot and ride the shuttle to main campus. The shuttle runs every 8-10 minutes.
5. Motorcycles, mopeds, motorscooters.

For information, please contact the Alternative Modes Division, 1516 E. Sixth Street, Building 98, Tucson, AZ 85721, (602) 621-1800.

**Penalties**—Regulations are subject to enforcement at all times including academic recess periods (e.g., Thanksgiving break, Spring break, final exam week, between semesters and summer sessions). On official university holidays, permit restrictions are lifted but general regulations are enforced. It is the responsibility of each student to obtain a copy of the Parking and Traffic Regulations and to comply with them. Failure to do so may result in issuance of citation, impoundment of vehicle, encumbrance of academic records, referral to Dean of Students for disciplinary action, or withdrawal/suspension of parking privileges.

**Eligibility for Extracurricular Activities**

Extracurricular activities relate directly to and encompass membership in university-recognized student organizations and groups, professional honoraries, 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 Requirements**—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. Graduating students, work carried for graduate credit only, 30. To participate in extracurricular 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 F. The faculty advisor or the extracurricular activity or organization shall review and confirm the above stated requirements for the elected or appointed person at the time or any election or appointment and forward this written confirmation to the chairperson of the Extracurricular 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 Pac-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 accounted 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. 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, Switchboard, Liaison for Neighborhood Knowledge, the Black Student Union, Movimiento Estudiantil Chicano de Aztlan, the Amerind Club, and various international-student organizations. Examples of sports clubs receiving financial support include rodeo, soccer, rugby, 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, Discount Card Program, Legal Aid, Student Health Advisory Committee, Switchboard, Academic Affairs,
Graduate Student Association, Inter Club Council, Minority Action Council, Scholarship Committee, Tempests Association, 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 co-curricular activities. These include the following areas: The Office of Greek Life, which manages fraternities and sororities; Parent Weekend activities; club and organization administration, which includes registration and recognition.

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

The office also provides advising assistance to certain ASUA programs and services, including concerts and Spring Fling. Opening of school social activities 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 Psi Phi, Phi Delta Theta, Phi Lambda Delta, Phi Kappa Psi, Phi Sigma Kappa, Pi Kappa Alpha, Sigma Alpha Epsilon, Sigma Alpha Mu, Sigma Chi, Sigma Nu, Sigma Phi Epsilon, Zeta Beta Tau.

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

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
Kappa Delta Pi - Education
Omicon 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
Tau Beta Pi - Engineering

Professional Organizations

Agricultural Business Club
Alpha Epsilon Delta - Premedical
Alpha Kappa Psi - BPA
Alpha Tau Omega - 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 Society of 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
Coordinated Council of Nursing Students
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 Beta Alpha
Library Students' Association
Linguistics Circle
MBA Student Association
Management Information Systems Association
Minority Pre-Law Association
Movimiento Estudiantil Chicano de Aztlan (M.E.Ch.A.)
Muslim Student Association
Personnel Club
Phi Alpha Theta
Phi Beta Lambda
Phi Chi Theta
Phi Delta Chi - Pharmacy
Phi Delta Phi - Law, Men
Phi Delta Pi - Education
Pi Lambda Theta - Education
Plant Pathology Club
Public Administration Students Association
Recreation Club
Sigma Alpha Iota - Music, Women
Student Leadership and Service Societies

Sigma Delta Chi - Journalism
Society of 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

Black Key - Seniors
Bobcats - Seniors
Chain Gang - Juniors
Chimes - Juniors
Mortar Board - Seniors
Order of Omega - Fraternity/Sorority members
Preludes - Freshman
Primus - Freshman
Sophos - Sophomores
Spires - Sophomores
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, Bahá'í Community of Tucson, Baptist Student Union, Beat Center, Campus Advance, Campus Christian Center, Campus Crusade for Christ, Christian Science Organization, the Church of Jesus Christ of Latter-Day Saints, Episcopal Campus Ministry, Hillel Jewish Student Organization, Humanists, Intervarsity Christian Fellowship, Islamic Center at Tucson, Little Chapel of All Nations, Lutheran Campus Ministry, Muslim Student's Association, Newman Catholic Student Center, Quaker University Organization, Sikh Dharma, the Navigators, Unitarian Universalists, United Campus Christian Ministry, United Methodist Campus Ministry, and the Wesley Foundation.

For further information please contact the respective organizations.

Special Cultural Opportunities

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 exhibits are presented throughout the year.

The University of Arizona Poetry Center—A 1960 gift of Ruth Stephan, the rapidly growing poetry collection numbers over 19,000 volumes of poetry, 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 American and British poets. It also includes books about poetry and poets. The center regularly sponsors campus readings by nationally known poets and writers throughout the year.

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 Drama 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.

International Arts Society—A cinema club, society membership is open to the faculty, staff, and student body of the University. A program of outstanding American and foreign films is presented throughout the academic 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.

Pianists' Foundation of America Series—Concerts by artist-pianists presented in Crowder Hall of the School of Music.
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 communications
- agricultural economics
- agricultural education
- agronomy
- animal sciences
- anthropology
- architecture
- art education
- art history
- astronomy
- atmospheric sciences
- biochemistry
- business economics
- chemical engineering
- chemistry
- civil engineering
- classics
- clothing and textiles
- communication
- computer engineering
- computer science
- consumer studies and family resource management
- creative writing
- criminal justice administration
- dance
- drama education
- drama production
- drama—musical theatre
- dramatic theory
- early childhood education
- earth science*
- ecology and evolutionary biology
- economics
- electrical engineering
- elementary education
- energy engineering
- engineering mathematics
- engineering physics
- English
- entomology
- extended English*
- family studies
- finance
- food science
- French
- general agriculture
- general biology
- general business administration
- general fine arts studies
- general home economics
- geography
- geological engineering
- geosciences
- German
- Greek
- health education
- health services administration
- history
- home economics and journalism
- home economics extension education
- horticulture
- human services administration
- hydrology
- industrial engineering
- interdisciplinary studies
- interior design
- irrigation
- Italian
- jazz studies
- journalism
- landscape architecture
- language arts—social studies*
- Latin
- Latin American studies
- linguistics
- management information systems
- marketing
- materials science and engineering
- mathematics
- mechanical engineering
- media arts
- medical technology
- merchandising and fashion promotion
- Mexican American studies
- microbiology
- mining engineering
- molecular and cellular biology
- music
- music education
- natural resource recreation
- nuclear engineering
- nursing
- nutritional sciences
- occupational safety and health
- operations management
- Oriental studies
- performance
- personnel management
- philosophy
- physical education
- physics
- plant pathology
- plant sciences
- political science
- Portuguese
- psychology
- public management
- range management
- real estate
- regional development
- rehabilitation
- religious studies
- Russian
- Russian and Soviet studies
- secondary education**
- social studies*
- sociology
- soil and water science
- Spanish
- speech and hearing sciences
- studio art
- systems engineering
- theory and composition
- veterinary science
- watershed management
- wildlife and 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>Discipline</th>
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<tbody>
<tr>
<td>a.ec</td>
<td>agricultural economics</td>
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<td>a.ed</td>
<td>agricultural education</td>
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<td>a.en</td>
<td>agricultural engineering</td>
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<td>a.m.e.</td>
<td>aerospace and mechanical engineering</td>
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<td>acct.</td>
<td>accounting</td>
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<td>agri.</td>
<td>agriculture</td>
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<td>In.s.</td>
<td>American Indian studies</td>
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<td>appl.</td>
<td>applied mathematics</td>
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<td>ar.l.</td>
<td>arid lands resource sciences</td>
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<td>arch.</td>
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<td>atmospheric sciences</td>
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<td>business administration</td>
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<td>Black studies</td>
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<td>civil engineering</td>
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<td>coun.</td>
<td>counseling and guidance</td>
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<td>cp.lit.</td>
<td>comparative literature and literary theory</td>
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<td>cr.l.</td>
<td>critical languages</td>
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<td>consumer science</td>
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<tr>
<td>c.sc.</td>
<td>computer science</td>
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<td>c.t.</td>
<td>clothing and textiles</td>
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<td>dance</td>
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<td>e.e.</td>
<td>electrical and computer engineering</td>
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<td>exercise and sport science</td>
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<td>f.c.m.</td>
<td>family and community medicine</td>
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<td>family and consumer resources</td>
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<td>finance and real estate</td>
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<td>Fre.</td>
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<td>f.s.</td>
<td>family studies</td>
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<td>geological engineering</td>
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<td>geography and regional development</td>
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<td>gero.</td>
<td>gerontology</td>
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<td>Greek</td>
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<td>h.ed.</td>
<td>higher education</td>
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<td>h.e.e.</td>
<td>home economics education</td>
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<td>history</td>
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<td>health education</td>
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<td>h.ps.c.</td>
<td>history and philosophy of science</td>
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<td>h.r.p.</td>
<td>health-related professions</td>
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<td>language, reading and culture</td>
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<td>Mexican American studies</td>
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<td>mathematics</td>
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<tr>
<td>m.c.b.</td>
<td>molecular and cellular biology</td>
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<tr>
<td>med.</td>
<td>medicine (interdepartmental)</td>
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<td>med.t.</td>
<td>medical technology</td>
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<tr>
<td>micr.</td>
<td>microbiology and immunology</td>
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<td>ml.</td>
<td>management information systems</td>
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<td>marketing</td>
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<td>military aerospace studies</td>
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<td>military studies</td>
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<td>mining engineering</td>
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<td>nnr.</td>
<td>natural resource recreation</td>
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<td>naval science</td>
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<td>neuroscience</td>
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<td>nutritional sciences</td>
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<td>obstetrics and gynecology</td>
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<td>ophthalmology</td>
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<td>Oriental studies</td>
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<td>o.s.h.</td>
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<tr>
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<td>pharmacology and toxicology</td>
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<tr>
<td>ped.</td>
<td>pediatrics</td>
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<tr>
<td>phcl.</td>
<td>pharmacology (College of Medicine)</td>
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<td>philosophy</td>
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<td>ph.pr.</td>
<td>pharmacy practice</td>
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<td>ph.sc.</td>
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<td>physics</td>
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<td>plant sciences</td>
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<td>range management</td>
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<td>Russian and Soviet studies</td>
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<td>radiology</td>
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<td>remote sensing</td>
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<td>r.n.r.</td>
<td>renewable natural resources</td>
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<td>r.onc.</td>
<td>radiation oncology</td>
</tr>
<tr>
<td>Russ.</td>
<td>Russian and Slavic languages</td>
</tr>
<tr>
<td>r.s.</td>
<td>special education and rehabilitation</td>
</tr>
<tr>
<td>s.i.e.</td>
<td>systems and industrial engineering</td>
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<tr>
<td>soc.</td>
<td>sociology</td>
</tr>
<tr>
<td>sp.h.</td>
<td>speech and hearing sciences</td>
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</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 agriculture, government, public service agencies, industry, design, and technology. 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 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: Forest-Watershed Resources, Landscape Resources, Range Resources, and Wildlife, Fisheries and Recreation Resources.

The School of Family and Consumer Resources is organized into six programs: Family Studies, Clothing and Textiles, Interior Design, Consumer Studies, Home Economics Education, and Consumer Studies. The College of Agriculture offers the Bachelor of Science in Agriculture, the Bachelor of Landscape Architecture (B.L.A.), the Bachelor of Science in Family and Consumer Resources (B.S.), and the Bachelor of Science in Renewable Natural Resources (B.S.R.N.R.).

A minimum of 20 units of course work must be completed with a grade-point average of 2.00 or better to successfully complete the 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 school and department listings in this catalog for additional information about minors.

A minimum of 20 units of course work must be completed with a grade-point average of 2.00 or better to successfully complete the 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 school and department listings in this catalog for additional information about minors.

Completion of a minor is not required for graduation in the College of Agriculture. Students interested in minors in the humanities, social and behavioral sciences, or the sciences need to consult the section on minors in the College of Arts and Sciences.
General Curriculum

All undergraduate students in the College of Agriculture are required to complete a common 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 a broad 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 a 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. Communications
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 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

I. Basic Skills and Proficiencies
A. Freshmen Composition 6-9 units
B. Communication 6 units
C. Mathematics 3 units
D. Computer Skills 3 units

II. Study Areas3
A. Western Civilization 6-9 units
B. Biological and Life Sciences4 8 units
C. Physical and Environmental Sciences 8 units
D. Individuals, Societies and Institutions 6-9 units
E. Non-Western Civilization 3 units
F. Arts, Literature and Language 6 units

Electives and/or Minor 21-64 units

III. Major5

1. Approved courses listed on the Curriculum Guidesheet. Consult an academic advisor for specific course requirements.
2. Students earning an "unsatisfactory" result on the exam will be required to complete additional writing course work.
3. Students are required to complete a minimum of five study areas.
4. Students are required to complete one course that includes lab work.
5. Students are required to complete a writing emphasis course in the major.
General Information

The College of Agriculture participates in several international programs. Current activities include projects in Portugal, 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 programs.

The college includes the following resource facilities: Agricultural Sciences Communications, Agricultural Statistics, Remote Sensing, and the Office of Arid Lands Studies.

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 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 six program areas: Clothing and Textiles; Consumer Studies; Counseling and Guidance; Family Studies; Home Economics Education; and Interior Design.

The school offers the degree of Bachelor of Science in Family and Consumer Resources with majors in child development and family relations (emphasizing child studies, family studies, or a combination of the two); early childhood education; clothing and textiles; interior design (design track or merchandising track); merchandising and fashion promotion; home economics education (secondary education track or family life education track); home economics extension education; consumer studies and family resource management; general home economics; and home economics and journalism.

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. 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.

*Program currently under review.

General Requirements for the Bachelor of Science in Family and Consumer Resources

<table>
<thead>
<tr>
<th>Group</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>I. Basic Skills and Proficiencies¹</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 Exam²</td>
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</tr>
<tr>
<td>II. Study Areas (Complete five study areas.)</td>
<td></td>
</tr>
<tr>
<td>A. Western Civilization</td>
<td>6-9</td>
</tr>
<tr>
<td>B. Biological and Life Sciences (incl. lab)</td>
<td>8</td>
</tr>
<tr>
<td>C. Physical and Environmental Sciences</td>
<td>8</td>
</tr>
<tr>
<td>D. Individuals, Societies and Institutions</td>
<td>6-9</td>
</tr>
<tr>
<td>E. Non-Western Civilization</td>
<td>3</td>
</tr>
<tr>
<td>F. Arts, Literature and Language</td>
<td>6</td>
</tr>
<tr>
<td>III. Foundation, Major and Minor</td>
<td>50-80</td>
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<tr>
<td>IV. Electives</td>
<td>0-30</td>
</tr>
<tr>
<td>Total Units Required for Graduation</td>
<td>130</td>
</tr>
</tbody>
</table>

¹Groups 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.

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

Honor in Scholarship and Participation—Each year the faculty of the school chooses the outstanding senior family and consumer resources student. The name of the student so honored is engraved on the permanent Family and Consumer Resources Plaque.

Honors Program—The School of Family and Consumer Resources participates in the university-wide Honors Program.

Family and Consumer Resources Organizations

University of Arizona Student Section of the American Home Economics Association is open to all family and consumer resources students. It is the organization for college-age individuals affiliated with their professional organization.

The University of Arizona Student Chapter of the American Society of Interior Designers—Any interior design major, with
a 30000 or better grade average, may be a member of the society upon acceptance by the national organization.

**The Fashion Dimensions Club** is open to anyone interested in fashion and merchandising.

**Omicron Nu** is the national honor society for home economics. Membership is open to juniors and seniors with a 3.0 gpa or better. Membership is open to graduate students with a 3.5 gpa or better who have completed at least half of their graduate program.

**Office of Student Counseling, Advising and Recruiting (OSCAR)** is the peer advising group in the School of Family and Consumer Resources. Students discuss University of Arizona policies and degree requirements, explore majors and clubs in the School of Family and Consumer Resources, discover career options and locate campus activities.

**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: Forest-Watershed Resources; Landscape Resources; Range Resources; and Wildlife, Fisheries and Recreation Resources.

The school offers the degrees of Bachelor of Science in Renewable Natural Resources with majors in watershed management, range management, natural resource recreation, and wildlife and fisheries science and the Bachelor of Landscape Architecture as built form. The college program is organized with the smallest details of interior space. Architects may also be involved in programming and pre-design activities, site analysis, financial feasibility, user need 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.

**Minimum Unit Requirements for Undergraduate Degree in Renewable Natural Resources and in Landscape Architecture**

<table>
<thead>
<tr>
<th>Group</th>
<th>B.S. in R.N.R</th>
<th>B.L.A.</th>
<th></th>
</tr>
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<tbody>
<tr>
<td>I. Basic Skills and Proficiencies¹</td>
<td>6-9</td>
<td>6-9</td>
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<tr>
<td>Freshman Comp.</td>
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<td>3</td>
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<td>Comm. 100, 102</td>
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<td>3</td>
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<tr>
<td>Comm. Elec. (oral or writ. Engl.)</td>
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<td>3</td>
<td></td>
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<tr>
<td>Math. or Stat.²</td>
<td>3</td>
<td>3</td>
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<tr>
<td>Computer Sci. Elective³</td>
<td>3</td>
<td>3</td>
<td></td>
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<tr>
<td>Upper-division writing-proficiency examination⁴</td>
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<td></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>
<tr>
<td>Western Civilization</td>
<td>6</td>
<td>6</td>
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<tr>
<td>Biol. and Life Sci. (incl. lab)</td>
<td>8</td>
<td>8</td>
<td></td>
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<tr>
<td>Phys. and Environ. Sci.</td>
<td>8</td>
<td>8</td>
<td></td>
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<tr>
<td>Indiv., Soc. and Inst.</td>
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<td>6</td>
<td></td>
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<tr>
<td>Non-Western Civilization</td>
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<td>3</td>
<td></td>
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<tr>
<td>Arts, Lit. and Lang.</td>
<td>6</td>
<td>6</td>
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</tr>
<tr>
<td>III. Major and College</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major subject</td>
<td>16</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>S.W. 200, 201</td>
<td>4</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>Electives⁶</td>
<td>3</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>IV. Electives—At least 9 units must be outside the College of Agriculture.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total Required for Graduation</strong></td>
<td><strong>130</strong></td>
<td><strong>130</strong></td>
<td></td>
</tr>
</tbody>
</table>

¹Groups 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.

²The mathematics or statistics requirement may be fulfilled by Stat. 275 or by any mathematics department course except 101, 105a-105b, 116 or 405. Math. 101, 105a-105b, 116 or 405 may be listed in Group IV.

³The computer science requirement may be fulfilled by an approved course or by demonstrated skill in the use of computers.

⁴Students awarded an unsatisfactory mark must complete an additional writing course from a college-approved list.

⁵Students in R.N.R. must complete a minimum of 8 units of chemistry, 4 units of ecology or molecular and cellular biology, Phys. 102a, 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, Phys. 102a, Econ. 201a, 3 units of biological or physical science, and 2 additional units of mathematics as part of the Study Areas.

⁶Must 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.

**Professional 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.

**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 need 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 and 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. Fifth-year options are offered in desert architecture, preservation, community design, behavioral 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 degree of Master of Architecture. Areas of emphasis in the
graduate program are desert architecture (including preservation and community design), human environment theory, design communications 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 16 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>Foreign Language</td>
<td>1</td>
</tr>
<tr>
<td>Physics or Chemistry</td>
<td>1</td>
</tr>
<tr>
<td>Laboratory Science*</td>
<td>1</td>
</tr>
<tr>
<td>Electives</td>
<td>4</td>
</tr>
</tbody>
</table>

*Physics 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. Applicants entering with an ACT score of 28 or SAT of 570 or higher in mathematics will not be required to take additional mathematics in the College of Architecture and may use the required mathematics units for additional open elective opportunities.

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 3.000 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 (2 units each)—52 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 (3 units each), 484 (2 units), plus 6 units of Architectural History electives—14 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 midyear admission into the first semester of the professional phase.

Application Deadlines—Students should apply by April 1 to the Office of Admissions. 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 Catalog.

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 2.000 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)

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Semester</td>
<td>Second Semester</td>
</tr>
<tr>
<td>First Year</td>
<td></td>
</tr>
<tr>
<td>English 101</td>
<td>3</td>
</tr>
<tr>
<td>Math. 117/R/S</td>
<td>3</td>
</tr>
<tr>
<td>Math. 118</td>
<td>2</td>
</tr>
<tr>
<td>Arch. 118 or 112</td>
<td>3 or 2</td>
</tr>
<tr>
<td>Arch. 114 or 124</td>
<td>3</td>
</tr>
<tr>
<td>Elective</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>13</td>
</tr>
</tbody>
</table>

26 units in the professional phase. 

21 units in the preprofessional phase.
Council of Architectural Registration Boards. The College of Architectural Registration as recommended by the National Association of State Architectural Boards, recognizes and accepts the Bachelor of Architecture degree as the first professional degree leading to architectural licensing. The program is fully accredited by the National Architectural Accrediting Board. The degree of Bachelor of Architecture 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 Architects. 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—Fifth-year students and former students are eligible to register with the University Placement Service, which is in communication with organizations seeking graduates. College of Architecture graduating students are urged to register with the Placement Service no later than the beginning of their last semester of studies to avail themselves of the benefit of this service. Further information may be obtained by contacting the Director of the Placement Service or visiting the office on campus.

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 School Medal 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.

College of Arts and Sciences

Faculties of Humanities, Science, and Social and Behavioral Sciences

Office of Academic Services
Modern Language Building, Room 347
(602) 621-3336
Faculty of Fine Arts
Music Building, Room 111
(602) 621-1301

The College of Arts and Sciences is the most comprehensive academic unit in the University of Arizona. Study in the college is designed to assist students within the arts and sciences—and throughout the university—to develop critical and open minds by providing an intellectual foundation in several areas of knowledge. An administrative, curricular and degree structure has been developed to support students' educational objectives, which may range from broad general education to highly specialized professional programs. The College of Arts and Sciences is organized into four faculties: the Faculty of Fine Arts, the Faculty of Humanities, the Faculty of Science, and the Faculty of Social and Behavioral Sciences. Each faculty consists of departments, schools, and committees offering programs at the undergraduate and graduate levels. The college is administered through a dean of each faculty.
Faculty of Fine Arts—Professional programs offered in the Faculty of Fine Arts educate the thinkers and practitioners who will define the emerging standards for the arts. The University provides a rich environment for training, research and experimentation in the arts directed by a faculty of practicing professionals and scholars. In the Faculty of Fine Arts, independent artists and scholars revitalize their skills and generate innovative methods and aesthetic concepts. The Faculty of Fine Arts also provides training and resources based on formal tradition and cultural heritage as a means to interpret and create in our contemporary society.

The academic commitment of the arts is to audiences as well as artists, to community as well as students, to culture as well as curriculum. Access to the knowledge found in the arts must be available to all of society.

Faculty of Humanities—As the humanities are a record of human experience, so the Faculty of Humanities emphasizes the development of those verbal, perceptual and imaginative skills needed both to understand and to communicate this body of knowledge. The Faculty of Humanities, comprising six departments of language and literature, offers degrees in 12 languages. It includes programs in religious studies, English as a Second Language and creative writing, as well as the public readings offered through the Poetry Center and the Freshman Composition Program.

Faculty of Science—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.

Faculty of Social and Behavioral Sciences—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.

Office of Academic Services—The Office of Academic Services (OAS) serves the college through two missions: It provides advising and it supports the General Education Program. OAS advisors help students select a major, plan general education courses, and make many other academic decisions. Fine Arts majors receive advising in their home departments. The college's General Education Program encompasses eight areas of learning that ensure breadth of undergraduate work. General education prepares students for roles as consumers and creators of culture and politics. OAS is located in the Modern Languages Building, Room 347.

Academic Divisions and Degree Programs

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 Drama, Bachelor of Arts in Music, Bachelor of Arts in Media Arts, Bachelor of Science in Geosciences, and Bachelor of Science in Speech and Hearing Sciences. The degrees are listed by faculty and major below. 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.

Faculty of Fine Arts

Departments: Art, Drama, Media Arts

School: School of Music

Committee: Committee on Dance

Majors and Degrees:
- Art Education (B.F.A.)
- Art History (B.A. in Art)
- Dance (B.F.A.)
- Drama Education (B.F.A.)
- Drama Production (B.F.A.)
- Drama-Musical Theatre (B.F.A.)
- Dramatic Theory (B.A. in Drama)
- General Fine Arts Studies (B.F.A.)
- Jazz Studies (B.M.)
- Media Arts (B.F.A., B.A. in Media Arts)
- Music (B.A. in Music)
- Music Education (B.M.)
- Performance (B.M.)
- Studio Art (B.F.A.)
- Theory and Composition (B.M.)

Faculty of Humanities

Departments: Classics, 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.)*
- 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

Faculty of Science

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)

Faculty of Social and Behavioral Sciences

Departments: Anthropology, Communication, Geography and Regional Development, History, Journalism, Linguistics, Oriental Studies, Philosophy, Political Science, Psychology, Sociology

School: Graduate Library School

Committees: American Indian Studies*, Black Studies*, Russian and Soviet Studies, Women's Studies

Institutes: Bureau of Applied Research in Anthropology, Social and Behavioral Sciences Research Institute, Southwest Institute for Research on Women

Centers: Center for Middle Eastern Studies, Latin American Area Center, Mexican American Studies and Research Center, Center for Southwest Studies

Majors and Degrees:

- Anthropology (B.A.)
- Communication (B.A.)
- Economics (B.A.)**
- Geography (B.A.)
- History (B.A.)
- Interdisciplinary Studies (B.A.)
- Journalism (B.A.)
- Latin American Studies (B.A.)
- Linguistics (B.A.)
- Mexican American Studies (B.A.)
- Oriental Studies (B.A.)
- Philosophy (B.A.)
- Political Science (B.A.)
- Psychology (B.A., B.S.)
- Regional Development (B.S.)
- Russian and Soviet Studies (B.A.)
- Sociology (B.A.)
- Women's Studies (B.A.)

*Only a minor is available
**In economics, a department in the College of Business and Public Administration, students select either a B.A. or a B.S.B.A. program of study.

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 Program.
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. 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. 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 (American Indian Studies, Black 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 and minor or double major within one department. For details see an advisor in the English Department.

B.A. AND B.S. General Education Program

General education enables students to explore fresh areas of knowledge and discover a variety of intellectual perspectives. The requirements share the aim of extending the boundaries of a student's education into other disciplines apart from the major. 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 the definitions and processes of various fields of knowledge—these are among the goals of general education.

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.

The General Education Program is governed by the college's General Education Committee, which decides which courses will be included and retained within it. The committee is composed of faculty members and students. It is the student's responsibility to have a clear understanding of the course work options within each study area. Credit in the general education study areas will be awarded only for the committee approved courses.

After the Transfer Evaluation Office has reviewed transcripts from previous schools for credit and equivalencies, transfer students should consult with an academic advisor in the Office of Academic Services for the application of completed courses.
in both skills and proficiencies, and study areas. Earning an Associate of Arts, Associate of Science, or Associate of General Studies degree does not insure that the general education requirements have been met.

The following requirements within the skills and proficiencies portion of the program are given in their entirety. The study areas, including specific courses, will be found in Booklink, a booklet which is published each semester by the Office of Academic Services (OAS). Booklink discusses each study area, describes the courses, identifies the instructor, and notes basic course objectives so that students and advisors can make informed decisions. Copies of Booklink are available in each department, in OAS, Modern Languages Building 347, and in the office of the Dean of the Faculty of Fine Arts, Music Building 211, prior to each registration period. Check each semester for the latest edition of Booklink in order to have the most current listing of available courses.

I. Basic Skills and Proficiencies

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

A. Freshman 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.

B. Mathematics (3 units)

Required is College Algebra (Math. 117 R/S), or any three-credit 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. For students whose native language is other than English, either:
   a. by successful completion of an intermediate level course in a foreign language; or
   b. by successful completion of Engl. 101 and 102, or Engl. 107 and 108.

Transfer credit is allowed only for courses taken at the college level (as defined by the specific department). College of Arts and Sciences departments may require or recommend specific languages in support of their major or preferred minor.

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 those which 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.

In consultation with an academic advisor, a student may elect to waive a total of three units in one of the following groups: A. Western Civilization; C. Individuals, Societies, and Institutions, except the gender, class, race or ethnicity course; or D. Non-Western Civilization.

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. Western Civilization (9 units)

Fundamental to the aims of this study area is the awareness that we are historical beings, shaped by the experience and acts of our predecessors, and that in turn we shape the lives of those who follow us. These courses examine western civilization as a collective heritage of ideas, values, and literary and artistic expressions, but also as a continuous process that adapts that heritage to social, political, scientific, and economic changes and experiences.

Students are required to choose one three-semester approved course sequence in Western Civilization.

B. Biological and Physical Sciences (8 units)

These courses introduce students to the language and practice of science in various fields, to the methods used to pose and test hypotheses, and to the logic involved in developing theories.

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 (which include biochemistry, ecology and evolutionary biology, microbiology and immunology, molecular and cellular biology) or one two-semester sequence in the physical sciences (which includes astronomy, atmospheric sciences, chemistry, Geog. 103a-103b and 104a-104b, geosciences, physics, planetary 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 three-unit 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, even if three units are waived from this study area.
D. Non-Western Civilization (3 units)
Non-Western civilizations include those within the pre-
Columbian New World, Africa, Asia, and the Middle East. The
courses introduce the values, traditions, and
development of one or more of these cultures and civilizations. Studied in conjunction with the western civiliza-
tion study area, courses in this group provide a greater
understanding of the reciprocal influences of western
and non-western civilizations.

E: The Arts and Literature 6 units
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.
Required is one approved three-unit course in the arts
and one approved three-unit course in literature.

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

I. Skills and Proficiencies
   A. Freshman Composition 6
   B. Mathematics 3
   C. Foreign Language 0-16
   Note: Credits may be obtained through the Advanced Placement or College-Level Examination
       Program.

II. Study Areas
   A. Western Civilization 9
   B. Biological & Physical Sciences 9
   C. Individuals, Societies and Institutions 9
   D. Non-Western Civilization 3
   E. The Arts & Literature 6

The Major for Humanities, Science,
and Social and Behavioral Sciences

The undergraduate major programs listed as majors and
degrees under these faculties in the section on “Academic
Divisions and Degree Programs” are open to all students. A
major is a method of organizing studies around a single disci-
pline. 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 pro-
gram. It should reflect post-graduate options and personal,
career, and life considerations. The interdisciplinary studies
major requires no minor.

Answers to Some “Major” Questions

Do I have to declare a major when I apply (or after I’m
enrolled)? A major should be declared after enough exploration
to know what discipline of study best suits one’s character,
needs, interests, and goals. Some entering students do know
and are ready to commit themselves to a major—even at times
to a minor. Other students have an idea, but need a few semes-
ters with a variety of course work in order to focus that idea. In
some cases, a student will want to design his or her own
major—also a possibility within the college. A major must be
declared by the end of the sophomore year.

Can a major be changed? Yes. There is a procedure to follow
which gives the student an opportunity to meet with the faculty
advisor for the new field of study.

When can I discuss majors with an advisor? Any time you are
ready. See a college advisor or a departmental major advisor.
After you have declared your major, the faculty major advisor
within the department you have selected will become your
major advisor. Exploratory students are advised within the OAS:

What is needed for graduate school? Generally, at least, a
3,000 cumulative grade-point average. Students will be evalu-
ated against requirements established by the discipline and
institutions to which they apply. Students should keep in close
contact with their department’s faculty advisor as they become
more and more involved with their major or probable field of
graduate study.

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, spec-
ified courses in exercise and sport sciences, and first year
courses in foreign language (except Greek, American Indian
languages, and languages taught by the Department of Orien-
tal Studies). American sign language may not be a minor if
used to meet the foreign language requirement.

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 Program.
(3) Courses to complete a major (no minor is required).
(4) 30 units of university credit (for definition see the Aca-
demic 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 univ-
ersty 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 gradu-
ation. (For explanation of University graduation require-
ments, 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 Program.
(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.)

B.F.A. AND B.M. General Education Program

General education requirements vary among the several degree programs of the Faculty of Fine Arts. Bachelor of Arts programs require the general education course work 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 then submit a College Recommendation Form (obtainable in the dean’s office) 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, Drama Production, Drama-Musical Theatre and Media Arts)

and Bachelor of Music

(Majors in Performance, Theory and 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 117R/S 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. Drama production and drama-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: Art 117, 118; Dnc. 259; Dram. 140a, 140b; Mus. 107, 108; Hum. 355; Phil. 111, 113; Or.S. 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, or Dram. 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. 260, 280; R.R.P. 135; W.F.Sc. 125, P.S. 100.
   Media arts majors are required to take 4 units of laboratory science.

C. Individual, 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.A.R. 101, philosophy (except Phil. 111 and 113), psychology, sociology, American Indian studies, Black studies, Oriental studies (except Or.S. 140a-140b), religious studies, women’s studies (except W.S. 200).

D. Non-Western and Minority 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. The Arts (6 units)
   From all fine arts offerings in departments other than the student’s major, with only one course of applied (study/performance/production) arts accepted.
   To satisfy group II-E requirements, media arts students must include no fewer than three units from Art 101 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.

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.
   Anth. 430, Clas. 229, Dram. 108, 109, 140a or 140b, 170, 474; Dnc. 100, 259, 270; Ecol. 159a or 159b; Jour. 301; M.A.R. 101, 200; Mktg. 361, 364; Mus. 107, 108; Phil. 110, 111, 433; W.S. 243a, 243b.

Committee on Dance Requirements:
   Dram. 101; Mus. 107, 108; Phil. 110.

Department of Drama Requirements:
   6 units of dramatic literature selected from the following courses: Engl. 267a, 331, 431a, 431b, 482, 446 468, 485; Ger. 371; Clas. 346. 6 additional units determined in consultation with the student’s study area advisor.

Department of Media Arts Requirements:
   3 units from each of the following categories:
   1. Art 241
   2. Mus. 100
   3. Art 117, 118; Mus. 107, 108
School of Music Requirements:
12 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.

Bachelor of Fine Arts
(Majors in Art Education and Drama 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.

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: Art 117, 118; Dnc. 259; Dram. 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; P.I.S. 100.
C. Individuals, Societies, and Institutions (9 units)
   Required courses: Pscy. 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, American Indian studies, Black studies, Oriental studies (except Or.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
   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 drama education advisor for designated units

Bachelor of Fine Arts
(Major in General Fine Arts Studies)

I. Communication and Conceptualization
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; P.I.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), phil. (except Phil. 111 and 113), polical science, psychology, sociology, American Indian studies, Black studies, Oriental studies (except Or.S. 140a-140b), religious studies, women's studies (except W.S. 200).
D. Non-Western and Minority Studies
   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 117 or 118, Dnc. 259 and
3 units of dance activity courses; Dram. 140a or 140b, 149; M.Ar. 101, 200; Mus. 107 or 108, and 3 units of performance courses.

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 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).

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 or upon entrance into the faculty. Students can file a change in major at any time upon approval of the Office of the Dean.

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, a minor 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, drama production, drama education, dramatic 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, drama 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 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 minimum 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:

A. Twenty units in one department;
B. A split minor of work done in two departments, with at least 8 units in one and 12 units in the other;
C. 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, drama, media arts, music;
D. 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 “General Education Program, Bachelor of Fine Arts, major in general fine arts studies” earlier in this section of the catalog.

Advising for general fine arts studies students begins in the Office of the Dean, Music Building 111. After the student has selected a department A, advising is done in that department. General fine arts studies students take the writing emphasis course in their department A.

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 in the three study areas. Each proposal or change in proposals must be approved within the OAS.

Designing the major requires that the student (1) prepare a written proposal; (2) meet with an OAS advisor; (3) have the final proposal accepted by the college, and (4) receive an OAS advisor’s signature on the major declaration form.

Requirements include:

1. All General Education Program 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. A department may designate up to 6 units of required course work within its discipline.

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 Oriental Studies Department, 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.

Admission and Advising

Academic Advising

In the College of Arts and Sciences, a student receives academic advising in two ways: Each department provides an advisor to help its majors select courses in that major and in a minor; the college advisor in the Office of Academic Services (OAS) helps the student with requirements of the General Education Program for the Bachelor of Arts and Bachelor of Science degrees.

OAS advisors are available throughout the year to advise transfer students, undeclared students, and students interested in the interdisciplinary studies major, special programs, and pre-professional programs.

In the Faculty of Fine Arts, students declare a major upon entering and are assigned a major advisor in the selected department. For general fine arts studies, advising is provided in Music Building 111.

College policy emphasizes that it is the student's responsibility to know and meet all degree requirements.

Advising Center for Exploratory Students (ACES)

The Advising Center for Exploratory Students (ACES) advises students who have not yet chosen a major. ACES assists students in their individual exploration of their own interests, prospective majors, and possible careers.

To indicate an interest in ACES, undecided students may mark "No College Selected" on their University application form or contact the ACES program directly at 621-3336. The ACES office is located in Modern Languages 347.

Transfer Students

The Admissions Office (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.

Arizona Community Colleges

The college provides Arizona community colleges with degree program information to enable the student to plan courses to meet the requirements of the University's General Education Program as well as the major and minor areas of study. Through community college counselors, students can integrate their two-year study plan for the Associate of Arts or the Associate of Science degree with the requirements of a Bachelor of Arts or Bachelor of Science degree. Emphasis is placed on the integrity of community college studies. With planning, the student may transfer to the University with a partially completed degree program. Transfer students must declare their major area of study either at the time of transfer, if 55 units have been completed, or within one semester in the College of Arts and Sciences. The Fine Arts student must declare a major upon admission.

Academic Policies

Change of College—To enter the College of 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 at the Office of Academic Services, Modern Languages Building, Room 347. 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 in the Dean's office.

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.
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 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 dean and only under very exceptional circumstances.

Grading Policies

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. To begin the process, the student raises concerns about the grade with the instructor no later than the end of the fifth week of classes of the first regular semester after the one in which the grade was awarded. If the issue is not resolved, the student takes the case to the head of the department where the course is taught. The next level of appeal is the Office of Academic Services, or in the case of Fine Arts courses, the Dean's Office, Music Building 111.

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 Program, 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.

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, practica, 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.

Correspondence Study

Students currently enrolled in the college must secure a dean's approval prior to initiating correspondence study. Non-admitted individuals who have completed six or more units of correspondence study should meet with an academic advisor to discuss admission and degree program requirements. Credit earned in correspondence study courses is not considered residence credit at the University of Arizona, and the grades received will not be averaged into the cumulative grade-point average. Students who are on probation or who have been disqualified from the university must consult with an academic advisor prior to enrollment in a correspondence course.

Double-Major 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 department's office for specific information.

Honors and Scholarships

To be eligible for one of the following honors, the student's grade-point average must be based on letter grade and credit, with all pass/fail and "S" grades excluded. All "I"s must have been made up before an honor is bestowed. Each type of honor is noted on the official transcript.

Academic Year Honors

Highest Academic Distinction requires a 4.000 GPA for a minimum of 30 units completed during the two semesters of the regular academic year.
Academic Distinction requires between a 3.500 and a 3.999 GPA for a minimum of 30 units completed during the two semesters of the regular academic year.

Semester Honors

Dean's List with Distinction requires a 4.000 GPA for a minimum of 15 units completed during the previous semester.
Dean's List requires between a 3.500 and a 3.999 GPA for a minimum of 15 units completed during the previous semester.
Honorable Mention requires a 3.500 GPA or above for 12 through 14 units completed during the previous semester. The names of the recipients of each type of honor are posted by the dean's offices, and special mementos are presented at Honors Convocations.

Scholarships—Numerous scholarships and awards are made each year by the departments and college to academically qualified students. Further, the Office of Student Financial Aid has a comprehensive program of scholarships and financial aid.

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.

Honors Societies, Professional and Honorary Associations

Faculty of Fine Arts
American Guild of Organists—Student Chapter
American Musicoological Society—Student Chapter
Dancer's Consortium
International Society for Music Education—Student Chapter
Kappa Kappa Psi—Band Fraternity for Men
Music Educators National Conference—Student Chapter
Music Teachers National Association—Student Chapter
National Student Speech-Language-Hearing Association
Phi Mu Alpha Sinfonia Fraternity of America—Men's National Professional Music Society
Pi Kappa Delta—National Speech Honorary
Sigma Alpha Iota—Women's National Music Honorary
Theta Alpha Phi—Honorary Fraternity for Theatre Arts

Faculty of Humanities
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 Science
Alpha Chi Sigma—Chemistry
American Geophysical Union—Atmospheric Sciences
American Meteorological Society—Atmospheric Sciences
Phi Beta Kappa—National Honor Society
Pi Mu Epsilon—Mathematics
Sigma Gamma Epsilon—Geosciences
Sigma Pi Sigma—Physics
Sigma XI—Scientific Research
Society for Earth Sciences—Geosciences
Society of Physics Students—Physics
Society of Women Engineers Student Chapter—Statistics
Tau Beta Pi—Geosciences

Faculty of Social and Behavioral Sciences
Alpha Kappa Delta (Alpha Chapter)—Sociology
Gamma Theta Upsilon—Geography and Regional Development
Kappa Tau Alpha—Journalism

Latin American Studies Association—Latin American Area Center
Phi Alpha Theta—History
Phi Beta Kappa—National Honor Society
Phi Sigma Alpha—Political Science
Psi Chi National Honorary—Psychology
Society of Professional Journalists—Student Chapter

Special Academic Programs

Cooperative Education, Internship Program, and Summer Co-op

Complete information on these programs is available through the Career and Placement 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 non-paid 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.

International Management/Thunderbird

The College and the American Graduate School of International Management (Thunderbird) offer a cooperative program emphasizing humanistic 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. For details, see the Office of Academic Services.

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. For further information, the student is referred to the Office of Academic Services, Modern Languages, Room 347.
Evening Study Program

Office of Academic Services advisors are available to meet with individuals interested in completing a degree program through late afternoon or evening classes. Evaluation of completed course work, degree program planning, and consideration of the class offerings provide the re-entry or the beginning student with information regarding the changing needs of the adult learner. This pre-entry advising provides assistance with questions about the college, academic advising, career exploration, peer support, and referrals to campus services.

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 examinations. 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 academic advisor in the Office of Academic Services.

Study Abroad

The University of Arizona study abroad programs are available in France, England, Italy, 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, Nugent 210, 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 with universities in Taiwan, Soka University in Tokyo and 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.

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 of the College of Arts and Sciences, and in the Graduate Professional Programs Office, College of Business and Public Administration.

Prehealth Professions Program

The Prehealth Professions Program of the Office of Academic Services provides an advisor for students interested in medicine, dentistry, optometry, podiatry, osteopathy, and physical therapy. The program also makes available peer advisors and a library of catalogs and other resource materials at Modern Languages 347.

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 non-science, and fostering life-long avocations such as art, music or archeology.

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.

Underrepresented minority students, including Native Americans, Hispanics, and blacks, 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 to meet with the prelaw advisor for assistance in planning a degree program. In addition, the prelaw advisor is able to answer questions about the law school admission process, the 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, and their average LSAT score ranges from 35 to 36 on a scale of 10 to 48.

For more information about the prelaw program, contact the prelaw advisor in the Office of Academic Services, Modern Languages 347.

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, students should consult an academic advisor in the Office of Academic Services, 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

These divisions are affiliated with or are part of the college and its academic mission. Information about some of these divisions is 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
Center for Middle Eastern Studies
Center for the Study of Complex Systems
The Division of Neurobiology of the Arizona Research Laboratories
The Grace H. Flandrau Planetarium
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 Center for Research on Women (SIROW)
The Steward Observatory
The Women in Science and Engineering Program

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 managerial and professional positions in the public and private 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. Also, 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. The faculty averages $2.5 million annually in research grants and contributions. 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 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. Under both programs, 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.

Within the B.S.P.A. degree program, students may select a major in criminal justice administration, health services administration, 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 of 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 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 Graduate Committee on Planning, offers the Master of Science degree with a major in planning.

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 to the BPA College, should come to the Undergraduate Programs Office, BPA 108, for information and academic advising. Students with prior college-level work should bring transcripts of that work.

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

Juniors and seniors in all majors except general business administration 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 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 university credit.

**Transfer Credits**

**General Statement**—Undergraduate programs in business administration in universities normally 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 Collegiate 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. Students 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 business and economics courses from community colleges will be accepted toward a bachelor's degree in business administration.

Professional business courses taught at the junior or senior level 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 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:

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>Accounting</td>
<td>6</td>
</tr>
<tr>
<td>Economics</td>
<td>3-6</td>
</tr>
<tr>
<td>Quantitative Analysis &amp; Statistics</td>
<td>3</td>
</tr>
<tr>
<td>Legal Environment</td>
<td>3</td>
</tr>
<tr>
<td>Introduction to Computing</td>
<td>3</td>
</tr>
<tr>
<td>Lower Division Business Electives</td>
<td>9</td>
</tr>
<tr>
<td>Maximum Gen'l Education</td>
<td>34-42</td>
</tr>
<tr>
<td>English</td>
<td></td>
</tr>
<tr>
<td>Mathematics</td>
<td></td>
</tr>
<tr>
<td>Science</td>
<td></td>
</tr>
<tr>
<td>Humanities</td>
<td></td>
</tr>
<tr>
<td>Social Science</td>
<td></td>
</tr>
<tr>
<td>Electives</td>
<td></td>
</tr>
</tbody>
</table>

**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 vary among universities. For further information, see "Transfer Students" in the Admission to the University section of this catalog.

**Advanced Standing Policy**

Enrollment in upper-division (300- and 400-level) courses taught by the departments in the BPA College is restricted by the Advanced Standing Policy. This policy restricts enrollment in all upper-division courses in the 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 Undergraduate 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 enroll in the restricted courses is granted subsequent to receipt of complete documentation of a student’s eligibility. Thus, evidence of completion of course requirements being taken elsewhere, of total units, or of the
attainment of the requisite university grade-point average is required before permission to register is granted. Conditional ability to register for restricted courses is granted only to BPA students who are completing any outstanding 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 students are responsible for their own registrations and for having established 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 all 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.

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. BPA or non-BPA students who previously had attained Advanced Standing who have been absent from the University for at least one but not more than two regular semesters, regardless of reason, must have their eligibility revalidated in order to enroll in restricted courses.

**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 course work at the University of Arizona of not less than the minimum established by the BPA College**;
4. an approved application on file with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

*See each degree program description for details.

**Now 2,600; 2,750 required for students approved for 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 course work at the University of Arizona of not less than the minimum established by the BPA College*;
4. been enrolled in a non-BPA program for at least one regular semester; and
5. an approved application on file with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

*Now 2,600; 2,750 required for students approved for 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.

Applicants must
1. be enrolled in a program approved as exempt and have a grade-point average based on University of Arizona course work at least equal to the minimum required in their own college, but not less than 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 Advanced Standing Policy.

**Catalog Exemption**

To qualify for catalog exemption, one must be graduating under the requirements 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 taken 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 completed this minimum. Thereafter, they must meet all of the regular provisions of the policy. Such students must have an approved application on file with the BPA Undergraduate Programs Office.

**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, values, and international multicultural experience.

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 57 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.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

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Basic Skills and Proficiencies</td>
<td></td>
</tr>
<tr>
<td>A. Communications</td>
<td>3</td>
</tr>
<tr>
<td>Eng. 101 or 103-H</td>
<td></td>
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<tr>
<td>Eng. 102 or 104-H</td>
<td></td>
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<tr>
<td>B. Mathematics and Quantitative Methods</td>
<td>3</td>
</tr>
<tr>
<td>Math. 110</td>
<td></td>
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<tr>
<td>Stat. 275</td>
<td></td>
</tr>
<tr>
<td>C. Language of Commerce/Pre-Professional Course Work</td>
<td>3</td>
</tr>
<tr>
<td>M.I.S. 111</td>
<td></td>
</tr>
<tr>
<td>Acct. 200</td>
<td></td>
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<tr>
<td>Acct. 210</td>
<td></td>
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<tr>
<td>Econ. 200</td>
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<tr>
<td>D. Professional Core</td>
<td>(6-8 units)</td>
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<tr>
<td>Fulfilled by selecting one of two options:</td>
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<tr>
<td>OR by two courses in international affairs</td>
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<tr>
<td>selected from the relevant list in the BPA Undergraduate Programs Office.</td>
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<tr>
<td>E. Arts, Literature and Ethics</td>
<td>(6-8 units)</td>
</tr>
<tr>
<td>Fulfilled by selecting one of two options:</td>
<td></td>
</tr>
<tr>
<td>(1) If &quot;ethics&quot; has been selected within the</td>
<td></td>
</tr>
<tr>
<td>Social and Behavioral Sciences Study Area,</td>
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<tr>
<td>then one 3-unit course in art and one 3-unit</td>
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<tr>
<td>course in literature to be chosen from the</td>
<td></td>
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<tr>
<td>relevant list in the BPA Undergraduate Programs Office,</td>
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<tr>
<td>(2) If &quot;ethics&quot; is not selected elsewhere,</td>
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<tr>
<td>then one 3-unit course in ethics and either</td>
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<tr>
<td>one such course in art or literature are to</td>
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<tr>
<td>be chosen from the list cited in option (1).</td>
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</tbody>
</table>

### Professional Requirements

<table>
<thead>
<tr>
<th>Category</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
<td>III. Professional Core</td>
<td></td>
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<tr>
<td>All candidates for the degree must complete</td>
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<tr>
<td>this set of professional courses. These</td>
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<tr>
<td>are normally taken in the junior year</td>
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<tr>
<td>except for the capstone business policy</td>
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<tr>
<td>course which should be completed in the</td>
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<tr>
<td>student's last year:</td>
<td></td>
</tr>
<tr>
<td>Econ. 300 and 330; Fin. 311; M.A.P. 305 and</td>
<td></td>
</tr>
<tr>
<td>320; M.I.S. 373; Mktg. 361.</td>
<td></td>
</tr>
<tr>
<td>Any one business policy course must be</td>
<td></td>
</tr>
<tr>
<td>selected from the set:</td>
<td></td>
</tr>
<tr>
<td>Acct. 471, Fin. 471, M.A.P. 471, M.I.S. 471,</td>
<td></td>
</tr>
<tr>
<td>or Mktg. 471.</td>
<td></td>
</tr>
<tr>
<td>(Credit is allowed for only one policy</td>
<td></td>
</tr>
<tr>
<td>course).</td>
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</tr>
</tbody>
</table>

### Major Fields Available

Students are asked to declare one of the major fields of business administration upon enrollment. Additional 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. This average is computed on all courses attempted that may be used in 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 may 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 of Arizona residence 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 in list (a) and (b) below. Either Acct. 471, M.A.P. 471, M.I.S. 471, or Fin. 471 are recommended for the policy requirement.

- (a) All accounting majors must complete: Acct. 300A-300B.
- (b) An additional 9 units (three courses) must be selected from the following: Acct. 320, 401, 410, 422, 431, 461, 472.

Some states require a five-year program to be eligible to sit for the Uniform CPA 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 CPA 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.

### B.S.B.A. Advanced Standing Eligibility Requirements

To attain advanced standing, as a B.A. student, the following lower-division requirements must be met: Eng. 101 or 103-H, 102 or 104-H, Math. 113, 123, M.I.S. 111, Acct. 200, 210, Econ. 200; Stat. 275; 6 to 8 units of biological and physical sciences; sufficient general education study area, lower-division pre-major and elective units to meet the minimum 56 required by the policy.

### Free Electives

V. Free Electives (7-17 units)
Business Economics

This major is designed for those who wish 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 the professional requirements of Econ. 200, 300, and 330 as well as Econ. 361 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. Majors may take Econ. 361 in place of Econ. 300 and substitute 3 units of upper-division economics for Econ. 300 with the approval of the department and the dean.

The major consists of fifteen units of economics, including Econ. 332, to be selected from the 300- and 400-level courses (not including 300, 330, and 361) offered by the Department of Economics.

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.

(a) All students in this major will complete Fin. 412, 421, and 431.

(b) Six additional units (two courses) will also be chosen from the following: Acct. 300a, 300b, 310; Econ. 332, 422, 442, Fin. 313, 361, 362, 422; M.A.P. 426.

General Business Administration

This major gives the student a broad knowledge of the principal areas of business administration. It prepares the graduate for a variety of careers (including intensive graduate study in business), and aims to educate generalists rather than specialists. It may not be combined with any of the other business major options. General business administration majors may take any of the policy set; M.A.P. 471 is recommended.

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 before beginning the major. M.I.S. majors may take any of the policy options; M.I.S. 471 is recommended.

(a) All students in this major will complete M.I.S. 301, 307, 341 and 441.

(b) An additional three units (one course) must be selected from the following: M.I.S. 331, 421, 422, 451, and 461.

Materials describing career paths, recommended major courses, and suggested options for upper-division nonbusiness 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.

(a) 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).

(b) 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 is 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.

(a) All students in the major will complete M.I.S. 473a-473b.

(b) Three additional courses (nine units) must be taken:

(i) At least one course must be selected from M.I.S. 474, 475, 476, or 479.

(ii) Two more courses may be taken from either

(i) or M.I.S. 301, 331, 421, 422, S.I.E. 405, or 462.

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 in the freshman or sophomore years. M.A.P. is the recommended policy option, but students may elect any of the policy options.

(a) All students in this major will complete M.A.P. 330 and 430.

(b) 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.

(a) All students in this major will complete Fin. 361, 362, 461.

(b) 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, values, and international multicultural experience. 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 57 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 field for graduation. Students must earn at least 12 units of University of Arizona residence credits in the major in the BPA College.

### 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>
</tr>
</thead>
<tbody>
<tr>
<td>A. Communications</td>
<td></td>
</tr>
<tr>
<td>Engl. 101 or 103H</td>
<td>3</td>
</tr>
<tr>
<td>Engl. 102 or 104H</td>
<td>3</td>
</tr>
<tr>
<td>Upper-Division Writing Proficiency Examination&lt;sup&gt;1&lt;/sup&gt;</td>
<td>3</td>
</tr>
<tr>
<td>Comm. 412</td>
<td></td>
</tr>
<tr>
<td>B. Mathematics and Quantitative Methods</td>
<td></td>
</tr>
<tr>
<td>Math 119&lt;sup&gt;2&lt;/sup&gt;</td>
<td>3</td>
</tr>
<tr>
<td>Math 123&lt;sup&gt;3&lt;/sup&gt;</td>
<td>3</td>
</tr>
<tr>
<td>M.A.P. 204&lt;sup&gt;4&lt;/sup&gt;</td>
<td>3</td>
</tr>
<tr>
<td>Stat. 275</td>
<td>3</td>
</tr>
<tr>
<td>C. Language of Commerce/Pre-Professional Course Work</td>
<td></td>
</tr>
<tr>
<td>M.A.P. 100</td>
<td>3</td>
</tr>
<tr>
<td>M.I.S. 111</td>
<td>3</td>
</tr>
<tr>
<td>Acct. 200</td>
<td>3</td>
</tr>
<tr>
<td>Acct. 272</td>
<td>3</td>
</tr>
<tr>
<td>Econ. 200</td>
<td>3</td>
</tr>
</tbody>
</table>

#### II. Study Areas

<table>
<thead>
<tr>
<th>A. Biological and Physical Sciences</th>
<th>(6-8 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Two semesters selected from astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, geography (103a, 103b, 104a, and 104b only), geosciences, hydrology and water resources, microbiology, molecular and cellular biology, physics or planetary sciences.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Social and Behavioral Sciences</th>
<th>(12 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Twelve units selected from options list available in BPA Undergraduate Programs Office.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Western and Non-Western Civilizations</th>
<th>(9 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. International and Multicultural Experience</th>
<th>(6-8 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulfilled by two semesters of the same foreign language OR by two courses in international affairs selected from the relevant options list in the BPA Undergraduate Programs Office.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E. Arts, Literature and Ethics</th>
<th>(4-8 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fulfilled by selecting one of two options:</td>
<td></td>
</tr>
<tr>
<td>(1) If “ethics” has been selected within the Social and Behavioral Sciences Study Area, then one 3-unit course in art and one 3-unit course in literature are to be chosen from the relevant list in the BPA Undergraduate Programs Office, or</td>
<td></td>
</tr>
<tr>
<td>(2) If “ethics” is not selected elsewhere, then one 3-unit course in arts or literature and either one such course in art or literature are to be chosen from the list cited in option (1).</td>
<td></td>
</tr>
</tbody>
</table>

### 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 330 or 435; M.A.P. 305 and 410a; M.I.S. 373; Pol. 474; M.A.P. 472<sup>4</sup>; (21 units).

#### IV. Major Fields

A major field of 21 units is to be selected. This is comprised of 12 units of restricted options in the selected major area plus 9 units chosen from among one of three management emphasis areas. (21 units)

<table>
<thead>
<tr>
<th>V. Free Electives</th>
<th>(4-8 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Required for Graduation</td>
<td>125 units</td>
</tr>
<tr>
<td>Minimum Out-of-College Unit Requirement</td>
<td>54</td>
</tr>
<tr>
<td>Minimum Upper-Division Unit Requirement</td>
<td>57</td>
</tr>
</tbody>
</table>

<sup>1</sup>Students earning an “unsatisfactory” result on the exam normally will be required to complete additional writing course work as specified by the college.

<sup>2</sup>The math readiness exam, used to determine math placement, is required. College algebra or the equivalent is prerequisite for Math. 119 and 123.

<sup>3</sup>To be completed prior to Stat. 275.

<sup>4</sup>Writing Emphasis course. The writing proficiency exam is a prerequisite.

### B.S.P.A. Advanced Standing Eligibility Requirements

To attain advanced standing as a BPA student, the following lower-division requirements must be met: Engl. 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; 6 to 8 units of biological and physical sciences; sufficient general education study area and elective units to meet the minimum 56 required by the policy.

### 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 108.

The major consists of 21 units. Twelve units are selected from a set of restricted options in the major field with an additional 9 units chosen from the options in a selected management emphasis area. Additional units beyond these requirements are optional to the student. To graduate the student must have a grade-point average of 2.0000 or better in all courses applicable to the major. Prior permission of the departmental advisor and the college dean is required to apply an individual study course to any major.

Students must earn at least 12 units of University of Arizona residence credits in the major in the BPA College.

The requirements for each major field in public administration are given below.
Public Management

This major, which should be selected by all B.S.P.A. students except those with firm preferences for other specific fields, prepares students for administrative positions in government and quasi-public agencies. Graduates of the program may choose to enter policy areas of government, defense, manpower, transportation, housing, environment, energy, education, and other fields through entry-level positions in a variety of areas including program analysis, research and evaluation, budgeting and finance, personnel, and public information. The public management major also prepares students for graduate study in law, in specialized planning and administrative fields, or in public policy and administration.

(a) All students in this major will complete 12 units from M.A.P. 330, 401, 413; M.I.S. 475, 478.
(b) Nine additional units (three courses) must be selected from the required courses of one of the management emphasis areas listed below. Some public management major required courses overlap with courses in the management emphasis areas. If this occurs, students selecting these courses cannot use them to fulfill the management emphasis area requirement. Substitutions must be approved by the student's major advisor.

Criminal Justice Administration

This major prepares students for operational and administrative responsibilities in courts, corrections and police work, as well as for graduate study in law or in the administration of justice.

(a) All students in this major will complete M.A.P. 331, 332 and two of the following: M.A.P. 337, 431, 436.
(b) Nine additional units (three courses) must be selected from the required courses of one of the management emphasis areas listed below.

Health Services Administration

This major is appropriate for students desiring careers in the planning and implementation of national, state, or local health policies, programs and services. Positions may involve hospital administration, as well as the management of public or volunteer health agencies and medical care services. Long-term care administration, with special reference to the aged, is offered as part of this major. Students in health services administration may also prepare for graduate study in health and allied professions.

(a) All students in this major will complete 12 units from M.A.P. 354, 454, 455, 456; Econ. 487.
(b) Nine additional units (three courses) must be selected from the required courses of one of the management emphasis areas listed below.

Human Services Administration

This major prepares students to exercise operational skills and administrative responsibility in human service agencies, institutions, and organizations. In developing management skills in the human service policy area, this major is effective preparation for entry-level positions and for graduate study in such fields as social work, social planning, and human services administration.

(a) All students in this major will complete 12 units from M.A.P. 348, 360, 454, 463, 466.
(b) Nine additional units (three courses) must be selected from the required courses of one of the management emphasis areas listed below.

Management Emphasis Areas

To complete any of the majors identified above, the student must also complete the requirements of one of the management emphasis areas described below. Options available in the management emphasis areas are operations management, human resources management, and policy analysis and strategic planning.

Operations Management—All students choosing this management emphasis area will complete:

(a) M.I.S. 476, 478.
(b) Three units of course work selected from M.I.S. 474, 479.

Three units of other course work may be substituted with approval of the student's major advisor.

Human Resources Management—All students choosing this management emphasis area will complete:

(a) M.A.P. 330, 430.
(b) Three units of course work selected from M.A.P. 411, 413, 444, 480; Econ. 382, 383, 386; Coun. 401; Psyc. 450; M.I.S. 479.

Policy Analysis and Strategic Planning—All students choosing this management emphasis area will complete:

(a) M.A.P. 401, 405.
(b) Three units of course work selected from M.A.P. 410b; Econ. 436; Pol. 406, 407, 480; Mktg. 470.

Entrepreneurial Studies Program

Sponsored by the Karl Eller Center for the Study of the Private Market Economy, the entrepreneurial studies program is for seniors in the College of Business and Public Administration and M.B.A. students. 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.

The program will provide students with the conceptual and analytical framework for conceiving, planning and initiating innovative business ventures. In particular, the program aims to impart an understanding of the nature of entrepreneurship, as well as the conditions necessary for its success.

Other College Programs

The Board of Advisors—A group of leading executives from Arizona and other states serves as the Board of Advisors to the College of Business and Public Administration, assisting in the development of resources, providing a communication link between the college and management community, reviewing the goals and objectives of the college, and advising and assisting the dean in the resolution of important policy issues.

An important dimension of the board's activities centers around member interaction with the students and faculty of the college.

The Business Partners—Believing that it exists within the total context of the private and public organizational sectors, the college maintains a Business Partners Program in which the institution and the business community provide one another with resources. Among the services supplied to business and industry is assistance in the recruitment of graduates.

The College Alumni Council—The College of Business and Public Administration is one of several within the University which has organized its own Alumni Council. The council assists in obtaining wide recognition of its accomplishments by sponsoring public events at which faculty expertise is made available to the larger community.

The Department of Executive Programs—The Department 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 BPA Breakfast Series provides a number of topics throughout the year to bring up-to-date information to the working professional.

**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 Placement 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 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 the Private Market Economy

**Student Involvement**

The college encourages student participation in the numerous professional clubs, organizations and honorary societies associated within the various fields with 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; Economics Club; Finance Management Association; Association of Collegiate Entrepreneurs; and AIESEC-International Association of Students in Economics and Business.

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, bilingual education, reading, and rehabilitation. Further, the college prepares individuals in the supervision and administration of elementary and secondary schools, special education 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.

**Academic Divisions**

**The Division of Educational Foundations and Administration**

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 examines psychological processes in educational settings, emphasizing learning and development, testing and measurement, and school psychology. Higher education focuses on the development and dissemination of knowledge about postsecondary education, including universities and colleges, regional and state agencies, the federal government, and various policy-making organizations. The division offers graduate degree programs in educational administration, educational psychology, foundations of education, and higher education.

**The Division of Language, Reading, and Culture**

brings together faculty members concerned with research, scholarship, and teaching related to the use of language in school and society. The faculty is specifically concerned with reading, composition, and bilingual and cross-cultural education. The division offers graduate degree programs in reading and in bilingual/bicultural education.

**The Division of Special Education and Rehabilitation**

focuses upon all exceptional persons, the gifted as well as the handicapped. The division has three missions: (1) to add to the status of knowledge about exceptional persons through research, (2) to provide technical assistance to local, state, and federal agencies. The division offers academic degree programs in special education and rehabilitation.

**The Division of Teaching and Teacher Education**

offers programs directed toward the pre-service 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. The division offers academic degree programs in early childhood, elementary, and secondary education and in educational media.

**Program Requirements**

At the time the catalog was being edited, revisions to many of the programs in the College of Education were being considered for approval. All current or prospective students should check with the Office of Student Services in the college or
consult the appropriate division for information on current degree requirements.

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, Master of Science, Master of Education, Master of Teaching, Educational Specialist, Doctor of Education, and Doctor of Philosophy.

Graduate Majors—The Doctor of Philosophy degree is available with majors in educational administration, educational psychology, elementary education, foundations of education, higher education, reading, rehabilitation, secondary education, and special education. The Doctor of Education degree is available with majors in educational administration, educational psychology, elementary education, foundations of education, higher education, reading, rehabilitation, secondary education, and special education. The Educational Specialist degree is offered with majors in educational administration, educational media, educational psychology, elementary education, reading, secondary education, and special education.

At the master's level, majors are offered in bilingual/bicultural education, educational administration, educational media, educational psychology, elementary education, foundations of education, higher education, reading, rehabilitation, secondary education, and special education. In addition, teaching majors for master's level degrees may be selected from over 24 departments outside the College of Education. Not all majors listed above are available for all master's degrees. Consult the appropriate division for details on specific master's level 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 rehabilitation, early childhood education, and elementary education. For information on course requirements for these majors, students should consult an advisor in the appropriate division of the college. Teaching majors are defined as the secondary school academic subject area in which the student plans to teach. These majors are administered through the relevant academic departments in cooperation with the College of Education, which is responsible for providing the necessary professional education coursework. 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, physical education, or any one of the physical sciences. The Bachelor of Arts in Education degree is awarded for majors in early childhood education, elementary education, or any teaching major area other than mathematics, physical education, or one 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 who major in elementary education are required to choose a subject matter minor. The minor should be selected and planned with the assistance of an advisor in the Division of Teaching and Teacher Education. Majors in early childhood education and in rehabilitation will also require a minor field.

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
Communication
Earth Science
English
French
General Biology
Geography
German
History

Minors Only

Anthropology
Athletic Coaching
Bilingual/Bicultural Education
Chemistry/Physics
Computer Science
Economics

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. in Ag.) - College of Agriculture
- Art Education (B.F.A.) - College of Arts and Sciences
- Drama Education (B.F.A.) - College of Arts and Sciences
- Health Education (B.S. in H.S.) - School of Health-Related Professions
- Home Economics Education (B.S. in F.C.R.) - College of Agriculture
- Home Economics Extension Education (B.S. in F.C.R.) - College of Agriculture
- Music Education (B.M.) - College of Arts and Sciences
- Physical Education (B.S. in H.S.) - School of Health-Related Professions

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. As candidates for the Bachelor of Science in Business Administration degree (B.S.B.A.), with a major in general business administration, these students will satisfy the requirements for a teaching certificate through the College of Education while completing the requirements for the business major. Because of the nature of the course requirements, students considering this program are encouraged to consult an advisor in the College of Business and Public Administration early in their academic careers.

Admission Requirements

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 most students who wish to enroll in restricted professional education courses for the purposes of earning a teaching certificate. To be admitted, applicants must meet the following minimum requirements:

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). (This third requirement applies to students who plan a career in teaching, that is, students in all undergraduate majors except rehabilitation.)

Students normally apply for admission to 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 Office of Student Services 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 (see "Academic Advising").

Admission to the College of Education is also required for post-baccalaureate students, although their application requirements will differ from those listed above for undergraduates (see "Post-Baccalaureate Program").

Since enrollments in the college may be limited, meeting the minimum requirements does not assure a student of admission to the college. At the time the catalog was being edited, a revised admissions policy was being considered for approval. Students should check with the Office of Student Services in the College of Education for information regarding current admission requirements and procedures.

Restricted Enrollment in Professional Education Courses

Most professional education courses (also referred to as "methods" courses) are closed to undergraduate students who have not met the following requirements:

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).

This enrollment restriction applies to all degree-seeking undergraduates, whether or not they are majoring in the College of Education. 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.

A student planning to select a major for an undergraduate education degree is also required to be formally admitted to the College of Education prior to enrolling in these courses. Such a student should consult the pre-education advisor in the Office of Student Services to make the necessary arrangements.

Students majoring outside the College of Education (see "Teaching Majors for Degrees Outside the College of Education") are required to meet the same three requirements listed above. 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.

Post-baccalaureate students working toward teacher certification are not required to take the PPST, but they do need to be formally admitted to the College of Education prior to taking professional education courses. The requirements for their admission, however, will differ from those listed for undergraduates. The pre-education advisor in the Office of Student Services is available to help these persons complete the necessary procedures (see "Post-Baccalaureate Program").

Graduate students must also meet certain requirements prior to taking professional education courses. These students should check with the Office of Student Services prior to enrolling to learn how the restrictions apply to them.

IMPORTANT: Students who enroll in professional education courses without meeting eligibility 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 teacher certification requirements. It is therefore essential that prospective enrollees confirm their eligibility with the pre-education advisor in the Office of Student Services prior to registering for a restricted course.

Any student who is not admitted to the College of Education and who is considering taking an education course should check with the pre-education advisor in the Office of Student Services to determine his or her eligibility.

Post-Baccalaureate Program

Persons who have previously earned a bachelor’s degree and are interested in obtaining a state teaching certificate may apply for admission to the College of Education’s Post-Baccalaureate Program. To be considered for admission, the applicant must have earned the undergraduate degree at a regionally accredited institution, with an overall grade-point average of 2.500 or better.

Those interested in the program should begin by consulting the pre-education advisor in the Office of Student Services in the College of Education. The advisors will work with them throughout the admission procedures, which will include preliminary enrollment as a non-degree seeking education major in the College of Education and a subsequent evaluation of the student’s record by an appropriate faculty advisor, either in the Division of Teaching and Teacher Education or in a relevant academic department. When these steps have been successfully completed, the student will be admitted to the College of Education and become eligible to register for professional education courses (see “Restricted Enrollment in Professional Education Courses”).

Students in the 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. Students can expect to spend from two to four full-time semesters in the Post-Baccalaureate Program, depending upon the type of certificate desired (elementary or secondary) and the content of their undergraduate program.

Further information is available in the Office of Student Services.

Academic Advising

Any student enrolled in the University who is considering a career in education may consult an advisor in the Office of Student Services in the College of Education. The advisor will assist the student in making a decision regarding education as a career field and in selecting an appropriate field of specialization. Though students will remain enrolled in the College of Arts and Sciences for the first two years of their undergraduate study, their course selection during this period is very important. For this reason, a pre-education advisor in the Office of Student Services is available to students to work with them in planning and completing the necessary course work. Upon formal admission to the College of Education (see Admission Requirements), students will be assisted by an advisor in the division appropriate to their chosen major.

Dean’s Honor Lists

The college honors high academic achievement in a semester through the Dean’s Honor List. Students who attain a grade-point average of 3.500 or better based on 12 units with letter grades (excluding pass/fail or “S” grades) will earn Honorable Mention; students meeting the same grade-point requirement for 15 units will be eligible for Dean’s List; and those with a 4.000 grade-point average for 15 units will earn the Dean’s List with Distinction. The honor lists are posted on the college bulletin board at the close of each semester. All honor students receive a certificate of recognition and the honor is noted on the student’s transcript. For specific information on the several Dean’s List categories and other academic honors, see the “Academic Honors and Awards” section of the catalog.

Undergraduate Programs

The faculty and administration of the College of Education are dedicated to the continuing development and improvement of their undergraduate preprofessional 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

Early childhood education is the appropriate major for students who intend to pursue teaching careers at the preschool, kindergarten, or primary grade levels. Since the teacher education programs are undergoing revision, students should check with the Division of Teaching and Teacher Education for course requirements for the major leading to the Bachelor of Arts in Education degree.

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. Since the teacher education programs are undergoing revision, 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 “Majors and Minors for Secondary School Teaching” in the preceding section. Students are encouraged to contact an advisor in the Office of Student Services during their lower-division years concerning selection of appropriate teaching majors and minors.

Since the teacher education programs are undergoing revision, 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 emphasizing 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 exceptionalities is available at the undergraduate level. Students are encouraged to check with the Division of Special Education and Rehabilitation for requirements for the minor.

London Semester

The London Semester, sponsored by the Division of Teaching and Teacher Education, is offered as an educational option to encourage students toward the development of a comprehensive view of global education. This program of foreign study presents opportunities for personal development through experiencing the culture, educational system, and language of the United Kingdom. The academic focus upon global education seeks to cultivate in students a perspective of the world which emphasizes the interconnectedness among cultures, species, and the planet.

Though designed for students within the College of Education, students majoring in other areas are also invited to apply. Prior to admission to the program, students must consult with the academic advisor for the London Semester in the Division of Teaching and Teacher Education in order to review their academic progress and to determine their eligibility for the program.

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, shall be:

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. A description of the nature and function of these centers and other services is provided below.

Arizona Center for Educational Evaluation and Measurement

The Arizona Center for Educational Evaluation and Measurement initiates and conducts multidisciplinary research on such topics as nondiscriminatory psychological assessment; assessment of development competencies, sequencing of instruction, cognitive skills in children; and evaluation of school effectiveness. The center maintains state-of-the-art research technology, 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.

Center for the Study of Higher Education

The Center for the Study of Higher Education conducts research studies and provides related service activities to meet state and institutional needs, as well as those of regional, national, and international 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.

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 disabled and 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.
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 transitions 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 practice.

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:

- Aerospace Engineering
- Agricultural Engineering
- Chemical Engineering
- Civil Engineering
- Computer Engineering
- Electrical Engineering
- Energy Engineering
- Engineering Mathematics
- Engineering Physics
- Geological Engineering
- Hydrology
- Industrial Engineering
- Materials Science and Engineering
- Mechanical Engineering
- Mining Engineering
- Nuclear Engineering
- Optical Engineering
- Systems Engineering

Freshman Year

Students should identify an intended major from the above list 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:

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</tr>
<tr>
<td>Total</td>
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</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.

- **Pascal**

- **Either**

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:

- **M.S.E. 110**

- **Chem. 103b-104b**
  - Aerospace Engineering, Chemical Engineering, Civil Engineering, Engineering Physics, Hydrology, Mechanical Engineering, Mining Engineering, Geological Engineering.

- **Either**
  - Agricultural Engineering, Energy Engineering.

- **Option**
  - Industrial Engineering, Nuclear Engineering, Systems Engineering.

Students who change majors at the end of the freshman year may need to learn the other language or take the other chemistry course. This will be determined by the department into which the student transfers, but 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:

- a) A Flinn Scholar or National Merit Scholar.
- b) Among the top 5% of his or her graduating class.
- c) An ACT composite score of at least 29 (or SAT of 1300).
Applications and inquiries should be directed to: Dr. W.M. Farr, College of Engineering and Mines, University of Arizona, Tucson, Arizona 85721.

**Humanities and Social Science Electives**

The humanities are the branches of knowledge concerned with the culture and values of mankind and the social sciences are studies of individual relationships in and to society. Humanities and Social Science (HSS) studies assist in meeting the objectives of a liberal 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 coursework is required as an integral part of the engineering program. Courses are acceptable only if a substantial amount of material relating to cultural values is involved as contrasted to routine exercises to enhance a student's performance. Further, this coursework must include courses at an advanced level rather than a selection of unrelated introductory courses.

The college's specific HSS requirement and a list of approved courses are available in all departmental offices and in Geology 134. Deviation from this list requires approval of a college petition.

**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.

**Accreditation**

The Accreditation Board for Engineering and Technology (ABET) is the official agency for accrediting undergraduate engineering curricula. Schools are visited periodically by teams of outstanding engineers selected by ABET. A complete evaluation is made of curricula, faculty qualifications, laboratory and library facilities, grading standards, and many other considerations. Thus, when the undergraduate curricula of an engineering college are accredited by ABET, the student is assured that high standards are maintained.

**Options**

1. **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 offer biomedical options available as undergraduate technical electives, graduate minor programs, and research. A university committee coordinates the option. See "Biomedical Engineering" for further details.

2. **Clinical Engineering Option**—This option is offered in conjunction with the Master of Science degree through the departments of Electrical and Computer Engineering and Aerospace and Mechanical Engineering. For information regarding the option, please see the **Graduate Catalog**. At the undergraduate level, students can select several of the medically-oriented courses such as those concerning medical instrumentation, clinical engineering, physiology, and health care management in order to obtain an understanding of engineering in medicine and biology while earning a Bachelor of Science degree.

3. **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 engineers perform 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. The Department of Systems and Industrial Engineering offers this option through the undergraduate degree program in systems engineering by structuring the choice of technical electives. Contact the department for further details.

4. **Manufacturing Systems Engineering Option**—The modern manufacturing systems engineer designs, installs, implements, improves, 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. The Department of Systems and Industrial Engineering offers this option through the undergraduate degree program in industrial engineering by structuring the choice of technical electives. Contact the department for further details.

5. **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 may be granted temporary advanced standing. If these courses are not completed during the next semester, they are offered, advanced standing may be revoked until such time as they are completed.

Students otherwise qualified, but lacking completion of the Upper-Division Writing-Proficiency Examination, may be granted temporary advanced standing. If the examination is not completed during the following semester, advanced standing will be revoked until it is 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 such time as 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 completed all course prerequisites and 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 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 Society for Metals
- American Institute of Aeronautics and Astronautics
- American Institute of Chemical Engineers
- American Water Resources Association
- Association of Engineering Geologists
- Association for Computing Machinery
- 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
- Tau Beta Pi (All engineering)

**Other Student Engineering Organizations**
- American Indian Science and Engineering Society
- 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 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, chemical engineering, civil engineering, electrical engineering, engineering mechanics, geological engineering, hydrology, irrigation engineering, 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 and Placement 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**—Engineering students who have qualified for advanced standing in the college should visit the Career and Placement Services Office to initiate preparation for career 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 and a gas turbine; 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:**

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<th>Second Semester</th>
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<td>Hum./Soc. Sci. Elective</td>
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<td><strong>Total</strong></td>
<td>16</td>
<td><strong>Total</strong></td>
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</tbody>
</table>
### Bachelor of Science in Agricultural Engineering (ABET Accredited)

Agricultural engineers integrate mathematics, the biological, physical, and engineering sciences with engineering design principles for producing and processing food, biological and agricultural products. These principles are applied to the design, analysis, and construction of equipment, systems, and facilities for the efficient utilization of food, fiber, and biochemical products. All programs utilize the latest in computer facilities and infrastructure such as residential and industrial heated, contained, and transported. Computers are used as an integral part of making the processes economical and safe.

#### Required Curriculum:

<table>
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<tr>
<th>Course</th>
<th>Units</th>
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</tr>
<tr>
<td>A.M.E. 466</td>
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<tr>
<td>Total</td>
<td>17</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 fields.

#### Bachelor of Science in Chemical Engineering (ABET Accredited)

Chemical engineering is a profession which provides society with materials and energy. It deals with how chemicals are brought together to react, separated and purified, mixed, heated, contained, and transported. Computers are used as an integral part of making the processes economical and safe.

#### Required Curriculum:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>Math. 223</td>
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<td>Phys. 116</td>
<td>4</td>
</tr>
<tr>
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</tr>
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<td>Chem. 243a</td>
<td>1</td>
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<td>Chem. 320</td>
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<td>Ch. E. 201</td>
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<tr>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>

*Selection of course alternatives depends upon the student's emphasis within the major.

#### Bachelor of Science in Civil Engineering (ABET Accredited)

Civil engineering is concerned with a wide variety of elements of both 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 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, or environmental engineering. Well-equipped physical and computer laboratories are available for instruction and research.

#### Required Curriculum:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>Phys. 116</td>
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<tr>
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<td>Chem. 327</td>
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<tr>
<td>Total</td>
<td>17</td>
</tr>
</tbody>
</table>

*Selection of course alternatives depends upon the student's emphasis within the major.

#### Bachelor of Science in Electrical Engineering (ABET Accredited)

Electrical engineering is a profession which provides society with materials and energy. It deals with how electrical energy is brought together to react, separated and purified, mixed, heated, contained, and transported. Computers are used as an integral part of making the processes economical and safe.

#### Required Curriculum:

<table>
<thead>
<tr>
<th>Course</th>
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<td>Phys. 116</td>
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<tr>
<td>Chem. 321</td>
<td>3</td>
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<tr>
<td>Total</td>
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</tr>
</tbody>
</table>
### Bachelor of Science in Electrical Engineering

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, plasma electronics, pattern recognition and image processing, simulation, artificial intelligence, optical communications, robotics, and other specialties, maintains a modern viewpoint in the undergraduate program.

**Required Curriculum:**

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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<th>Course</th>
<th>Units</th>
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#### First Semester

<table>
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<td>E.C.E. 220a</td>
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#### Second Semester

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<tr>
<td>Total</td>
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<td>Total</td>
<td>16</td>
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</tbody>
</table>

*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.

**E.C.E. 301 or E.C.E. 381**

---

### Bachelor of Science in Energy Engineering

The energy engineering program provides the opportunity to focus on the specific problems in energy generation and use. An introduction to science and mathematics is the basis for the subsequent study of the engineering sciences and design necessary for competent preparation in energy engineering.

The array of skills needed to participate effectively in the decision process in energy-related engineering projects requires the consideration of classical and advanced engineering technologies, environmental impact of the available technology alternatives, the available resource base, and the economic cost-benefit trades between the array of alternatives. The program of study is designed to provide the student with the background necessary to participate in this decision process.

**Required Curriculum:**

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Math. 223</td>
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<td>Math. 254</td>
<td>3</td>
</tr>
<tr>
<td>Phys. 116</td>
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</tr>
<tr>
<td>E.C.E. 220a</td>
<td>4</td>
<td>E.C.E. 220b</td>
<td>4</td>
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<td>E.C.E. 271b</td>
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#### Junior Year

<table>
<thead>
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#### Senior Year

<table>
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<th>Course</th>
<th>Units</th>
</tr>
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<tbody>
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<td>Tech. Electives**</td>
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<tr>
<td>Tech. Electives**</td>
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<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>16</td>
</tr>
</tbody>
</table>

*Engin. Sci. Electives: To be chosen from the following: C.E. 214 (Statics); A.M.E. 232 (Dynamics); M.E.E. 321R (Mats for Engin.); S.I.E. 265 (Engin. Econ.); Stat. 361 (Stat. for Engrs.); A.M.E. 331R (Thermodynamics); A.M.E. 240 (Thermo).

**Technical Electives: Upper-division courses in engineering, math, or science, chosen in consultation with a faculty advisor. Not less than 15 credits must be in E.C.E.**
The curriculum requirements in the humanities and the social sciences, including economics, are important elements in developing the range of skills of these engineering students.

Required Curriculum:

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>Math. 223</td>
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<td>Math. 254</td>
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<td>Phys. 116</td>
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<td>Phys. 121</td>
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<td>Ch.E. 201</td>
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<td>C.E. 214</td>
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**Total 17 Total**

### Junior Year

<table>
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<td>3</td>
<td>M.S.E. 331R</td>
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</tr>
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<td>A.E.E. 220b</td>
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**Total 18 Total**

### Senior Year

<table>
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<tr>
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<td>Total</td>
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</table>

**Total 18 Total**

*Econ 210 plus 1 elective unit.


### Bachelor of Science in Engineering Mathematics

The 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>Units</th>
<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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<td>17</td>
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</tbody>
</table>

**Total 17 Total**

### 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 consultation 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 College of Mines 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:**

<table>
<thead>
<tr>
<th>Course</th>
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<td>Eng. 102</td>
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<td>Eng. 101</td>
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<td>Math. 125b</td>
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<td>Chem. 103a</td>
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**Total 18/16 Total**

### Sophomore Year

<table>
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<td>Phys. 112a</td>
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**Total 15 Total**

### Junior Year

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<tr>
<td>Total</td>
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<td>Total</td>
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</tbody>
</table>

**Total 16 Total**

*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: 20 units to be chosen in consultation with an advisor.
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:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>Math. 223</td>
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<td>Phys. 116</td>
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Junior Year

<table>
<thead>
<tr>
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<td>Geos. 450</td>
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Summer Session

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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 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, and must include 3 units of design.

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 ensuring high quality while simultaneously meeting cost and output goals. This is accomplished through the optimal allocation of resources throughout the system.

Industrial engineers practice in both administrative and production segments of manufacturing and service organizations. Industrial engineers are commonly employed in heavy industry (such as steel), medium industry (such as plastics and computers), and light industry (such as electronics assembly), healthcare delivery, electronics, transportation and government. In each of these environments, industrial engineers are involved with a variety of systems such as production planning, inventory control, management information, facility layout, job/workplace design, material flow and distribution. The importance of manufacturing is reflected by the presence of a manufacturing system engineering option.

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>Math. 223</td>
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<td>Phys. 116</td>
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<td>Geos. 101a, 102a</td>
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<tr>
<td>Hydr. 250</td>
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Summer Session (First Term)

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Senior Year

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*Humanities/Social Science Electives: humanities, social science, language, and fine arts.
**One of the following courses required: Msc. 150 (5 units), C.E. 206 (4 units), C.E. 818 (4 units).
***Technical and other electives (may not be prerequisite/equivalent to required courses).

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 control, water supply, recreation, structure (bridges, dams, etc), design, pollution control, and other water management concerns. The hydrology curriculum is designed to give the student a basic knowledge of hydrology and allied subjects. Flexibility is offered through the selection of electives so that a program of study can be developed which best fits the student's needs.

Graduates with the degree of Bachelor of Science in Hydrology obtain professional positions in the fields of hydrology and water resources. Because hydrology is an applied science, instruction is augmented at all levels with field trips in Arizona, a state which contains a great diversity of natural features and climatic zones, making it a superb outdoor laboratory. The five-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>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
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Junior Year

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| Biological Science | Stat. 361 | 3
| Requirement**   | 4     |
| Total           | 16    |

Summer Session (First Term)

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Senior Year

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<td>Hydr. 480</td>
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<td>W.R.A. 443</td>
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<td>Geos. 450</td>
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<td>Electives***</td>
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</table>
The modern manufacturing systems engineer designs, installs, implements, improves and manages computer integrated manufacturing systems. This option prepares students to organize, schedule, and manage the total manufacturing system, from product design through fabrication, distribution and consumer services. It is offered through the structuring of technical electives in the industrial engineering curriculum. These electives include Robotics, Manufacturing Systems Modeling, and Computer Aided Design.

Required Curriculum:

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Junior Year

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Senior Year

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Bachelor of Science in Mechanical Engineering

(A.B.T 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 heat power, 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 and a gas turbine; 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:

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<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
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<td>Phys. 116</td>
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<td>Hum./Soc. Sci. Elective</td>
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Junior Year

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<th>Course</th>
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<td>M.S.E. 360L</td>
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Senior Year

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Required Curriculum:

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<tbody>
<tr>
<td>Math. 223</td>
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Junior Year

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<tr>
<td>Total</td>
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</table>
Bachelor of Science in Mining Engineering (ABET Accredited)

Mining engineering is a 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:

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
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</thead>
<tbody>
<tr>
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</table>

*Elective courses are chosen by the student in consultation with a faculty advisor. The 33 units of electives must include 16 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). Otherwise, 3 of these units must be taken from a selected list of courses having a design emphasis.

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 basis 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 125 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:

<table>
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<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
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Bachelor of Science in Optical Engineering (ABET Accredited)

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 instru-
mentation, 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

<table>
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<th>Course</th>
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### Junior Year

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### Senior Year

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*The 12 units of technical electives are to be chosen by the student, in consultation with a faculty advisor, from a list of approved technical electives that may be obtained at the departmental office.

### Bachelor of Science in Systems Engineering (ABET Accredited)

Systems engineers design and build systems to meet the needs of people. As computing 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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### Senior Year

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<td><strong>Total</strong></td>
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*Five course substitutions as indicated within the brackets are required for the software systems engineering option.

**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.

***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.

### College of Law

Law Building, Room 120
(602) 621-1498

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 educational 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 colleges 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 Admission 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. Scores for the March test will not be considered for applicants to the entering class.

   An applicant may take the LSAT more than once; however, the scores will be 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 attended to LSDAS prior to January 1. Students must provide 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 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. 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 transient or 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 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**—With the written approval of their advisors, 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 for 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 new 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. 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 a personal interview. 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 and WICHE certified and funded residents from Alaska, Montana, and Wyoming. 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

Professional nursing is a service which helps people achieve and maintain optimum health. It is demanding but rewarding. Recent biological and psychosocial discoveries require professional nurses to have a body of knowledge in pace with scientific advances which they apply to effective nursing care. Professional nurses must possess problem-solving ability and discriminative judgment in recognizing the health needs of patients, their families, and the community, and in utilizing appropriate nursing intervention.

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:

Degrees

The degrees offered are the Bachelor of Science in Nursing, the Master of Science, the Nursing Specialist, and the Doctor of Philosophy. For information regarding graduate study, please see the Graduate Catalog.

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 preclinical courses, which are taken in the College of Arts and Sciences, followed by the clinical major. After having completed the preclinical 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; otherwise, they may be denied admission or, once admitted, recommended for withdrawal.

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 professional admission, students must have completed all prerequisites, have earned a cumulative grade-point average of 2.500 and have removed any high school deficiencies.

Completion of prerequisite courses with a 2.500 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 2.500 is normally required.

All transfer students must have a minimum 2.5000 average on all freshman and sophomore courses for both University of Ari-
zona 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. At the time of catalog editing, admission criteria for the College of Nursing were under review. 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 remedial 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 reapplication.

In addition to these requirements, registered nurses from diploma or associate degree schools of nursing must hold a current, valid 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 courses are required to provide their own cars 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 criteria 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 will be permitted to repeat the course for credit contingent on space available.

Honors
The college participates in the Honors Program.

Required Curriculum Leading to the Degree of Bachelor of Science in Nursing

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Total Minimum Units Required for Graduation—130-133

*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 Bookiel.

College of Pharmacy
Pharmacy Building, Room 344
(602) 626-1427

An important objective of the College of Pharmacy is to educate qualified students to become pharmacists who are committed to providing the highest quality of pharmaceutical and related health care services. These services are mainly concerned with optimizing the therapeutic effects and minimizing...
the adverse effects of drugs, and require the knowledge and skills of a drug specialist. The practice of pharmacy requires great sensitivity to the health care needs of people and demands a high standard of moral and professional integrity.

The pharmacy curriculum, which includes scientific, professional, and general education courses, is designed to develop pharmacists who are professionally competent and academically well-rounded. The professional program in the College of Pharmacy is fully accredited by the American Council on Pharmaceutical Education.

**Academic Programs**

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, 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 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 professional grade-point average are considered for the determination of scholastic standing in the College of Pharmacy. A student is placed on academic probation if either grade-point average falls below 2.00 at the end of a semester or summer session. A student who is on probation may be disqualified at the end of the next semester if either grade-point average is below 2.0. A student who has been disqualified for at least a semester and who requests readmission to the pharmacy program, must petition the College of Pharmacy. The readmitted student is automatically placed on academic probation and is subject to any additional conditions that may be imposed by the faculty. It should be noted under "Academic Probation and Disqualification," of the Academic Guidelines section of this catalog, "Any later disqualification will be considered permanent disqualification."

**Internship Requirements**

After enrolling in the College of Pharmacy, a student may register as an intern with the Arizona State Board of Pharmacy, 5060 N. 19th Avenue, Suite 101, Phoenix, AZ 85015. Inquiries concerning registration as a pharmacy intern and internship regulations should be addressed to the Secretary of the Board of Pharmacy.

**Financial Assistance**

Both undergraduate and graduate students in the College of Pharmacy are eligible for financial assistance through the scholarship and loan funds described in the Scholarships and Financial Aids section of this catalog.

**Required Curriculum Leading To the Degree of Doctor of Pharmacy**

### First Prepharmacy Year

<table>
<thead>
<tr>
<th>First Semester</th>
<th>Second Semester</th>
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<tr>
<td><strong>Subject</strong></td>
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<tr>
<td>Engl. 101</td>
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### Second Prepharmacy Year

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*Lower-division social science elective — 6 units of introductory courses from the following areas: anth., psy., soc., pol., comm., hist.*

### First Professional Year

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Second Professional Year

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Third Professional Year

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Summer Session*

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Fourth Professional Year*

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*The Summer Session and Fourth Professional Year are individually designed by the clerkship coordinator and the student.

Curriculum Electives

In addition to the lower-division social science 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
- Biochemistry
- Chemistry
- Communication
- Computer Science
- Ecology and Evolutionary Biology
- Economics
- Finance and Real Estate
- Health-Related Professions
- Management & Policy
- Management Information Systems

Examples of electives pertinent to pharmacy that may be taken:

- Ph.Sc. 399 (1-4) Independent Study
- Ph.Pr. 424 (2) Antibiotics
- Ph.Sc. 427 (2) Antineoplastic Drugs
- Ph.Sc. 430a, 430b (3,3) Medical Radiopharmaceuticals
- Ph.Sc. 439 (1) Pharmaceutical Analyses Laboratory
- Pc. 399 (1-4) Independent Study
- Ph.Pr. 399 (1-4) Independent Study
- Ph.Pr. 419 (2) Parenterals
- Ph.Pr. 448 (2) Perspectives in Geriatrics
- Ph.Pr. 451 (2) Hospital Pharmacy
- Ph.Pr. 465x (2) Drug-Induced Disorders
- Ph.Pr. 460x (3) Applied Parenteral Nutrition
- Ph.Pr. 489 (3) Clinical Pharmacotherapy of Mental Disorders
- Engl. 397 (3) Business Writing
- Engl. 398 (3) Technical Writing
- M.A.P. 330 (3) Personnel Management
- M.A.P. 350 (3) Management and Organizational Behavior
- Mktg. 361 (3) Introduction to Marketing
- M.I.S. 411 (3) Information Systems in Society
- N.F.S. 310 (3) Principles of Human Nutrition in Health and Disease
- S.E.R. 484 (3) Problems of Drug Abuse

Service and Research Units

The Arizona Poison and Drug Information Center, the Ruth E. Golding Clinical Pharmacokinetics Laboratory, and the Jeffrey M. Golding Clinical Research Unit 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, 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 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 redesigned at the time the catalog was being edited. For further information 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 pre-health sciences professional program. Any student enrolled in the University who is considering application for admission to one of the majors in health-related professions should consult an advisor in the Office of Academic Services in the College of Arts and Sciences, Modern Languages 347, or 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).
   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).
   D. Western Civilization (9 units): Three 3-unit courses approved from Booklink.
   E. General Education Electives (3 units): English, Arts and Literature, and College of Education courses required for teaching certification. (At the time the catalog was being edited, the College of Education course work required for State Teaching Certification was being revised. Students should check with the Division of Community and Environmental Health for information on current degree requirements).

II. Study Areas
   A. Biological and Physical Sciences (12 units): Chem. 103a, 103b, 104a, Ecol. 159a-159b, 160a-160b.
   B. Arts and Literature (6 units): Two 3-unit courses approved from Booklink.
   C. Individuals, Societies and Institutions (9 units): Psyc. 101, Soc. 100 and Pol. 103 (for community health option) or Pol. 110 (for school health education option).
   D. Western Civilization (9 units): Three 3-unit courses approved from Booklink.
   E. Non-Western Civilization (3 units): One 3-unit course approved from Booklink.

Admission to the Major—The following courses must have been completed: Chem. 103a-103b, 104a-104b, Ecol. 159a-159b, 160a-160b, 181, 182, Engl. 101 (or 103H), 102 (or 104H), Hlth. 178, Math. 117R (or 117S), Psyc. 101, Soc. 100.

Major Requirements—The major requires completion of a core of 36 units. The remaining units must be taken in one of two options: community health or school health education.

The major core requirements: 36 units, including Chem. 103b, 104b, Ecol. 181, 182, 320, Ex.S.S. 261, Hlth. 306, 330, 437, Micr. 357, N.F.S. 310 O.S.H. 486.

The community health option: 36 units, including C.E. 479, Chem. 241a, 243a, C.Sc. 115, Hlth. 433, 440, 493a, Math. 262, O.S.H. 410, Phys. 102-102b, 180a-180b, and 3 units of approved electives.

The school health education option: Hlth. 381, 430, 432, 434 and College of Education courses work required for State Teaching Certification. (At the time the catalog was being edited, the College of Education courses required for teaching certification were being revised. Students should check with the Division of Community and Environmental Health for information on current degree requirements).

Students applying for the school health education option leading to teaching certification must meet additional requirements in order to be eligible for enrollment in professional education courses taught in the College of Education. These requirements include.
1. 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;
2. completion of a minimum of 12 units at the University of Arizona;
3. evidence, at the time of application, of having passed the Pre-Professional Skills Test (PPST), and
4. 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 in Medical Technology**

The Division of Medical Technology provides professional preparation for a career in medical technology. This health profession is responsible for clinical laboratory analysis, including quantitative, qualitative, and morphological measurements which assist the physician in clinical diagnosis and treatment.

Completion of the medical technology major, accredited by the American Medical Association and the National Accrediting Agency for Clinical Laboratory Sciences, qualifies the student for various National Registry examinations.

**General Education Requirements for the Major in Medical Technology**

**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. 125a

**II. Study Areas (36-39 units)**
- A. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b
- B. Arts and Literature (6 units): Two 3-unit courses approved from Booklink
- C. Individuals, Societies and Institutions (9 units): Med.T. 387, 495a (or 499 for 3 units), and 9 units of approved electives
- D. Western Civilization (9 units): Three 3-unit courses approved from Booklink
- E. Non-Western Civilization (3 units): One 3-unit course approved from Booklink

In consultation with an academic advisor, a student may elect to waive a total of 3 units in one of the following study areas: B. Arts and Literature or E. Non-Western Civilization.

**Admission to the Major**—All general education requirements for the major must have been completed as well as the following courses: Chem. 103b, 104b, 241a, 243a, C.Sc. 115, Phys. 102a-102b, 108a-108b.

**Major Requirements**—The major requires completion of the following 56 units: Chem. 322, 323, Ecol. 181, 182, 320, Hth. 433, Math. 263, Micr. 110, O.S.H. 402, 410, 412, 460, 486, 487, 495a (or 499 for 3 units), and 9 units of approved electives.

**Major in Physical Education**

The Department of Exercise and Sport Sciences provides general and professional education for students intending to pursue graduate study in exercise science or for those planning careers in such areas as applied exercise science, teaching, and coaching. The physical education major is designed to prepare students to teach physical education at the secondary-school level or in grades K-12.

**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. This can be accomplished through courses (8 units) or by examination (0 units)
- C. Mathematics (3 units): Math. 117R (or 117S) or Math. 125a

**II. Study Areas (36-39 units)**
- A. Biological and Physical Sciences (12 units): Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b
- B. Arts and Literature (6 units): Two 3-unit courses approved from Booklink
- C. Mathematics (3 units): Math. 117R (or 117S) or Math. 125a.
In consultation with an academic advisor, a student may elect to waive a total of 3 units in one of the following study areas: B. Arts and Literature or E. Non-Western Civilization.

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. 265, 268, 320, 373, 374, and 6 units of professional activities (Ex.S.S. 201-232), Math. 117R (or 117S), Psyc. 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 53 units in the Department of Exercise and Sport Sciences. An additional 8 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. (At the time this catalog was being edited, the College of Education courses required for teaching certification were being revised. Students should check with the Department of Exercise and Sport Sciences for information on current degree requirements.)

The physical education teaching major (secondary-school emphasis): 19 units of Ex.S.S. courses required for admission to the major; 34 additional units, including Ex.S.S. 354 (2 units), 355, 360, 371, 377, 380, 381, 385, 394b, 410, and 8 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): 53 units of exercise and sport sciences courses as required for the secondary-school emphasis (described above), plus 8 additional units to include Ex.S.S. 279, 352, and 358.

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 (26 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 3.0 over 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 is 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 will be in good standing after completing nine credit hours of graduate work with superior grades, and subject to any additional requirements established by the major department or academic unit. 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 courses 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 Foreign Students— Nonimmigrants should request graduate application forms from the Graduate Student Admissions Office, and the required credentials and materials from the major department. All foreign student applications, with the required credentials, should reach the Graduate Student Admissions Office before March 1 for summer and fall terms and September 1 for the spring term. 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 academic institution in which English is the spoken tongue and medium of instruction. Results of the TOEFL are valid for two years, 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 of 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. All 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 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 copies 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 the Graduate College of the University of Arizona. Both 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.

Major Fields for Specialist Degrees

- educational administration
- educational media
- educational psychology
- elementary education
- microbiology
- nursing
- reading
- secondary education
- special education

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 departments 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.)
Specialist in Microbiology (Sp.M.)
Doctor of Education (Ed.D.)
Doctor of Musical Arts (A.Mus.D.)
Doctor of Philosophy (Ph.D.)

General Divisions of the University

Campus Recreation

The Department of Campus Recreation is a new unit within the Division of Student Affairs. The Department of Campus Recreation currently encompasses intramurals, sports clubs, outdoor recreation, and open recreation. Facilities include Bear Down Gymnasium, Bear Down weight room, the Park Fitness Center weight room and aerobics room, Bear Down field and the newly created Rincon Vista field. Also available are three swimming pools, five handball/ racquetball courts and sixteen tennis courts.

A variety of organized and informal activities are offered to students, faculty, and staff throughout the year. The intramural program includes competitive activities in 26 sports for men, 25 sports for women; and 8 coeducational activities. Students are encouraged to participate both individually and as members of a residence hall team, fraternity or sorority team, or independent team. For those wishing to compete at a higher level, various sports clubs are available. Interested students can join existing clubs or create their own. Students can participate in informal recreational activities during scheduled facility hours. The new outdoor recreation program offers a wide variety of recreational trips such as alpine and cross-country skiing, hiking, Mexico shopping junkets, and cave exploring. It also offers a recreational equipment rental center and serves as a recreational resource center. Information on all of these programs can be obtained at the Department of Campus Recreation, Bear Down Gymnasium, Room 101, or by calling 621-4709.

The Department of Campus Recreation is currently designing the Student Recreation Center. This 122,000-square foot facility will include two gymnasiums, fourteen racquetball courts, two squash courts, a 7,000-square foot weight and exercise room, two multipurpose rooms for aerobics, martial arts and dance, an indoor running track, and an olympic-sized swimming pool.

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 to intercollegiate athletics, which consists of the Director of Athletics, the faculty representative to the NCAA, members of the faculty, alumni members, and students.

Office of Interdisciplinary 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 by creating a number of interdisciplinary units: the Office of Arid Lands Studies, the Environmental Research Laboratory, the Optical Sciences Center, the Institute for Atmospheric Physics, the Center for Insect Science, and others.

The Office in Interdisciplinary Programs was established as an agency responsible for furthering the development of new activities. The Coordinator of Interdisciplinary Programs works with the Dean of the Graduate College and the Vice President for Research in fostering both educational and research projects.
School of Military Science, Naval Science and Military Aerospace Studies

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 at no cost. 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 at no cost. 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 post-graduate 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. Psy. 101
2. Soc. 100
3. Anth. 101, 102
4. Phil. 113, 310, 322

Military History
1. Hist. 215, 315, 332, 436, 449, 450

Computer Literacy
1. M.I.S. 111, 121
2. C.Sc. 115, 121

Mathematics
1. College Algebra, Math. 117e
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, three and two 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- and two-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 NROTC program offers a four-year college program and a two-year college program. All programs lead to service as a commissioned officer in the Navy or Marine Corps. Applicants for the four-year college program may be made to the NROTC unit at any time. Applicants for the two-year college program may be made to the NROTC unit during the fall semester or early part of the spring semester of the sophomore year. Applicants are selected on the basis of demonstrated academic performance and expressed motivations.

**Financial Aid**—The NROTC program offers four-, three-, and two-year scholarships. Students in the NROTC scholarship program receive tuition and scholastic fees, textbooks, uniforms and $100.00 per month for a maximum of 40 months. Students in the NROTC college program receive Naval Science textbooks and uniforms while they are in the program and $100.00 per month subsistence allowance during their junior and senior years.

Applications for the NROTC four-year scholarship program must be made to the Navy by December 1 for entry into the program the following fall semester. Applicants must compete nationally on the basis of ACT or SAT scores. High school and college academic performance weighs heavily on an applicant's selection. Applications for the NROTC two-year scholarship must be made to the Navy during early fall for entry into the program the following June. Applicants must be college sophomores and selection is based primarily on the student's academic performance.

Further information concerning the program may be obtained from high school and college counselors, recruiting stations, and the NROTC unit at the University of Arizona.

**Courses of Instruction**—Students in the NROTC scholarship program are encouraged to pursue majors in the engineering and hard science (mathematics, chemistry, and physics) fields of study to meet the technological requirements of today's growing Navy.

While enrolled in the NROTC program the student will complete the following courses of study in addition to their academic major requirements.

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Naval Science 101</td>
<td>Naval Science 201</td>
</tr>
<tr>
<td>Naval Science 102</td>
<td>Naval Science 202</td>
</tr>
</tbody>
</table>

Course descriptions may be found under Naval Science in the departmental 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 (elective courses must be approved by the Professor of Naval Science) during their third and fourth years vic the above schedule.

All NROTC students attend Naval Science laboratory once a week. In addition, the NROTC scholarship students must take certain additional courses depending on major. Information concerning these additional courses may be obtained at the Department of Naval Science.

**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 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.

**Programs**—Air Force ROTC offers both a two- and four-year program. 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. The two-year program consists of the Professional Officer Course. Students must have at least a junior standing to enter the two-year program, and 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 have or be willing to spend two years in ROTC as full-time students. All ROTC students attend a weekly one-hour leadership laboratory providing "hands-on" experience in the art and science of leading people.

**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. People with prior military service and people accepted into the two-year program may receive credit for the lower-division Air Force ROTC courses. For more information, please contact the Department of Military Aerospace Studies.

Extended University

The Extended University is responsible for educational and community services as an outreach function of the University of Arizona. In cooperation with all academic colleges and departments of the University, specific courses and programs are developed to meet the ever-changing educational needs of people in the Tucson area and southern Arizona. Learning opportunities include a variety of credit and noncredit programs.

Extended University Programs

University Extension—University Extension serves the needs of those who find it difficult or impossible to take regularly scheduled classes on campus. Both graduate and undergraduate courses are offered off-campus and all courses receive regular university credit. In all cases, admission to the University is required to receive credit. Extension also offers a variety of noncredit courses for personal and professional growth and development.

University Correspondence—Correspondence courses are designed to parallel, as closely as possible, the same courses offered on campus. An independent study program may be successfully completed by students anywhere in the world. All lessons and examinations are mailed to the instructor who grades and returns the lessons to the students. Tucson area students take examinations in the Correspondence Office on campus. Students residing outside the Tucson area take examinations in their local community under the supervision of an approved proctor. Regularly enrolled on-campus students may register for correspondence courses with the approval of the college dean. For information on restrictions governing the use of correspondence study to fulfill graduation requirements, see "Correspondence Study" and "University Credit Requirement" under the Graduation Requirements section of this catalog. Noncredit correspondence courses are also available.

University Conferences and Conference Services Department—Working with colleges, departments and faculty, the conference department assists in planning regional, national and international conferences, workshops and seminars.

Elderhostel—Arizona Elderhostel (Tucson and Nogales) is part of the national Elderhostel network offering special low-cost academic programs for adults 60 years of age and older.

Office of the Summer Session

Summer Session is an integral part of the academic structure of the University and consists of a three-week presession and two five-week terms. Courses offered are of the same character as those held during the regular academic year, with similar standards of academic achievement required. More than 700 courses are offered during the summer terms. The summer program is coordinated by the Office of Summer Session, with departmental academic programs determined by academic deans.

Admission—Summer session is open to all regularly admitted students to the University. It is also open to students admitted at the undergraduate level for the Summer Session only.

For further information, please see the Summer Session Schedule of Classes, which is published each February.

Winter Session—A three-week Wintersession, consisting of a limited number of courses and coordinated by the Office of Summer Session, is held during the break between the fall and spring terms. Students are able to earn up to 3 units of credit.

Sierra Vista Off-Campus Center

Established as an Off-Campus Center in 1968, the Sierra Vista Off-Campus Center offers regular University of Arizona upper-division undergraduate and graduate courses to the Sierra Vista/Ft. Huachuca community and surrounding areas. Plans are currently under way for a new facility in Sierra Vista.

Office of International Programs

The Office of International Programs serves as a campus-wide support and coordinating unit for all international activities of the University of Arizona. Numerous international development activities are coordinated through this office. These include active projects in Africa, the Middle East, and Latin America.

The office serves as a campus clearinghouse for information on international programs, studies, and projects, to students, faculty, and the general public. The office also provides special services, by contractual arrangement, with sponsors of international students for which fees are charged.

Study Abroad programs coordinated from this office include summer and semester programs in Rio de Janeiro, Brazil; London, England; Florence, Italy; Segovia, Spain; and in France, Germany, Japan, and Taiwan. The University also operates a major summer program in Guadalajara, Mexico. Numerous international academic programs include formal faculty exchanges between the University and institutions in France, Austria, Britain, and Mexico.

The Peace Corps Office, which counsels and processes Peace Corps and U.N. Volunteer Program applicants, is part of the Office of International Programs.
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 Registrar Data Processing, 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:

<table>
<thead>
<tr>
<th>Prefix</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>100-299</td>
<td>Lower-division courses primarily for freshmen and sophomores.</td>
</tr>
<tr>
<td>100-199</td>
<td>Primarily introductory and beginning courses.</td>
</tr>
<tr>
<td>200-299</td>
<td>Intermediate-level courses.</td>
</tr>
<tr>
<td>300-499</td>
<td>Upper-division courses primarily for juniors and seniors.</td>
</tr>
<tr>
<td>300-399</td>
<td>Advanced-intermediate-level courses.</td>
</tr>
<tr>
<td>400-499</td>
<td>Advanced-level courses.*</td>
</tr>
<tr>
<td>500-599</td>
<td>Graduate courses. Open to exceptionally well-qualified seniors with the prior written approval of the course instructor and the Graduate College.*</td>
</tr>
<tr>
<td>600-699</td>
<td>Graduate courses. Not open to undergraduate students.</td>
</tr>
<tr>
<td>700-799</td>
<td>Graduate courses limited to doctoral students.</td>
</tr>
<tr>
<td>800-899</td>
<td>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.</td>
</tr>
<tr>
<td>900-999</td>
<td>Independent graduate study involving research, thesis, or dissertation. Not open to undergraduates.</td>
</tr>
</tbody>
</table>

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. Credit is awarded for the first half of the course except in a few instances when credit in the first half is contingent upon completion of the second half.

*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 convened jointly or separately, unless designated [Rpt.] or unless special approval is granted by the student’s major advisor.
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.] 1989-90
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
406. —Course number.

Social Structure in Modern Societies — Course title.
(3)—Number of units.
[Rpt.]—May be repeated for credit. A restriction regarding the number of times a course may be repeated for credit (beyond the student's first enrollment) or the total number of units of credit permitted for a course may be designated. [Rpt.] indicates that the course may be repeated for credit once, for a total of two enrollments. [Rpt./2] indicates that the course may be repeated for credit twice, for a maximum of three enrollments in the course; [Rpt./6 units] means that the course may be repeated until the student has received a total of 6 units of credit. It is the student's responsibility to ensure that course content is not duplicated.

I—Semester in which the course is usually offered. I indicates fall semester; II, spring; S, summer. To ascertain course offerings for a particular semester, consult the Schedule of Classes.
1989-90—Year in which course is offered. If no year designation is given, the course is offered each year.

GRD/CDT—GRD and CDT indicate that the course is available by examination. GRD indicates that the course is available by examination for a grade and credit, and CDT indicates that the course is available by examination for credit only. These options are not available for graduate credit.

Critical review...societies—Course description.
2R, 3L—Class structure. R, L, and S indicate "recitation," "laboratory," and "studio." 2R, 3L indicates that the class meets two hours of recitation and three hours of laboratory per week (based upon 15 weeks). For courses consisting of lecture and recitation periods only, the number of class hours per week is the same as the unit value and is not specified in the course listing.
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 course description is shown in the course list of the "home" department with instructional responsibility for the course. If no course description appears, consult the crosslisted department.

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, discussions, 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 individual 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 subscripts and title. Individual-studies courses are those with numbers ending in 91, 93, 94, 98 and 99, as well as all 900-level courses. Under their generic numbers and titles, and without subscripts, they are available for use by all departments at the course-number levels appropriate to the departments' academic programs.

See the Honors Center under the Departments and Courses of Instruction section 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.
(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, usually in a small group setting. The scope of work shall consist of research 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 practical application of theoretical learning within a group setting and involving an exchange of ideas and practical methods, skills, and principles.
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.

Individual Studies

191, 291, 391, 491, 591, 691, 791. Preceptorship (Credit varies)
Specialized work on an individual basis, consisting of instruction and practice 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)
Specialized work on an individual basis, consisting of training and practice in actual service in a technical, business, or governmental establishment.
Grades Available: S/P, C, D, E, I, W.

493L, 593L. Legislative Internship [493 (12), 593 (9)] II Working experience at the Arizona State Legislature; responsibilities draw upon student'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, psychology, public administration, secondary education, sociology, statistics, 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 practical 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, I, 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 the 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.
**Graduate students who have completed the course requirements of their programs and will be taking examinations or completing courses or projects initiated at an earlier date should register for supplementary registration. Students completing requirements for advanced degrees must be registered during the semester or summer term in which requirements are completed, or during the previous semester or term if requirements are completed during an intersession. Students who have previously enrolled for all the regular courses required for their degree and who register for supplementary registration (course number 930, one to nine units) all subsequent academic years in which they are using university facilities or faculty time must register for 930 if not registered for anything else. Credit received for this course is in addition to the units required for the advanced degree.
Aerospace and Mechanical Engineering (AME)

AME Building, Room 301
(602) 621-2235


Associate Professors Thomas F. Balsa, Kee-Ying Feng, Edward B. Haugen (Emeritus), Juan C. Heinrich, Edward J. Kershen, Seth H. Lichter, Parviz Nikravesh, Kumar N. R. Ramohalli, Bruce R. Simon

Assistant Professors Ara Arabyan, Cho-Lik Chan, Abhijit Chandra, Ari Glezer, Alfonso Ortega, Arne J. Pearlstein, Robert F. Pettiford

Assistant Department Head Karl M. Patton

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.)

323. Dynamics (3) II Dynamics of particles and rigid bodies as applied to mechanical systems; introduction to mechanical vibrations. P, C.E. 214. CR Math. 413a or CR Math. 413b.


312. Introduction to Production Engineering (3) II Theory of economic material removal or forming; machine tool principles, potentialities, and limitations; cutting tools, consideration of cutting tool materials and selection, tool makeup from manual to servo controls, design project. 2R, 3L. P, C.E. 214.


334. Dynamics of Machines (3) II Analysis of motions and forces in machines, design exercises. P, 232, Math. 223.

340. Advanced Thermodynamics (3) III Power systems; nonreacting and reacting mixtures; heat transfer, design exercises.


402. Product Engineering Design (3) II Economic production principles; design relationship of materials and production processes, tooling, quality control, and packaging; design development. CR Math. 233.


406. Engineering Quality Control (3) II (Identical with SIE 405) May be convened with 506.


409. Engineering Design (3) I II Role of design in engineering; virtual prototyping; detailed design, analysis, application of Mohr's circle of stress and strain; deflection analysis and introduction to failure and fatigue theory. P, 232, C.E. 217.

410. Aerospace Design (3) II Advanced design, formulation, and evaluation of prototype design; design participation of student groups in the advanced design of a modern aerospace vehicle system. 2R, 3L. P, 409, 461, CR Math. 434.

413a-413b. Reliability and Quality Analysis (3-3) 413a: Axiomatic probability and combinatorial analysis; random variables and their functions and transformations; random variables associated with Bernoulli trials, Poisson process and the central theorem. P, Math. 223. 413b: Standard statistical analysis including estimation theory, hypothesis tests, and least squares; Bayesian estimation and decision analysis; elementary stochastic process. P, Math. 413a/513a, 464.

415. Mechanical Engineering Design (3) I II Engineering design process steps; idea generation techniques, optimal design of engineering systems, computer aided design, major design project. P, 340, CR Math. 232.

416. Mechanical Engineering Design Implementation (3) I II Construction, testing and evaluation of prototype design; design iteration to arrive at final system configuration. 2R, 3L. P, 415, 416 must be taken in consecutive semesters.

417. Clinical Engineering (3) II (Identical with E.C.E. 417) May be convened with 517.

418. Physiology for Engineers (4) I (Identical with Physiol. 418).

419. Physiology Laboratory (2) I (Identical with Physiol. 419).


428. Material Selection in the Design Process (3) II Study of material properties, application to aerospace structures. P, 310, 432.


436. Finite Element Methods of Structural Analysis (3) I II Matrix algebra, computers, theory of elasticity, work and strain energy, energy theorems, finite element structure, programming aspects of the problem, general purpose programs, application to aerospace structures. P, 439.

437. Engineering Program Design and Implementation (2-4) II Hardware and software, Computer graphics, Requirement specification, Structured optimization, Analysis algorithms and case studies, and group projects. 2R, 3 to 6, L, P, 310, 432, S.I.E. 272, Math. 254. May be convened with 537.


442. Heat Transfer (3) I Study of conduction, convection and radiation heat transfer, with applications to engineering problems. P, 331a, 413a -413b.

447. Direct Energy Conversion (3) I (Identical with N.E.E. 447) May be convened with 547.


453. Air Conditioning Engineering (3) I Analysis and design of systems and components for control of temperature, humidity, air cleaning and acoustics, application to residential and commercial buildings. P, 340b, CR, 331a. (Identical with N.E.E. 453.)


455. Power Systems Laboratory (2) I II Lab. investigations involving thermal power systems and energy conversion devices. 3L, P, 340, 333.

459. HVAC System Design (3) I II (Identical with N.E.E. 459)

460. Aerodynamics (3) I Basic equations and their approximations; potential flow theory; fundamentals of airfoil and wing theory; axisymmetric flows; application to aerodynamics of wings and bodies. P, 361, 432.

461. Gasdynamics (3) II Thermodynamics review; equations for one-dimensional flow; inviscid flow; shock waves; simple two-dimensional flows; friction and heat addition. P, 331a, 240.

462. Aerodynamics Laboratory (1) I Low-speed wind tunnel testing; aircraft flight tests. P, 333, 361, 461.


467. Solar Energy Engineering (3) I (Identical with N.E.E. 467)

469. Energy Engineering Laboratory (3) I II (Identical with N.E.E. 469)


495. Colloquium s: Senior Colloquium (1) I II


505. Modern Control Theory (3) II 1990-91 Controllability and stability for linear and nonlinear systems, observer design, qualitative methods of optimal control and game theory applied to control system design. P, 405.

506. Engineering Quality Control (3) II (Identical with S.I.E. 506) May be convened with 406.

507. Quality Control (3) I (Identical with S.I.E. 507)

508. Reliability Engineering (3) I For a description of course topics, see 408. May be convened with 408. For a description of course topics, see 318. Graduate-level requirements include additional assignments and independent study, an in-depth report and a seminar presentation on the selected topic. P, CR, 331a. (Identical with 318.)

512. Advanced Probabilistic Design (3) I For a description of course topics, see 512. Graduate-level requirements include additional assignments and independent study, an in-depth report and a seminar presentation on the selected topic. P, CR, 331a. (Identical with 512.)

517. Clinical Engineering (3) I II For a description of course topics, see 417. May be convened with 417. Graduate-level requirements include a special project report and a seminar presentation on the selected topic. P, CR, 437.


523. Probabilistic Mechanical Design (3) I For a description of course topics, see 523. Graduate-level requirements include additional assignments and independent study, an in-depth report and a seminar presentation on the selected topic. P, CR, 437. May be convened with 523.


532a-532b. Engineering Analysis (3-3) 532a: Mathematical models, operational techniques; functions of a complex variable; Fourier analysis. P, Math. 254, 532b: Linear analysis; ordinary and partial differential equations; methods of solution.


537. Engineering Program Design and Implementation (2-4) II I (Identical with N.E.E. 537)

538. Composite Materials (3) II For a description of course topics, see 438. Graduate-level requirements include an additional project on
542. Advanced Thermodynamics (3) I Reversible and irreversible macroscopic thermodynamics; selected engineering applications. P. 331a, 240.

544. Advanced Heat Transfer (3) II Thermal radiation, spectral and gray-body analysis, application to enclosures; conduction of heat in solids; thermodynamic methods for transient and steady-state problems. P. 442, CR. 532a, computer programming ability.

546. Nature of Turbulent Shear Flow (3) I 1990-91 Physical phenomena in turbulent shear flows; experimental techniques; observations and physical consequences; prediction methods; recent advances. P. 520a-520b, 532b.

549. HVAC System Design (3) II (Identical with N.E.E. 559) May be convened with 447.

552. Fluid Mechanics of Viscous Flows (3) I Behavior of viscous fluids over a range of Reynolds numbers; Navier-Stokes equations; boundary layer equations; slow low; compressible boundary layers. P. 520b.

553. Aerodynamics of Propulsion (3) II 1989-90 Interior ballistics of rocket motors; ramjets, turbojets, turbosfans; detonation wave theory; combustion chamber instability analysis; nozzle design. P. 461.

555. Combustion Gasdynamics (3) II 1989-90 Aerothermodynamics; fluid mechanics, thermodynamics, chemistry of propulsion and air pollution processes; combustion, detonation; singular perturbations in deflagration. P. 532a, 461.

556. Combustion Gascdyanmics (3) II 1989-90 Aerothermodynamics; fluid mechanics, thermodynamics, chemistry of propulsion and air pollution processes; combustion, detonation; singular perturbations in deflagration. P. 532a, 461.

559. HVAC System Design (3) II (Identical with N.E.E. 559) May be convened with 447.

560. Fluid Mechanics of Viscous Flows (3) I Behavior of viscous fluids over a range of Reynolds numbers; Navier-Stokes equations; boundary layer equations; slow low; compressible boundary layers. P. 520b.

561. Compressible Aerodynamics (3) II Inviscid flow of compressible fluids; governing equations and their solution for subsonic, transonic, supersonic, and hypersonic flows. P. 532a, 461.

585. Biomedical Engineering (3) I 1990-91 Applications of engineering to medicine. P. 532a, 461.


615. Hydrostatic Stability (3) I Introduction to linear analysis for problems in fluid mechanics, the Orr-Sommerfeld equation, behavior of eigenvalues, stability limits, extensions to problems in two component systems. P. 520a-520b, 532a-532b.

616. Convective Stability (3) II 1989-90 Linear and nonlinear stability theory for thermally or chemically stratified flows; doubly-diffusive effects; analytical and numerical methods; materials processing and geophysical applications. P. 520a-520b, 532a-532b.

621. Advanced Computational Aerodynamics (3) I Governing equations for aerodynamic applications; iterative techniques for solving partial differential equations; grid generation and multi-grid techniques; applications to compressible viscous flows. P. 421, 520b, 532b.

695. Colloquium (See Nutritional Sciences)
Agricultural Policy (3) II Economic analysis of the policy issues relating to price support programs, focusing on agriculture and rural America, with emphasis on the historical and continuing role of government in price and income policies. Advanced degree credit available for non-majors only.

467. Population and Development in the Middle East (3) I (Identical with Or.S. 467) May be convened with 471.

471. Problems in Regional Development (3) I II (Identical with Geog. 471) May be convened with 571.


476. Natural Resource Economics (3) II Economic principles useful in analyzing natural resource problems and policies in the South-west and middle west. (Identical with Econ. 201a-201b). Available for Honors. Consult department for information. (Identical with Econ. 475 and R.N.R. 475). May be convened with 575, Martin.

480. Forest Policy and Administration (3) II (Identical with Ws.M. 480) May be convened with 580.

504. Production Economics (3) I Theory of the firm and industry; single and multiple products; risk and uncertainty. (Identical with Econ. 504) Wilson.

512. International Agricultural Economic Development (3) I II The role of agriculture in economic growth and development, including economic policies related to agriculture, and to world trade in agricultural commodities. (Identical with Econ. 512) Wilson.


514. Cost-Benefit Analysis (3) II Theoretical bases and empirical techniques, with emphasis on LDCs. Consumer-producer surplus, social and private costs; macroeconomic distortions; non-market goods; uses in policy analysis. (Identical with Econ. 514 and M.A. 514). Monk.


516. Rural Area Development (3) I For a description of course topics, see 416. 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 471.


540. Design and Analysis of Experiments (3) II Statistical principles and research design for experimental and observational studies; introduction to the linear statistical model for analysis of data from research studies including regression; factorial designs; cointegration; and polynomial response functions. P, 539a, Kuehl.

542. Transformation of Agrarian Societies in Latin America (3) III For a description of course topics, see 450. Graduate-level requirements include a research paper which analyzes a current financial issue or problem in the agricultural sector and selected readings in professional journals. P, 215, or Econ. 300 and 3 units of accounting. May be convened with 450, Wilson.

549. Agricultural Economic Development in Latin America (3) I For a description of course topics, see 450. Graduate-level requirements include additional reading and a research paper of publishable quality. (Identical with Econ. 549 and Anth. 559). May be convened with 471, Martin.

550. Agricultural Finance (3) I For a description of course topics, see 450. Graduate-level requirements include a research paper which analyzes a current financial issue or problem in the agricultural sector and selected readings in professional journals. P, 215, or Econ. 300 and 3 units of accounting. May be convened with 450, Wilson.

556. Population and Development in the Middle East (3) I II (Identical with Or.S. 556) May be convened with 471.

571. Problems in Regional Development (3) I II (Identical with Geog. 571) May be convened with 471.

575. Economics of Water and Land Resources (3) I 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, 475. Economic analysis of environmental and energy-related resources. P, Math. 123, Econ. 361. (Identical with Econ. 575 and R.N.R. 575). May be convened with 475, Martin.


580. Forest Policy and Administration (3) II (Identical with Ws.M. 580) May be convened with 480.

Agricultural Education (AED)

Forbes Building, Room 222A
(602) 621-1523

Professors Floyd G. McCormick, Head, Gordon J. Graham, Clinton O. Jacobs (Emeritus), Kenneth S. Olson, Philip R. Zurbrick, Associate Professors Christopher J. Kaling, Assistant Professors David E. Cox, 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; for careers in agricultural communications; and for positions in international agricultural extension available in state, federal and international agencies, business and industry. The major emphasizes 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, agricultural communications. A strong emphasis in international agricultural extension is offered at the graduate level.

Any student who plans to become a teacher must be formally admitted to the Teacher Education Program. A student may be admitted to the Teacher Education Program with the approval of the head of the department.

Students who do not plan to teach may meet departmental requirements by a minimum of 18 credits in agricultural education and/or education. Students registering for 389 must have a cumulative grade-point average of 2.000 or better, successful completion of the Pre-Professional Practicum (PPST), and approval of the head of the department.

The major in agricultural communications requires a student to complete the following courses: A. A minimum of 33 credits in the major 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: A. A minimum of 33 credits in the major areas as described under the general education requirements in the College of Agriculture section of this catalog.

The major in agricultural communications requires a student to complete the following courses: A. A minimum of 33 credits in the major areas as described under the general education requirements in the College of Agriculture section of this catalog.

Agricultural Education (AED)

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Agricultural Education (AED)

Forbes Building, Room 222A
(602) 621-1523

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Students who do not plan to teach may meet departmental requirements by a minimum of 18 credits in agricultural education and/or education. Students registering for 389 must have a cumulative grade-point average of 2.000 or better, successful completion of the Pre-Professional Practicum (PPST), and approval of the head of the department.
301. Youth Leadership Development (3) 1 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.T.E. 338b)

350. Applications in Agricultural Mechanics (3) 1 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 Operations of agricultural mechanics systems as utilized in urban and commercial agriculture. P. 100a. Miller

389. Supervised Teaching in Agriculture (1 to 8) [Rpt./I] I Observation and teaching vocational agriculture in the classroom and field under supervision. P. 338a or CR

396. Honors Proseminar (3) II


408. Principles of Vocational Education (2) II I Identical with H.E.E. 408

422. Community Communications Media (3) II I Characteristics of balanced communications serving education and information programs; participation and influence utilizing newspapers, radio, television, and newsletters. (Identical with Ag. 422) Graham

496. Seminar a. Instructional Materials Development (3) Field trip. P, 389 or CR. Zurbrick
b. Techniques in Teaching Agricultural Mechanics (1) I Open to majors only. P. Undergraduate teacher placement.

c. Instructional Realia (1) [Rpt./3 units] I P, CR 396a

538. Philosophy and Principles of Extension Education (3) I Theory and economic significance of extension education in domestic and international situations. P. 12 units of agriculture or family and consumer resources. (Identical with H.E.E. 538)

539. Extension Education Methods (3) II Acquisition of competencies in the development and application of non-formal education methods used by change agents to diffuse practical information. P. 6 units of agricultural education or education. (Identical with H.E.E. 539)

540. International Agricultural Extension Education (3) I Identification and discussion of a number of critical factors peculiar to agricultural extension and rural development in developing countries. Working and living overseas; country studies.

542. Education for Agricultural Entrepreneurship (3) II Pedagogy of developing motivation, skills and knowledge needed to start small enterprises in agriculture. Field trips. P. 6 units of macro/microeconomics with emphasis upon management.

597. Workshop a. Occupational Experience Program (1 to 3) [Rpt./3] I II
b. Youth Leadership Development (1 to 3) I II (Identical with T.T.E. 409)
c. Extension Credibility and Accountability (1 to 2) [Rpt./2] (Identical with H.E.E. 597d)
d. Administration, Management, and Supervision of Cooperative Extension (1 to 3) [Rpt./2] (Identical with H.E.E. 597d)

e. Continuing Education in Agriculture (1 to 3) [Rpt./3] I II
f. Program Planning and Evaluation (1 to 3) [Rpt./3] I II
g. Program Evaluation: Extension (1 to 2) [Rpt./2] (Identical with H.E.E. 597e)

598. Workshop [Rpt./2] (Identical with H.E.E. 598)

601. Advanced Agricultural Education Methods (3) [Rpt./3] I II Problems in organizing and conducting programs of instruction in agricultural and vocational 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. P. 9 units of A.Ed. or education. Zurbrick

620. Program Evaluation in Agricultural Education (3) I Objectives, evaluation, 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. McCormick

622. Adult Vocational Education (3) II Organization, content, and techniques for conducting adult vocational education. Characteristics of adult learners; issues affecting adult vocational education. P. Bachelor's degree and one year teaching experience.

623. Technology and Operational Management (3) I Emphasis provides background for developing product technology and decision making upon product development, in addition to strong knowledge of biology and the engineering sciences. The Bachelor of Science in Agricultural Engineering is accredited by the Accreditation Board for Engineering and Technology.

624. Advanced Agronomy (3) II Problems in soil and water, structures and environment, systems analysis, power and machinery and electrical and electronic systems. The biochemical/food engineeering emphasizes providing background for engineering agriculture to work in design and management of agricultural processing of food products and utilization of waste material. The agri-biosystems engineering emphasizes providing background for developing biological agricultural processing of food products and utilization of waste material. The agri-biosystems engineering emphasizes providing background for developing biological agricultural processing of food products and utilization of waste material.

697. Workshop [Rpt./2] (Identical with H.E.E. 697)

720. Microbiology in Agriculture (3) I Principles of microorganisms, soil microorganisms in agriculture, and water and air pollution. P. Undergraduate teacher placement.

730. Theory and Practice of Human Development (3) II Principles of human development with emphasis on personality and socialization, and the development of human behavior as influenced by cultural factors. P. Undergraduate teacher placement.

741. Human and Environmental Education (3) II Human and environmental education including the use of media in education, the philosophy of environmental education, and the role of the teacher in environmental education. P. Undergraduate teacher placement.

751. Assessment of Human Development (3) II Assessment of human development including the use of assessment instruments and methods in education. P. Undergraduate teacher placement.

752. Research Methods in Human Development (3) II Research methods in human development including the use of research instruments and methods in education. P. Undergraduate teacher placement.

753. Theory and Practice of Counseling (3) II Principles of counseling and guidance with emphasis on the development of counseling and guidance programs in education. P. Undergraduate teacher placement.

754. Assessment of Counseling (3) II Assessment of counseling and guidance programs in education including the use of assessment instruments and methods in education. P. Undergraduate teacher placement.


756. Human and Environmental Education (3) II Human and environmental education including the use of media in education, the philosophy of environmental education, and the role of the teacher in environmental education. P. Undergraduate teacher placement.

757. Assessment of Human Development (3) II Assessment of human development including the use of assessment instruments and methods in education. P. Undergraduate teacher placement.

758. Theory and Practice of Counseling (3) II Principles of counseling and guidance with emphasis on the development of counseling and guidance programs in education. P. Undergraduate teacher placement.

759. Assessment of Counseling (3) II Assessment of counseling and guidance programs in education including the use of assessment instruments and methods in education. P. Undergraduate teacher placement.

760. Research Methods in Counseling (3) II Research methods in counseling and guidance programs in education including the use of research instruments and methods in education. P. Undergraduate teacher placement.

761. Developmental Psychology (3) II Principles of human development with emphasis on personality and socialization, and the development of human behavior as influenced by cultural factors. P. Undergraduate teacher placement.

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765. Developmental Psychology (3) II Principles of human development with emphasis on personality and socialization, and the development of human behavior as influenced by cultural factors. P. Undergraduate teacher placement.


415. Agri-biosystems Process Engineering (3) I 1989-90 Basic engineering and biological principles to equipment and methods for processing, handling, refrigerating and drying food, biological, and agricultural materials. 2R, 3L, P, ECE. 240 or Ch. E. 206. May be convened with 515.


447. Sensors and Controls (3) I 1990-91 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, P, ECE. 207, 206. May be convened with 547.

455. Irrigation Engineering (3) I II 1989-90 Introduction to soil and water relationships, irrigation systems, design and operation of surface, sprinkler, and trickle irrigation systems. Field trip. P, 455. May be convened with 555.

456. Irrigation Engineering Laboratory (1) I 1989-90 Methods of data acquisition and analysis which are pertinent to the design of irrigation systems. Computer-aided acquisition and processing will be used. Laboratory exercises. ADH. 3L. Field trip. CR. 455. May be convened with 556.


465.* Food Engineering (3) II 1990-91 Fundamentals of fluid flow, materials handling, heat transfer, refrigeration, freezing and drying as applied to food processing. (Identical with N.F.S. 465) May be convened with 565.

494. Practicum (1) [Rpt/1] II (Identical with N.F.S. 465) May be convened with 594.

504. Irrigation Principles and Management (3) I For a description of course topics, see 404. Graduate-level requirements include a special project. P, Math. 117F/R, S.W. 200. May be convened with 404.

506. Applied Hydraulics (3) I For a description of course topics, see 406. Graduate-level requirements include a special project on current hydraulic research. P, Math. 118, 123 or 125a, Phys. 102a. May be convened with 406. G. Allen


515. Agri-biosystems Process Engineering (3) I 1990-91 For a description of course topics, see 415. Graduate-level requirements include a special project. P, ECE. 207, 206. May be convened with 515.

523. Agricultural Systems Analysis and Design (3) II 1990-91 For a description of course topics, see 423. Graduate-level requirements include a special project. P, A.M.E. 232, C.E. 217. May be convened with 423. Larson

547. Sensors and Controls (3) I 1990-91 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, P, ECE. 207, 206. May be convened with 547.

554. Experimental Data Acquisition Laboratory (3) I 1989-90 Digital basics: numbering systems, codes, addressing, logic gates, wave shaping. Analog techniques: op-amps, signal conditioning, data acquisition conversion processes, energetic, hydraulic, or irrigation see 447. Graduate-level requirements include a special project. P, A.M.E. 240 or Ch. E. 206. May be convened with 447.

556. Irrigation Systems Design (3) I For a description of course topics, see 456. Graduate-level requirements include a special project. P, A.M.E. 321 or A.M.E. 331a. (Identical with C.E. 556) May be convened with 456.

558. Drainage of Irrigated Lands (3) II For a description of course topics, see 458. Graduate-level requirements include a special project. P, ECE. 207, 208. May be convened with 458.

565. Pressurized Irrigation Systems (3) II 1989-90 Analysis of design and operating criteria for irrigation major. P, Satisfaction of the Writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

566. Seminar (1) [Rpt/1] I (Identical with N.F.S. 566a) May be convened with 566.

571. Irrigation Engineering Laboratory (1) II For a description of course topics, see 471. Graduate-level requirements include a special project. CR. 455. May be convened with 471.

575. Drainage of Irrigated Lands (3) II For a description of course topics, see 475. Graduate-level requirements include a special project. CR. 455. May be convened with 475.

582. Soil and Water Conservation Engineering (3) II 1990-91 For a description of course topics, see 482. Graduate-level requirements include a special project. P, C.E. 321 or A.M.E. 331a. (Identical with C.E. 582) May be convened with 482.

585. Food Engineering (3) II 1990-91 For a description of course topics, see 485. Graduate-level requirements include a special project. P, C.E. 321 or A.M.E. 331a. (Identical with C.E. 585) May be convened with 485.

595. Irrigation Engineering (3) II For a description of course topics, see 495. Graduate-level requirements include a special project. P, C.E. 321 or A.M.E. 331a. (Identical with C.E. 595) May be convened with 495.

596. Seminar (1) [Rpt/1] I (Identical with N.F.S. 596a) May be convened with 596.

Agriculture (AGRI)

Forbes Building, Room 303 (602) 621-3612

Several courses offered within the College of Agriculture are applicable to broad subject matter 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.

220. Microcomputers in Agriculture (2) II (Identical with P.OI. 220)

422. Community Communications Media (3) I (Identical with A.Ed. 422)

450. Alternative Futures in Energy and the Environment (3) For energy and environment status and future alternatives; interaction of food fiber production and natural resource use, with emphasis on student discussion of diverse views. Caldwell

Agronomy and Plant Genetics (See Plant Sciences)
American Indian Studies (AIS)

Social Sciences Building, Room 324
(602) 621-7108

Committee on American Indian Studies

Professors Barbara Babcock (English), James W. Clarke (Political Science), Vine Deloria, Jr. (Political Science), Lawrence J. Evers (English), Jerrold Levy (Anthropology), N. Scott Momaday (English), James Officer (Anthropology), J. Jefferson Reid (Anthropology), Susan W. Steele (Linguistics), Robert K. Thomas Robert Williams, Jr. (Law)

Associate Professors: Paul R. Hadley, Philip H. Krutzsch, Donald P. Speer (Anthropology), Joy Harjo (English), Thomas M. Holm (Psychology), Alice S. Paul (Elementary Education)

Assistant Professors: Jennie Joe (Family and Community Medicine), Olelia Zepeda (Linguistics), Director

Lecturer Emory Sekaquaptewa (Anthropology)

The minor in American Indian studies consists of at least 20 units 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 peoples of the New World. The departments of Anthropology, Art, English, Linguistics, and Political Science offer courses in the history, culture, lifeways, and contemporary problems of the native peoples of North America. The minor in 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 (Identical with Ling. 102)

203a-203b. Elementary Navajo Language (3-3) (Identical with Ling. 203a-203b)

205. Prehistoric Peoples of the Southwest (3) II (Identical with Anth. 205)

206. Native Peoples of the Southwest (3) I I (Identical with Anth. 206)

210. Native Languages of North America (3) I (Identical with Ling. 210)

307a-307b. Elementary Papago Language (3-3) (Identical with Ling. 307a-307b)

334. Politics and the American Indians (3) II (Identical with Pol. 334)

350. Oral Tradition (3) II (Identical with Eng. 350)

396H. Honors Prosamen (3) I I

404. Sociology of the Southwest (3) 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) II (Identical with Anth. 423) May be convened with 523.

430. The Anthropology of Visual Art (3) II (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 Eng. 449a-449b) May be convened with 549a-549b.

467. Race and Ethnic Relations (3) II (Identical with Soc. 467) May be convened with 567.

477a. Ethnic Literature

a. North American Indian Literature (3) (Identical with Anth. 467a) May be convened with 567a.

482. Hopi Language in Culture (3) II (Identical with Anth. 482) May be convened with 582.

484a-484b. Development of Federal Indian Policy (3-3) I (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.

499H. Honors Independent Study (3)

502a-502b. Dynamics of Indian Societies (3-3) Philosophies, institutions and characteristics of tribal life in North America. 502a: American Indian philosophy, cosmology, and world view. 502b: Impact of European immigration on tribal groups of North America. (Identical with Anth. 502a-502b)

504. Ecology 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) II (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 Eng. 549a-549b) May be convened with 449a-449b.

577a. Ethnic Literature


582. Hopi Language in Culture (3) II (Identical with Anth. 582) May be convened with 482.

584a-584b. Development of Federal Indian Policy (3-3) I (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.

596. Development of Federal Indian Policy (3-3) (Identical with Pol. 596) May be convened with 496.

599. Indian Religions and Spirituality (3) For a description of course topics, see 499. Graduate level requirements include an additional research paper based on past research and personal experience with related topic. May be convened with 499.

599. Colloquium

a. Theory and Indian Studies (3) II P, 502a-502b or 484a-484b.

569. Seminar

a. American Indian Law and Policy (3) [Rpt./2] I (Identical with Pol. 596, which is home) P, admittance to Honors Program.

613. Indian Law (I) (Identical with Law 631)

Anatomy (ANAT)

Arizona Health Sciences Center, Room 4205
(602) 626-6094

Professors Robert S. McCuskey, Head, Jay B. Angelve, Jr., Joseph T. Bagnara, Bryant Benson, Robert W. Core (Physiology), Mac E. Hendley, Robert H. Krutzsch, Donald P. Speer (Surgery), Nicholas J. Strausfeld (Arizona Research Laboratories, Neurobiology)

Associate Professors David E. Blask, Mary J. C. Hendrix, C. Ward Kischler, R. Clark Lantz, Albert V. LeBouton, Mary E. Morbeck (Anthropology)

Assistant Professors Gail D. Bird (Molecular and Cellular Biology), Christopher A. Leaden; Paul A. St. John, Leslie P. Tolbert (Arizona Research Laboratories, Neurobiology)

Lecturers William D. Barber, Norman E. Koelling

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 (3-3) I I Opportunities in biomedical research. P, admission to Honors Program, Chem. 103b, 104b, 243b, 245d.

401. Human Gross Anatomy (3) II Survey of the gross structure of the human body. IR, 6L.

402. Human Gross Anatomy Laboratory (1) IP, 8 units of premedical students only. (Identical with Pol. 401)

415. Vertebrate Reproductive Biology (2) I Structure, function and control of the vertebrate reproductive system. (Identical with M.C.B. 415)

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.

457R. Endocrinology (3) II Neural and endocrine integration in the regulation of mammalian physiological functions. P, M.C.B. 103; (Identical with M.C.B. 457R) May be convened with 557R.

457L. Endocrinology Laboratory (1) II Techniques in endocrinology. P, CR 457R (Identical with M.C.B. 457L) May be convened with 557L.

557. Endocrinology (3) II Survey of the endocrine system. P, admittance to Honors Program.

557L. Endocrinology Laboratory (1) II Survey of the endocrine system.

558. Advanced Subjects in Endocrinology (2) I I Selected topics in vertebrate and invertebrate endocrinology. P, 467R (Identical with M.C.B. 558).

559. Cancer Biology (3) II 1990-91 (Identical with Anth. 559)

555. Developmental Biology (3) I (Identical with M.C.B. 555) May be convened with 456.

557. Experiments in Developmental Biology (4) II (Identical with M.C.B. 557) May be convened with 457.

558. Advanced Subjects in Endocrinology (2) I I Selected topics in vertebrate and invertebrate endocrinology. P, 467R (Identical with M.C.B. 558).

567R. Endocrinology (3) II For a description of course topics, see 467R. Graduate-level requirements include an in-depth research paper on a specific hormone or other aspect of the endocrine system. P, CR, 467L.

Graduate-level requirements include an in-depth research paper on a specific hormone or other aspect of the endocrine system.
567R. (Identical with M.C.B. 567L) May be con-
vened with 467L.

582. Topics in Neural Development (2) I
and II 1989-90. (Identical with Nrsr. 582)

583. Topics in Plasticity (2) I 1989-90
(Identical with M.C.B. 583)

584. Cellular Neurobiology (2) II 1989-90
Focuses on a different selected topic in the cell
biology of neurons and glial cells each offering.
Students read and critically discuss primary lit-
erature. P. course in neurobiology or cell biol-
ocy, consult S. department before enrolling.
(Identical with M.C.B. 584 and Nrsr. 584)

585. Principles of Cellular and Molecular
Neurobiology (4) I (Identical with Nrsr. 585)

586. Principles of Systems Neurobiology (4)
I (Identical with Nrsr. 589)

595. Colloquium

a. Special Topics in Cell Biology (2) [Rpt./6
units] (Identical with C.Bio. 595d)

b. Introduction to the Neurosciences (2)
1989-90Introduction to the Neurosciences
(2) 1989-90 (Identical with Med. 595y,
which is home) May be convened with
467y.

601. Human Gross Anatomy (8) I Compre-
prehensive survey of the human body. P. structure
and function of the cells, tissues, and organs of
vertebrates. P. 601, 602.

602. Microscopic Anatomy (6) I Essentials of
microscopic anatomy. P. Chen, 103b, 104b,
243b, 245b, Phys. 102b; consult department
before enrolling.

603. Microscopic Structure (1-3) 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) [Rpt.] I
Study in depth of the gross human anatomy of
selected areas or systems. P. 601, 602.

605. Neurosciences (6) I Essentials of mam-
nalian nervous system. Structure and function,
P. Chen, 103b, 104b, 243b, 245b, Phys. 102b;
consult department before enrolling.

606. Advanced Vertebrate Neuroanatomy (4)
I Structure of the central nervous system in
selected vertebrates. P. 605.

610a-610b. Anatomical Techniques (1 to 4 to
12) I Introduction to anatomical techniques, and
procedures of anatomical analysis. P. 601, 602;
consult department before enrolling.

616. Introduction to Anatomical Literature
(1-12) I A quick orientation, bibliographic
approach to basic anatomical references. Pri-
marily for those students planning a career in
anatomy and wishing to prepare themselves for
further graduate study. 3L.

666. Seminar

a. Biological, Structural and Functional
Interactions (1) [Rpt./4] I Open to majors
only. P. Chem. 103b, 104b, 243b, 245b,
Phys. 102b.

801. Human Gross Anatomy (8) I No grade is
given until the final 8 units are completed.

802. Microscopic Anatomy (5)

805. Neurosciences (6) II (Identical with Nrsr. 805)

891. Preceptorship

a. Anatomy (3-12) [Rpt./12 units]

Animal Physiology (See Animal Sciences)

Animal Sciences (ANS)

Shantz Building, Room 205
(602) 621-7623

Professors: B.L. Reid, Acting Head, William H.
Brown, Darrel E. Goll, William H. Hale (Emer-
itus), David J. Hartshorne, John T. Huber,
John A. Marchello, Donald E. Ray, Richard W.
Reif, John H. Rice, Jr., Jack Schuh, Marvin R. Selke,
Gerald H. Stott (Emeritus), Bruce R. Taylor (Emeritus,
C. Brent Theurer, Frank M. Whiting

Anatomy and Physiology, Jerry Allen, William A.
Schurg, R. Spencer Swingle.

Assistant Professors Sue DeNite, Vincent Guer-
niero, Mark E. Wise

Lecturers: Remi Bellocc (Adjunct), David E.
Hooper (Adjunct), Lonny T. Powell, Thomas
N. Wegner

Extension Specialists Dennis V. Armstrong,
Albert M. Lane (Emeritus), Edward A.
LeVinee

Livestock Specialist Shannon S. Easterday

Animal sciences is a field of study involving the
production, marketing, and utilization of ani-
mals in agriculture, entertainment, and compa-
nionship. Students gain knowledge in the
biological processes involved in genetics, nutri-
tion, and reproduction as well as in the practical
business aspects of raising and livestock man-
agement. Students may find employment in
production management, racing administration,
and sales and marketing. Majors must complete
an agricultural sector such as agribusiness firms,
financial institutions, and breed associations.
Students may also complete a field of study
which is home) May be convened with
467y.

205. Live Animal and Carcass Evaluation (3)
II A comprehensive view of meat animal, dairy and
horses, and selection and criteria guidelines.
P, course in meat processing, with special
reference to structure and composition of the
various meats. 2R, 3L. Not open to students with
more than 7 units of ani-
mal sciences.

134. Feeds and Feeding (2) Selection, evalu-
ation of feeds for specific classes, feeding
ratios for livestock and poultry. Not open to
students with credit or CR in 430 or 447.

142. Introduction to the Animal Racing
Industry (2) I Overview of the history, terminol-
ogy, personnel, equipment and breeds of ani-
mals 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. 2R, 3L. Field trip.
(Identical with W.F.S.C. 180)

205. Live Animal and Carcass Evaluation (3)
II A comprehensive view of meat animal, dairy
and horses, and selection and criteria guidelines.

270. Introductory Horse Science (2) I The
feeding, management and training of horses.

295. Colloquium

a. Career Orientation (1) II

340. Race Track Marketing (2) II Concepts
and issues related to the marketing and promo-
tion of the racing industry. P. 142, CR, Mktg.
361 or A.Ed. 215.

342. Organization and Administration of the
Racing Department (3) I Basic duties and
functions of the racing office and department.
P. 142.

344. Animal Racing Laws and Enforcement
(12) I Legal aspects of the racing industry
including the way the science of biology is
used in modern livestock practice. 2R, 3L. Not
open to students with more than 7 units of ani-
mal sciences.

375. Workshop

a. Research Development in Animal Agri-
culture (1)
### Animal Breeding Systems

- **413. Principles of Animal Breeding (3)**
  - Emphasis on genetic improvement in livestock and dairy cattle.
  - Field trips to different breeding farms and research facilities.
  - Prerequisites: Chem. 241a, 243a.

### Nutrition and Endocrinology

- **430. Principles of Nutrition (3)**
  - Study of nutrients and their role in the body, including protein, carbohydrates, fats, and minerals.
  - Prerequisites: Chem. 241a, 243a.

### Milk and Meat Production

- **474. Sheep Production (2)**
  - Focus on the production and management of sheep.
  - Field trips.
  - Prerequisites: Bioc. 460 or 462a.

- **473. Swine Production (2)**
  - Study of swine production and management.
  - Field trips.
  - Prerequisites: Bioc. 460 or 462a.

### Dairy Cattle Production

- **586. Physiology of Lactation and Neonatal Development (3)**
  - Study of lactation and neonatal development in dairy cattle.
  - Field trips.
  - Prerequisites: Chem. 241a, 243a.

### Poultry Production

- **580. Nutritional Biochemistry Techniques (3)**
  - Study of nutritional biochemistry and analytical techniques.
  - Field trips.
  - Prerequisites: Bioc. 460 or 462a.

### Workshop

- **463. Workshop (3)**
  - Focus on specific topics related to animal breeding and nutrition.
  - Field trips.
  - Prerequisites: Bioc. 460 or 462a.
171. Ancient Civilizations of the Near East (3) I (Identical with Hist. 171)
172. Islamic Civilization: Traditional and Modern Middle East (3) II (Identical with Or. S. 172)
200. Cultural Anthropology (3) II Contemporary theories and methods in use among cultural anthropologists.
205. Prehistoric Peoples of the Southwest (3) I Nontectnical discussion of the lifeways of the ancient peoples of the Southwest. (Identical with A. In. S. 205)
206. Native Peoples of the Southwest (3) II Nontectnical discussion of Southwestern Indian cultures from ancient times to the present. (Identical with A. In. S. 206)

210. Survey of Anthropology for Engineers and Scientists (3) I Topics in human physical and cultural development; human ancestors back to 3 million B.C., ancient Maya civilization as a case study of cultural complexity outside the West, and the spread of agriculture.

235. Principles of Archaeology (3) I History of archaeological research, survey of concepts and methods for the study of prehistoric cultures.

257. Materials Science of Art and Archaeological Objects (3) II I (Identical with M. S. E. 257)

258. Materials Science of Art and Archaeological Objects Laboratory (1) I (Identical with M. S. E. 258)


276. The Nature of Language (3) III An introduction to basic concepts of linguistic anthropology and their implications for the study of culture and society. (Identical with Ling. 276)

301. Paranormal Anthropology (3) I Witchcraft and the occult in cross-cultural perspective.

303. Sex Differences and Languages (3) I 1990-91. Sex/gender differences in language use among adults and children and their social and biological bases. (Identical with Ling. 303 and W. S. 303)

304. Introduction to Archaeological Fieldwork (3) III Practical excavation, class discussion, mapping and the preliminary stages of artifact analysis, 2 R, 6 L, Field trips.

305. Cultural Change (3) I A review of theories of cultural change and social change with case studies. (P. 200)

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 Introduction to the cross-cultural analysis of family and kinship systems in contemporary society.

333. Archaeological Interpretation (3) II Survey of modern methods and theories in archaeology, with emphasis on current archaeological problems being investigated throughout the world.

337. Studies in Modern Material Culture (3) I Studies relating contemporary behavior and material culture will be planned, implemented and evaluated to test methods of archaeological analysis and evaluation of social science research. P. 3 units of social science.

340a-340b. Introduction to Classical Art and Archaeology (3-5) 1989-90 (Identical with Clas. 340a-340b)

364. Primatology (3) I Comparative primate biology, behavior, ecology and evolution. P. 111 or 260.

384. Sociology of Latin American Societies (3) II I (Identical with Soc. 384)

396. Honors Seminar (3) I A research project involving independent study, reading and research. May be convened with 506.

400. Societies of Culture Change (3) II Intensive investigation of specific theories and varieties of culture change. P. 200. May be convened with 506.

403. Anthropology of Conflict Resolution (3) I Doing anthropology as a cross-cultural perspective, aiming to build both understanding of conflict processes and skills for managing and resolving them. May be convened with 506.

404. Sociology of the Southwest (3) I I (Identical with Soc. 404) May be convened with 504.

405. Urban Adaptation of Ethnic Groups (3) I A study of urban adaptations of ethnic and social groups to urban areas, focusing on 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 I Comparative analysis of traditional and contemporary peasant communities. On-going cross-cultural research project. (Identical with Soc. 407) Research-Writing Emphasis Course.

408. Anthropology and Public Policy (3) I II Examines the development, goals, techniques, and consequences of public policy. 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) May be convened with 509.

411. Anthropology of Religion (3) I Comparative approaches to the study of religion, systems of ritual and symbolization in the primitive world, shamanism and possession, religious movements. (Identical with Rel. 411) May be convened with 511.

413. Ethnology of the Southwest (3) I 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. Ethnology of the Southwest (3-5) I History, arts and crafts, economics, social institutions, religions, and mythology of the present-day Indians of the Southwest.

416. Ethnological Inquiry (3) I III 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. Fee. May be convened with 517.

418a-418b. Scientific Illustration-Photography (2 to 4) I (Identical with Eco. 418a-418b) May be convened with 518a-518b.

19. Psychological Anthropology (3) I Cultural emphasis and experiences as basic shaping forces in personal development and emotional life. Topics include psychoanalysis and anthropology, gender and sexuality, childhood, grief and mourning, dreaming, psychopathology, and the role of anthropology in interdisciplinary projects.

420. Contemporary American Culture (3) II Diverse perspectives on American values as expressed in organization of kinship, space, bureaucracies, media, social classes, ethnic groups, religious sects and movements. May be convened with 520.

421. Ethnology of North America (3) I Origin and development of populations of North America; historical development and interactions of cultures. P. 200. May be convened with 521.

422a-422b. Pre-Columbian Art (3-3) I (Identical with Art 422a-422b) May be convened with 522a-522b.

423. Peoples of Mexico (3) I I Cultural background, and contemporary economic, social, and religious life of the Indian and mestizo populations of Mexico. (Identical with A. In. S. 423 and M.A. S. 423) May be convened with 523.

427a. The Prehistory of East Asia (3) I I The origins and subsequent development of prehistoric cultures in China, Japan, Korea, Mongolia, Siberia and Southeast Asia. Broad concepts such as cultural change and environmental adaptation are stressed in this course. P. 200. May be convened with 527a.

427b. The Archaeology of Pre-Han China (3) I I 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 Paleolithic to the third century BC. 427a is not a prerequisite for 427b. P. Consult department before enrolling. (Identical with Or. S. 427b) May be convened with 527a.

428. Anthropology of Law (3) I II 1990-91 issues in the anthropology and history of law, focusing on the nature of law in its social context, selected cases. (Identical with Hist. 428a-428b) May be convened with 528.


430. The Anthropology of Visual Art (3) I I The role of anthropology in the interdisciplinary projects involving studying art and aesthetics cross-culturally as sociocultural phenomena.

431. Anthropology and Development (3) II I Role of anthropology in interdisciplinary projects involving economic development and planned change on the national and international levels. May be convened with 531.

432. Peoples of the Pacific (3) I Populations and cultures of Polynesia, Micronesia, and Melanesia. A study of these "natural laboratory" settings in an ecological framework. May be convened with 532.

434. Kinship and Social Organization (3) II I A comparative study of social systems; types of social organization, and units of sociability (Identical with Soc. 434) May be convened with 534. Writing-Emphasis Course.
435. Principles of Archaeological Fieldwork (3) II 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 533.


438. 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.


440. Laboratory in Zoarchaeology (3) I 1990-91 Fragmentary animal remains in archaeological interpretation. Diagnostic morphological features. Analytical techniques; lab analysis; repeat preparation. 1R, 6L.

441. Organization of Museums (3) I An intensive study of museum practice, 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. 442b: Three-week laboratory processing and analysis. Registration restricted. Contact department for application, which must be returned by April 1.

443a-443b. The Archaeology of North America (3-3) I (Identical with Clas. 443a-443b) May be convened with 543a-543b.

444. 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. Prehistoric Economic Development in the Old World (3-3) (Identical with Or.S. 449a-449b) May be convened with 549a-549b.

450. Social Stratification (3) I The use of knowledge of human nonhuman primate social behavior to examine existing social systems. May be convened with 550.

451. Archaeology of North America (3) I Intensive study 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.

453. Mesoamerican Archaeology (3) I Development of culture in Mexico and Central America from the early hunters and gatherers through the conquest of the Aztecs and Mayas by the Spanish. (Identical with M.A.S. 453) May be convened with 553. Writing-Emphasis Course.*

454. Andean Archaeology (3) I Development of culture in the Andean countries of South America from hunters and gatherers of the terminal Pleistocene through Inca civilization. May be convened with 555.

456a-456b. The World's 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. The Paleolithic, from earliest known artifact 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 557.

457. Prehistoric Mesopotamia (3) I Theories of the rise of civilization tested against archaeological data from Mesopotamia with comparison of proto-languages and cultures, and their origins in time and space. P, 276. (Identical with Ling. 480) May be convened with 560. Writing-Emphasis Course.*

462. Hope Language in Culture (3) I An introduction to Third Mesa dialect of Hopi, with emphasis on cultural context and contemporary usage. May be convened with 562.


465. Social Organization of India and Pakistan (3) I (Identical with Or.S. 465) May be convened with 565.

466. Paleanthropology (3) I Evidence for human and nonhuman primate evolution including laboratory study of fossil casts and modern skeletal biology. P, 265 or consult department before enrolling. May be convened with 566. Writing-Emphasis Course.*

467. Race and Ethnic Relations (3) I Identification of the methods by which humans adjust to their environments through the processes of growth and change. (Identical with Geos. 467) May be convened with 567.

468b. Cultural Anthropology (3) I (Identical with Or.S. 468b) May be convened with 568b.

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) I Survey of the cultural uses of plants, both past and present; contributions of botany to the theory of human behavior and culture. May be convened with 574.

475. Origins of Agricultural Development (3) I Evaluation of theories of origins and early development of cultivated plants in general, with attention given to crop plants of worldwide economic importance and selected crops of local economic importance. Three-day field trip. P, Econ. 312. May be convened with 575.


477. Discourse and Text (3) II 1989-90 Analysis of patterns of communication in discourse; modern approaches to discourse and text. P, 276, Ling. 200 or consult department before enrolling. (Identical with Ling. 477) May be convened with 577.

479. Cultural Materials Technology (3) I Investigates the ways in which systems of technology and cultural context and the resulting impacts on invention, innovation and conversation, technology transfer, and cultural change. (Identical with M.A.S. 479) May be convened with 579.

489. Historical Comparative Linguistics (3) I Types and mechanisms of linguistic change; language and dialect formation; determination of prehistoric connections; reconstruction of
514. Late Quaternary Geology (3) [I (Identical with Geos. 514)]
515. Cultural Ecology of Agrarian Societies in the Middle East (3) [I] Emphasis is on land tenure, Islamic law, irrigation and agricultural development in the central Middle East, Nile Valley, and the Sahara. Field trips to the Middle East or Egypt. May be repeated with approval.
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 repeated with approval.
517. Cultures of Ancient Mexico (3) [III] For a description of course topics, see 417. Graduate-level requirements include a term paper. May be repeated with approval.
518-519. Cultural Illustration-Photography (2 to 4 to 2 to 4) (Identical with Ecol. 518a-518b) May be repeated with 418a-418b.
519. Psychological Anthropology (3) [II] For a description of course topics, see 419. Graduate-level requirements include a term paper. May be repeated with approval.
520. Contemporary American Culture (3) [III] For a description of course topics, see 420. Graduate-level requirements include a term paper. May be repeated with 420.
521. Ethnology of North America (3) [III] For a description of course topics, see 421. Graduate-level requirements include a term paper, an oral presentation, and a research paper. May be repeated with 421.
522a-522b. Pre-Columbian Art (3-3) (Identical with Art 522a-522b) May be repeated with 422a-422b.
523. Peoples of Mexico (3) [II] For a description of course topics, see 423. Graduate-level requirements include a major term paper. May be repeated with 423.
524. Theoretical Population Genetics (3) [II] For a description of course topics, see 424. Graduate-level requirements include a term paper. May be repeated with 424.
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 Or.S. 527a) May be repeated 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 Or.S. 527b) May be repeated with 427b.
529. Cultures and Societies of Africa (3) [III] For a description of course topics, see 429. Graduate-level requirements include a problem-oriented paper using ethnographic data. May be repeated with 429.
530. The Anthropology of Visual Art (3) [II] For a description of course topics, see 430. Graduate-level requirements include a research paper or project. (Identical with A.In.S. 530) May be repeated with 430.
531. Anthropology and Development (3) [III] For a description of course topics, see 431. Graduate-level requirements include evaluating the history of a specific development project from a social science perspective. May be repeated with 431.
532. Peoples of the Pacific (3) [II] For a description of course topics, see 432. Graduate-level requirements include a research project and paper. May be repeated with 432.
534. Kinship and Social Organization (3) [III] 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 repeated with 434.
535. Prehistoric Societies in Network (3) [II] For a description of course topics, see 435. Graduate-level requirements include a research paper. May be repeated with 435.
536a-536b. Medical Anthropology (3-3) [I] May be repeated with 436a-436b.
537a-537b. Readings in Akkadian (3-3) [I] For a description of course topics, see 437. Graduate-level requirements include a major term paper. May be repeated with 437.
538a-538b. Linguistic Fieldwork (3-3) (Identical with Soc. 538a-538b) May be repeated with 438a-438b.
539a-539b. Readings in Latin America (3-3) [II] For a description of course topics, see 439. Graduate-level requirements include a term paper. May be repeated with 439.
540a-540b. Cross-Cultural Communication (3-3) (Identical with Soc. 540a-540b) May be repeated with 440a-440b.
541. Organization of Museums (3) [I] For a description of course topics, see 441. Graduate-level requirements include a major term paper, an annotated bibliography, and a research paper. May be repeated with 441.
542. Museum Collections Management (3) [II] For a description of course topics, see 442. Graduate-level requirements include an annotated bibliography and preparation of a museum catalog. May be repeated with 442.
543a-543b. The Archaeology of Neolithic and Bronze Age Greece (3-3) (Identical with Class 543a-543b) May be repeated with 443a-443b.
544. In the Wake of the Green Revolution (1) [Rpt.] I For a description of course topics, see 444. Graduate-level requirements include a term paper. May be repeated with 444.
545. Museum Exhibition (3) [II] For a description of course topics, see 445. Graduate-level requirements include a major research paper on the development of a museum exhibition. May be repeated with 445.
546. Museum Conservation (3) [II] For a description of course topics, see 446. Graduate-level requirements include an annotated bibliography and preparation of a museum catalog. May be repeated with 446.
547. Writing Culture (3) [Rpt.] I For a description of course topics, see 447. Graduate-level requirements include a major research paper. May be repeated with 447.
548. Archaeology of the Southwest (3) I [II] Development of culture in the prehistoric Southwest from the late Paleolithic to the historic period. May be repeated with 448.
549a-549b. Folklore (3-3) (Identical with Eng. 549a-549b) May be repeated with 449a-449b.
551. Archaeology of North America (3) [III] For a description of course topics, see 451. Graduate-level requirements include a research paper. May be repeated with 451.
552R. Archaeology of the Southwest (3) I Development of culture in the prehistoric Southwest from the late Paleolithic to the historic period. May be repeated with 452.
553. Mesoamerican Archaeology (3) [II] For a description of course topics, see 453. Graduate-level requirements include a research paper. May be repeated with 453.
554. Andean Archaeology (3) [III] For a description of course topics, see 454. Graduate-level requirements include a research paper or project, an annotated bibliography, and preparation of a museum catalog. May be repeated with 454.
555. Ethnoarchaeology (3) [II] History, method, and theory of ethnoarchaeology with case studies of the use of ethnography in archaeological interpretation and theory-building. May be repeated with 455.
556a-556b. Old World Prehistory (3-3) [II] For a description of course topics, see 456a-456b. Graduate-level requirements include a research paper. May be repeated with 456a-456b.
557. Comparative Cultural Economics (3) [II] For a description of course topics, see 457. Graduate-level requirements include additional readings and a detailed research paper. (Identical with Or.S. 557) May be repeated with 457.
559. Agricultural Economic Development in Latin America (3) [II] (Identical with A.Ec. 559) May be repeated with 459.
560. Paleolithic Origins (3) [II] Chronological development of Paleolithic culture in the Old World. May be repeated with 460.
561. Anthropology of Visual Art (3) [II] For a description of course topics, see 461. Graduate-level requirements include a term paper. May be repeated with 461.
562a-562b. Pre-Columbian Art (3-3) (Identical with Art 562a-562b) May be repeated with 462a-462b.
563. Evolution of Ancient States and Civilizations (3) [II] For a description of course topics, see 463. Graduate-level requirements include a term paper. May be repeated with 463.
564a-564b. Introduction to Dendrochronology (3-3) (Identical with Geos. 564a-564b) May be repeated with 464a-464b.
565. Women in International Development (3) [II] For a description of course topics, see 465. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, and preparation of a museum catalog. May be repeated with 465.
566. Paleanthropology (3) [II] For a description of course topics, see 466. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, and preparation of a museum catalog. May be repeated with 466.
567. Race and Ethnic Relations (3) [II] (Identical with Soc. 567) May be repeated with 467.
568. Human Osteology (3) [II] For a description of course topics, see 468. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, and preparation of a museum catalog. May be repeated with 468.
570a-570b. Human Adaptability (3-3) For a description of course topics, see 470a-470b. Graduate-level requirements include a term paper on the subject matter. (Identical with Ger. 570a) May be repeated with 470a-470b.
573. Primate Anatomy (4) [Rpt.] For a description of course topics, see 473. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, or specialized examinations. May be repeated with 473.
574. Ethnobotany (3) [II] For a description of course topics, see 474. Graduate-level requirements include bimonthly abstracts of papers from the Graduate School or current literature. May be repeated 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
635. Foundations of Archaeology (3) I A comprehensive introduction to archaeology, including a survey of major problems in the cultural, technological, and theoretical perspectives employed in archaeological research and interpretation.

642a - 642b. Advanced Field Course in Archaeology [Oriental Studies] Field methods, theory, and field techniques. 642a. Three-week field excavation and survey. 642b. Three-week laboratory processing and analysis. Registration by permission, which must be returned by April 1.


665. Survey of Physical Anthropology (3) II Modern physical anthropology including evolutionary theory, genetics, skeletal biology, primatology, paleoanthropology, human growth, adaptability and demography.


679. Language and Methodology (3) I 1990-91 Training in the use of ethnographic method in linguistic and cultural research: where naturally occurring speech data are used for analysis of data from observation, tape recording and videotaping. 6 units of linguistics.

680. Survey of Linguistic Anthropology (3) II Major theoretical and methodological issues in linguistic analysis. Language as a cultural code, biological foundations, universals and typology, language and social reality, textual analysis.

695. Colloquium
   a. Forensic Anthropology (2) [Rpt./6 units] 2L, 1P, 1C, 468 and 587b.

696. Seminar
   a. Archaeology (1-3) [Rpt./3] I
   b. Cultural Anthropology (1-3) [Rpt./3] I
   c. Physical Anthropology (1-3) [Rpt./3] I
   d. Anthropology (1-3) [Rpt./3] I

Applied Mathematics (APPL)
Mathematics Building, Room 414
(602) 621-4664

Committee on Applied Mathematics

Professors David W. McLaughlin, Chairperson (Applied Mathematics and Mathematics), David Arnett (Physics), Bruce R. Barrett (Physics), Harrison H. Barrett (Radiology), Peter Carruthers (Physics), James M. Coshing (Mathematics), Chandra Desai (Civil Engineering), Donald G. Dudley (Electrical and Computer Engineering), Charles Falco (Physics), William Fans (Mathematics), Hermann Faseli (Aerospace and Mechanical Engineering), Herrmann Flaschka (Mathematics), Robert L. Gall (Atmospheric Sciences), Barry D. Ganapal (Nuclear and Energy Engineering), W. Martin Greenlee (Mathematics), Joseph F. Gross (Chemical Engineering), Robert L. Hamblin (Sociology), David L. Heintz (Nuclear and Energy Engineering), Frederic A. Hopf (Optical Sciences), William B. Hubbard (Astronomy and Planetary Sciences), J. Randolph Jokipii (Astronomy, Planetary Sciences), George L. Lamb, Jr. (Mathematics, Optics), William E. Lamb, Jr. (Chemistry, Sciences, Physics), Arvel L. Law (Management Information Systems), Eugene H. Levy (Lunar and Planetary Sciences), David O. Lomon (Mathematics), Roy Mastron (Management Information Systems), H. Jay Mastron (Management Information Systems), Pierre Meyeste (Atmospheric Sciences), Richard E. Michod (Ecology and Evolutionary Biology), Richard L. Morse (Nuclear and Energy Engineering), William M. Schaffer (Mathematics), Shimo Neuman (Hydrology), Marcel F. Neuts (Systems and Industrial Engineering), Alan C. Newell (Mathematics, Arizona Research Laboratory), Charles M. Newman (Mathematics), Adrian N. Patrasciuciu (Mathematics), Michael L. Rosenzweig (Ecology and Evolutionary Biology), Hanno Rund (Mathematics). Associate Professors Thomas F. Balza (Aerospace and Mechanical Engineering), Adam S. Burrows (Physics), William Dallas (Radiology), Frederick A. Huber (Computer Science), William Filipone (Astronomy and Planetary Sciences), K. Y. Fung (Aerospace and Mechanical Engineering), Juan C. Hernandez (Aerospace and Mechanical Engineering), Thomas Kennedy (Mathematics), Edward J. Kershen (Aerospace and Mechanical Engineering), Stephen Koch (Physics), David Levemore (Mathematics), Moshe Shaked (Mathematics), Vernon L. Smith (Economics), Malur K. Sundaresan (Electrical and Computer Engineering), Peter J. Downey (Computer Science), Eugene W. Myers, Jr. (Computer Science), Ramesh Narayan (Astronomy, Planetary Sciences), George L. Lamb, Jr. (Mathematics, Optics), John Palmer (Mathematics), Oligeri Palusinski (Aerospace and Mechanical Engineering), Robert S. Rajendran (Geosciences), Hanno Rund (Mathematics), Richard E. Michod (Ecology and Evolutionary Biology), Udi Manber (Computer Science), Eugene W. Myers, Jr. (Computer Science), Ramesh Narayan (Astronomy, Planetary Sciences), George L. Lamb, Jr. (Mathematics, Optics), John Palmer (Mathematics), Oligeri Palusinski (Aerospace and Mechanical Engineering), Robert S. Rajendran (Geosciences), Hanno Rund (Mathematics), Richard E. 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Lamb, Jr. (Mathematics, Optics), John Palmer (Mathematics), Oligeri Palusinski (Aerospace and Mechanical Engineering), Robert S. Rajendran (Geosciences), Hanno Rund (Mathematics), Richard E. Michod (Ecology and Evolutionary Biology), Udi Manber (Computer Science), Eugene W. Myers, Jr. (Computer Science), Ramesh Narayan (Astronomy, Planetary Sciences). The program in applied mathematics encourages and supports cross-disciplinary research covering a broad spectrum of disciplines in science, engineering and business in which mathematics and modeling play fundamental roles. Students have considerable flexibility in the design of their individual programs. The program attempts to draw out from young men and women their ability to think logically and laterally and to train them in all facets of modern applied mathematics. Standards are high but the rewards are great, and graduates have made successful careers in industry and academia.

The committee offers programs leading to the Master of Science and Doctor of Philosophy degrees in applied mathematics. For admission and degree requirements, please see the Graduate Catalog.
Introduction (6) Design of buildings and exterior space with vertical and horizontal organization and systems of circulation, urban and suburban sites, active environmental control methods, advanced structural forms and materials (e.g., steel and concrete). P, 201, 202.

212. Design Communication (2) 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 (2) I Rendering techniques and media for use in architectural communication. Shade and shadow, entourage, reflections, a production techniques, color rendering. P, 201 and 212.

226. Environmental Analysis (2) I Introduc- tion to elemental, contextual and systems (6) Environmental analysis in architecture including the influence of site, climate and social/physical context. Open to majors only. P, admission to professional phase.

227. Architectural Programming (2) II Introduction to theory and methods of architectural programming including influences of users, economics, time, technology, and aesthetics. Open to majors and admission to professional phase of architecture.


236. Fundamentals of Environmental Control Systems (3) II Systems and means of environmental control with emphasis on passive and active methods and principles, energy conservation, and satisfying basic human needs with respect to heat, light and sound. P, 235.

263. Architectural Design and Drawing (3) [Rpt 7] I Studio-based coursework in architectural design or drawing with supplemental lectures. Emphasizes in building design, perspective and rendering, or construction documents. Students must select one area of concentration. Open to non-majors only. Nonmajors may petition to enroll.

270. Introduction to Architectural Computing (3) I I Study of computer hardware, software and programming techniques in architecture. Emphs ses in drafting, computerized space, sheet design, data base management, graphics and structured programming using SASCAL. No previous computer experience required. P, 202.


324. History of Architecture and Western Civilization: Ancient through Medieval (3) I 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, 124.

328. Wood and Steel Structural Systems (3) I II Analysis and design of structural components and systems constructed of wood, steel, and their combination. Study of loadings, materials and combined loads. Examination of the behavior of individual elements and the total system. P, 318.

334. History of Architecture and Western Civilization: 1850 to Present (3) I II History of architecture as a reflection of the western heritage of ideas, values and artistic expression and economic, social, and political conditions. P, 324.


342. Environmental Control in Architectural Design (6) Design of large-scale, multi-use buildings and building complexes, with emphasis on the integration of diverse functions and activities, urban spaces and advanced building technologies with concern for human experience. P, 301, 202, 401. May be convened with 501.


433. Watercolor Techniques for Architects (2) I Techniques of watercolor communication utilized in architecture. P, 403. May be convened with 503.

401. Systems Approach in Architectural Design (6) Design and programming of building systems to achieve clarity, emphasis on the interface with contextual and systems of activity and integrated choices of structure and environmental controls. Open to nonmajors only. Nonmajors may petition to enroll.

402. Complex Function in Architectural Design (6) 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 II Directed studies in advanced design communication. Topics vary. Selected topics may include rendering, design, publications and public relations. For majors only. 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 environments and regions with emphasis on passive cooling techniques. P, 301. May be convened with 513.

414. History of Architecture: American Architecture (II) I Development in American architecture from the colonial to the early modern period with an understanding of architectural history. Nonmajors may petition to enroll. May be convened with 514.

418. Concrete and Masonry Structural Systems (6) I Analysis of structural components and systems constructed of concrete and masonry including slabs, joists, beams, columns, retaining walls, and foundations. P, admission to professional phase. Open to nonmajors only. Nonmajors may petition to enroll. May be convened with 518.
stress and ultimate strength procedures. Examination of the behavior of individual elements and the total system.

437. Seminar in Environmental Psychology (3) I (Identical with Psy) 427) May be convened with 527.


439. Pre-Design Services (3) II Principles and operations of gathering, analyzing, interpreting, translating and disseminating information including ideas pertinent to architectural design. P, 302. May be convened with 529.

440. Lightweight Construction Techniques (3) II Survey of lightweight construction techniques, including laminated wood, cellular forms, lightweight concrete, and others. May be convened with 533.

441. Construction Documents (3) I Content, intent, functions and practice of preparing documents needed for various construction delivery systems. May be convened with 533.

442. Site Planning (2) I Studies relating to design determinants for development of outdoor space. Lectures and exercises dealing with intensity, critical analysis of topography, climate, and vegetation. Final project summarizing and applying all criteria to a realistic development project is required. P, 418. May be convened with 544.

451. Topics in Architecture (6) I Design studio option in one of the following: desert architecture, urban architecture, community design, building design, entrepreneurial architecture, computer-aided design, design competitions, design technologies, and energy conscious design. Offerings are limited by faculty availability and all topics are not offered each year. Other topics may be introduced. P, 302, 335, 336, 402. May be convened with 551.

452. Senior Project (6) I II Studio-based project related to one of the topics in 451. Project should demonstrate a synthesis of knowledge or development of theoretical concepts. P, 452.

453. Honors 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 extensive experience on graphic work stations. P, 270 and 202. May be convened with 570.

471. Internship 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.

472. Architecture and Human Process (3) I Social sciences and cultural aspects of built environment as human information. Begins with individual responses from environmental psychology, defines social uses of places, and addresses some collective resource utilization in environment. Projects analyzing actual situations provide the link to design applications. P, 302. May be convened with 577.

480. Computer Applications in Architecture (3) II Advanced self selected projects exploring potential applications in computer-aided design. Seminars on technical topics with intensive use of graphic work stations. P, 470. May be convened with 580.

481. Methods of the Built Environment (2) I A lecture survey dealing with the origins and implications of the physical manifestations of communal ordering systems. An analytic study of urban form, historical patterns and design. A synthesis of function and space, with particular attention to the interrelationship between the built environment and the total system. May be convened with 584.

487. Space: A Social-Cultural View (3) I [Rpt./I] 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.

497. Workshop b. Special Projects in Architecture (1-3) I II 575 Consult college before enrolling. May be convened with 597b. I I I Field trips. Open to nonmajors only. (Identical with L.Ar. 497b and Ping. 497b)

501. Systems Approach in Architectural Design (3) I 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. Complex Functions in Architectural Design (3) I 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 (2) I For a description of course topics, see 404. Graduate-level requirements include additional research paper focusing on a particular aspect of Mexican architecture. May be convened with 404.

512. School Design Communication (3) I II 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 Architecture: American Architecture (2) I 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 topics of the course. May be convened with 414.

527. Field Methods in Environmental Psychology (3) II (Identical with Psy. 527) May be convened with 414.

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 pre-design 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.

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. Planning the Built Environment (2) I For a description of course topics, see 444. Graduate-level requirements include an additional project demonstrating a theoretical understanding of one particular area of study. May be convened with 444.

551. Topics in Architecture (6) I For a description of course topics, see 451. Graduate-level requirements include additional project in-depth research 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 concept or methodology utilized in professional practice. May be convened with 459.

570. Computer Graphics in Architecture (3) I For a description of course topics, see 487. 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 487. 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 477.

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 focusing on one particular major topic. May be convened with 477.

580. Computer Applications in Architecture (3) II For a description of course topics, see 487. Graduate-level requirements include an additional project demonstrating in-depth requirements for one particular major topic of study. May be convened with 487.

584. Planning the Built Environment (2) I For a description of course topics, see 484. Graduate-level requirements include an additional project focusing on and developing one of the major themes of the course. (Identical with Ping. 584) May be convened with 484.

587. Space: A Social-Cultural View (3) I [Rpt./I] 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) [Rpt.] I II Open to majors only. (Identical with Ping. 597a)

a. Interdisciplinary Environmental-Behavior Design (3) I (Identical with Idis. 596u, which is home)

597. Workshop a. Architecture (3-8) [Rpt.] I II Open to majors only. (Identical with Ping. 597a)

b. Special Projects in Architecture (1-3) [Rpt.] I II 597 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.Ar. 597a and Ping. 597d) May be convened with 497b.
Art (ART)

The Department of Art provides a broad spectrum of theoretical, historical, and creative programs in the arts. It offers degrees in studio art, art history, and art education.

The major program offers the following degrees:

- Bachelor of Fine Arts with majors in studio art and art education, as well as 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 admissions, 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 outside of the major department, including general education requirements described under the College of Arts and Sciences. All BFA students are also required to take at least one 3-unit course specifically focused on gender, race, ethnicity, or non-western civilization. A major in studio art is not intended for the graduate level. To qualify for the degree with this major, 9 units of art (6 units specifically in the history of art) must be taken in residence at the University of Arizona.

The addition to the general education requirements for the Bachelor of Arts degree described under the College of Arts and Sciences/Faculty of Fine Arts in this catalog, the department has been designed to provide a 34-unit major and a 20-unit minor. The following requirements for the major must be met: 101, 117, 118, and 18 units of art history, and 7 units of elective art courses. The degree may be taken on a single or split minor. Minimum total units required for the degree with this major—145.

Writing-Emphasis Course: A writing-emphasis course may be selected from specifically designated 400 level art history courses. Students must have completed the writing proficiency examination or completed work in lieu of a passing score, before enrolling in the designated 400 level writing-emphasis courses. Consult the Academic Guidelines section of this catalog.

The Department of Art participates in the Honors Program.

Art (ART)

101. Drawing (I) 3 I II Visual perception and the principles of composition presented through various drawing problems and materials.

102. Color and Design (I) 3 I II Elements and principles of two-dimensional composition, with emphasis on color mixing, interaction and contrast. 36...

103. Three-Dimensional Design (I) 3 I II Study of volume, mass, and space relationships through modeling, casting, carving, and construction. 628...

201. Figure Drawing (I) 3 I II Drawing from the model and other subjects to develop pictorial and perceptual skills. 65. P. 101.

241. Beginning Photography (I) 3 II I II Fundamentals of photographic processes and aesthetics. 2R, 2S. Field trips. (Identical with MAr 241)

250. Relief Printmaking (I) 3 I II An introduction course in the techniques and aesthetics of relief printmaking. 65. P. 101, 102.

251. Intaglio (I) 3 I II An introductory course in the fundamental techniques and aesthetics of the intaglio tradition. 65. P. 101, 102, or permission of department.

253. Alternative Methods in Printmaking (I) 3 I II An introduction to the nontraditional approaches to printmaking. Monotype, intaglio techniques, and handmade paper. 65. P. 101, 102, or permission of department.

Lithography (I) 3 I II An introductory course in the techniques and aesthetics of lithography. 65. P. 101, 102, or permission of department.

266. Beginning Graphic Design (I) 3 I II An introductory study of design tools and techniques of advertising layout. 65. P. 101, 102.

266. Beginning Illustration (I) 3 I II Exploration of techniques, styles and media for illustration. 65. P. 102, 205, 265.

The Department of Art provides a broad spectrum of theoretical, historical, and creative programs in the arts. It offers degrees in studio art, art history, and art education.

The major program offers the following degrees:

- Bachelor of Fine Arts with majors in studio art and art education, as well as 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 admissions, please consult the Graduate Catalog.

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266. Beginning Graphic Design (I) 3 I II An introductory study of design tools and techniques of advertising layout. 65. P. 101, 102.

266. Beginning Illustration (I) 3 I II Exploration of techniques, styles and media for illustration. 65. P. 102, 205, 265.
371. Beginning Jewelry and Metalsmithing I (3) [Rpt. /1] Introduction to the fundamentals of jewelry and metalwork processes. 6S. P, 104.

372. Intermediate Jewelry and Metalsmithing II (3) [Rpt. /2] Emphasis on surface enrichment through stone setting, reticulation, electroforming, etc. 6S. P, 271.


374. Intermediate Fibers I (3) [Rpt. /3] Two-dimensional fibers techniques including 4-hand techniques (corsetry, woven waves, controlled waves) and tapestry weaving (cartoon as well as spontaneous methods). Emphasis on individual interpretation of traditional and nontraditional approaches to printmaking. Continuation of form investigation, using hand construction and wheel; studio problems in clay and glaze formulation, kiln firing and ceramic history.


376. Painting II (3) [Rpt. /2] II Intermediate course in drawing problems using the model. 6S. Field trips.

377. Intermediate Sculpture (3) [Rpt. /2] II In-depth exploration of the media and concepts of sculpture. 6S. Field trips.

378. Intermediate Figure Modeling (3) [Rpt. /5] II Study of the figure from the model through drawing, sculpture and structured ritual, slide copying and view camera operation. 6S. Field trips.

379. Color Photography (3) [Rpt. /2] II Exploring conceptual and practical aspects of color picture-making with an emphasis on darkroom skills and the development of personal vision. 2R, 2S. P, 341, acceptance of portfolio by Faculty Committee.

380. Photography Since 1950 (3) [Rpt. /2] II Slide presentations and discussions of major photographers since 1950. 2R, 2S.


383. Advanced Photography I (3) [Rpt. /1] II Advanced study of the various techniques of photography. 6S. P, 341, acceptance of portfolio by Faculty Committee.

384. Advanced Photography II (3) [Rpt. /1] II Advanced course in drawing problems using the model. 6S. Field trips.

385. Mixed Media Book (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 presented. 2R, 2S. Field trips. P, 12 units of studio art courses. May be convened with 549.

386. Video for Artists (3) [Rpt. /1] II Senior and graduate students utilize small format video camera and editing to extend/amplify concepts that have developed in their artistic inquiry. 2R, 2S. Field trips. P, 548.

387. Printmaking III (3) [Rpt. /2] II Advanced course in the techniques and aesthetics of relief printmaking. 6S. Field trips. P, 549.

388. Rendering Techniques (3) [Rpt. /1] II Intermediate course in rendering techniques with various media in the creation of editorial and advertising illustration. 6S. P, 265, 266, acceptance of portfolio by Faculty Committee.

389. Advertising Illustration (3) [Rpt. /1] II 6S. P, 265, 266, acceptance of portfolio by Faculty Committee.


391. Alternative Methods in Printmaking I (3) [Rpt. /2] II Advanced course in the nontraditional approaches to printmaking. Continuation of 374. Intermediate Fibers I (3) [Rpt. /3] Two-dimensional fibers techniques including 4-hand techniques (corsetry, woven waves, controlled waves) and tapestry weaving (cartoon as well as spontaneous methods). Emphasis on individual interpretation of traditional and nontraditional approaches to printmaking. Continuation of form investigation, using hand construction and wheel; studio problems in clay and glaze formulation, kiln firing and ceramic history.


393. Packaging Design (3) [Rpt. /1] II Retail packaging, point-of-purchase displays, and lines of related products, with emphasis on graphic treatment, logotype design, and three-dimensional structure. 6S. P, 9 units of graphic design courses and acceptance of portfolio by Portfolio Committee.

450. Portfolio Preparation (3) [Rpt. /1] II Final presentation and defense of portfolio. Student's portfolio is critiqued in areas of order, style, and degree of presentation to bring it to a professional level. 6S. P, 9 units of graphic design courses and approval of portfolio by Portfolio Committee. May be convened with 565.

455. Lithography III (3) [Rpt. /2] II Advanced Problems in design and execution of jewelry and metalsmithing projects. Field trips. P, 341, acceptance of portfolio by Faculty Committee.

Art 111
505. Graduate Figure Drawing (3) [Rpt./5] II Special problems in drawing, using the classroom model and outside sources as references for personal expression. 6S.

509. Graduate Drawing Critique (3) [Rpt./5] II Individual exploration in drawing media and visual concepts. Classroom and individual critiques.

514. Advanced Photography (3) [Rpt./1] III 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. P. 341, acceptance of portfolio by Portfolio Committee. May be convened with 441.

545. Photographic Processes (3) [Rpt./2]. 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. P. 341, acceptance of portfolio by Portfolio Committee. May be convened with 445.

547. Mixed Media Book (3) [Rpt./1] I 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.

548. Video for Artists (3) 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. admission by portfolio. May be convened with 448.

550. Graduate Relief Printmaking (3) [Rpt./4] I II Relief printmaking with emphasis on individual research, personal direction and professional standards. 6S.

551. Graduate Intaglio (3) [Rpt./4] II Intaglio printmaking with emphasis on individual research, personal direction and professional standards. 6S.

553. Graduate Alternative Methods in Printmaking (3) [Rpt./4] II Nontraditional approaches to printmaking with emphasis on individual research, personal direction and professional standards. 6S.

555. Graduate Lithography (3) [Rpt./4] II Lithography with emphasis on individual research, personal aesthetic, and professional standards. 6S.

556. Portfolio Preparation (3) [Rpt./1] II For a description of course topics, see 465. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. P. 9 units of graphic design courses and approval of portfolio by Portfolio Committee. May be convened with 465.

559. Graduate Illustration (3) [Rpt./1] I 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. P. 9 units of illustration courses and approval of portfolio by Portfolio Committee. May be convened with 466.

560. Graduate Graphic Design Problems (3) [Rpt./1] II Two- and three-dimensional design considerations with emphasis on conceptualization and presentation. 6S. Field trips. P. acceptance of portfolio by Portfolio Committee.

569. Graduate Illustration (3) [Rpt./1] II Exploration of any optical material or phenomenon as a possible solution to illustration problems. P. acceptance of portfolio by Portfolio Committee.

571. Advanced Jewelry and Metalsmithing I (3) [Rpt./4] I For a description of course topics, see 471. Graduate-level requirements include an in-depth studio research project. P. 9 units of metalwork. May be convened with 471.

572. Advanced Jewelry and Metalsmithing II (3) [Rpt./1] II For a description of course topics, see 472. Graduate-level requirements include an in-depth studio research project. P. 9 units. May be convened with 472.

573. Graduate Metals and Forming Processes (3) [Rpt./5] II For a description of course topics, see 473. Graduate-level requirements include an in-depth studio research project. P. 373. May be convened with 473.

574. Advanced Fibers (3) [Rpt./5] II For a description of course topics, see 474. Graduate-level requirements include an in-depth studio research project. P. 374. May be convened with 474.

576. Advanced Watercolor Painting (3) [Rpt./5] II High level experimentation in personal expression with watercolor and related media. Demonstration and critiques. 6S.

578. Sculpture Materials (3) [Rpt./21 units] I II Exploration of materials and processes, and their compatibility with concepts.

580. Graduate Painting (3) [Rpt./5] II Graduate study in painting with an emphasis on the development of personal imagery and body of work. 6S.

581. Readings in Contemporary Art (3) I For a description of course topics, see 481. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Field trips. May be convened with 481.

582. Projects in Recent Art (3) [Rpt./6 units] II Advanced level study and studio application of contemporary art, ideas and practices, 1960 to the present. 6S.

583. Combining Media (3) [Rpt.] I For a description of course topics, see 483. Graduate-level requirements include an in-depth studio research project. May be convened with 483.

584. Advanced Ceramics (3) [Rpt./6 units] II Advanced level study and studio application of contemporary art, ideas and practices, 1960 to the present. 6S.

585. Graduate Fiber Studies (6 -10) [Rpt./6] II Graduate experimentation in all aspects of fiber media. Demonstration and critique. 6S.

586. Graduate Studio in Ceramics (6 -10) [Rpt./6] II Graduate experimentation in all aspects of ceramic media. Demonstration and critique. 6S.

587. Sculpture Materials (3) [Rpt./21 units] II Exploration of materials and processes, and their compatibility with concepts. 6S.

589. Extensions of the Figure (3) [Rpt./2] II For a description of course topics, see 489. Graduate-level requirements include an in-depth studio research project. May be convened with 489.

590. Seminar in Recent Art (3) [Rpt./3 Concepts] II 2R, 2S. Open to majors only.

597. Workshop a. Advanced Gallery Management (3) [Rpt./2] II Field trips.

598. Painting Concepts (3) [Rpt./2] II For a description of course topics, see 498. Graduate-level requirements include an in-depth studio research project. May be convened with 498.

600. Drawing Concepts (3) [Rpt./2] II For a description of course topics, see 499. Graduate-level requirements include an in-depth studio research project. May be convened with 499.

602. Drawing Design Problems (3) [Rpt./1] II Two- and three-dimensional design considerations with emphasis on conceptualization and presentation. 6S. Field trips. P. acceptance of portfolio by Portfolio Committee.

603. Foundations in Sculpture (3) [Rpt./6] II Personal response to form and composition using a variety of technical means including welding, casting, carving and non- traditional techniques. 6S. P. 487.

617. Survey of World Art, Prehistoric-Gothic III For a description of course topics, see 517. The art and architecture of Western civilizations through the Gothic era, and of world prehistoric and primitive cultures.

618. Survey of World Art, Renaissance-20th Century (3) III The art and architecture of Western civilization, Renaissance through the 20th century.

619. Western Civilization and the Arts: The Twentieth Century (3) III For a description of course topics, see 519. May be convened with FA. 207.

624. Introduction to the History of Photography (3) III For a description of course topics, see 524. May be convened with FA. 207.

625. Art History of the Cinema (3) III For a description of course topics, see 525. May be convened with FA. 207.

626. Honors Prospective (3) III For a description of course topics, see 526. May be convened with FA. 207.

630. Introduction to Classical Art and Archaeology (3-3) 1899-90 (Identical with Clas. 340a-340b).

340a-340b. Introduction to Classical Art and Archaeology (3-3) 1899-90 (Identical with Clas. 340a-340b).

346b. Honors Prospective (3) III For a description of course topics, see 536. May be convened with FA. 207.

412a -412b. Medieval Art (3-3) For a description of course topics, see 512a-512b. May be convened with FA. 207.

412a -412b. Medieval Art (3-3) 412a: I Arts of the nomadic invasions of Western Europe, and Hiberno-Saxon, Merovingian, and Carolingian art. 412b: I 1899-90 Survey of Ottonian, Romanesque, and Gothic art from A.D. 1000 through 1250. May be convened with FA. 207.

413a -413b -413c. Renaissance Art in Italy (3-3) 1300-1700. 413a: 14th-16th centuries. 413b: 16th century. 413c: 16th century. May be convened with FA. 207.

414a -414b. Northern Renaissance Art (3-3) 414a: Development of Netherlandish painting during the 15th and 16th centuries. 414b: Between the Wars. May be convened with FA. 207.

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 convened with FA. 207.

418a -418b. 20th-Century Art (3-3) Painting and sculpture. 418a: 1886 to World War I. 418b: Between the Wars. P. 6 units of history or art history. May be convened with FA. 207.

422a -422b. Pre-Columbian Art (3-3) 422a: Art of the high cultures of Mesoamerica, with the focus on architecture, sculpture, painting and crafts prior to European contact. 422b: Pre- Columbian art of Central and South America, with particular attention to the Andean area. May be convened with FA. 207.

424a -424b. History of Photography (3-3) 424a: From its invention to 1895; impact of photography on the art and culture of the 19th century. 424b: As an art medium from 1895 to 1965. P. 6 units of art history. May be convened with FA. 207.
425. Northern Baroque Painting (3) II Painting in Belgium and the Netherlands during the 17th century. P. 118. May be convened with 525.

429. 17th- and 18th-Century Art in Italy (3) Painting and architecture of the Baroque and subsequent periods. P. 6 units of history or art history. May be convened with 529.

429a-429b-429c-429d. American Art (3-3-3-3) Art in the United States. 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 convened with 529a-529b-529c-529d.

484. Roman Art and Architecture (3) (Identical with Clas. 484) May be convened 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. Medieval Art (3-3) For a description of course topics, see 412a-412b. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. May be convened with 412a-412b.

513a-513b-513c. Renaissance Art in Italy (3-3-3) For a description of course topics, see 413a-413b-413c.

514a-514b. 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. P. 6 units of history or art history. 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. May be convened with 418a-418b.

522a-522b. Art Museum Training (1-6) [Rpt./12 units] I May be convened with Clas. 584) May be convened with 522a or 522b. May be convened with 511, 12 units graduate art history courses.

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. May be convened with 424a-424b.

525. Northern Baroque Painting (3) 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. 118. 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.

584. Roman Art and Architecture (3) (Identical with Clas. 484) May be convened with 584.


h. History of Photography (3) [Rpt./4] I I P. 424a or 424b. I II P. 1990-91 Field trips.

693. Internship I a. Art Museum Training (1-6) [Rpt./12 units] I II Open to students concentrating in museum studies only. P. 12 units of graduate art history courses.

b. Curatorial Training for Archives of Photography (1-6) [Rpt./12 units] I II Open to students concentrating in museum studies only. P. 12 units of graduate art history courses.

c. Archivist Training for Collection of Photography (1-6) [Rpt./12 units] I II Open to students concentrating in museum studies only. P. 12 units of graduate art history courses.

d. Archival Studies of Photography: Preservation/ Cataloging (1-6) [Rpt./12 units] II I Open to students concentrating in museum studies only. P. 511, 12 units graduate art history courses.

Art Education

130. Appreciating the Visual Arts (3) I I Introduction to techniques for describing and analyzing works of art utilizing relevant material from history and aesthetics, 2R, 2S.


338I. The Teaching of Art (3) I I Carries credit in education only. (Identical with T.T.E. 338I)

400. Art for Exceptional Learners (3) I II Adaptation of structured art curricula to exceptional learner populations. P. previous course work in art and/or special education. May be convened with 500.

433. Understanding the Visual Arts (3) I II A discipline-based introduction to the visual arts that provides students with the opportunity to acquire beginning expressive skills, to learn the value of art within Western culture, and to become aesthetically literate. 2R, 2S. P. junior standing.

431. The Nature of Artistic Expression (3) II A discipline-based study of the visual arts providing knowledge and skills necessary to understand and discuss works of art in an historical setting, place works of art in an aesthetic context, and express ideas through art materials. P. 12 units graduate study may be convened with 531.

496. Seminar I a. Current issues in Art Education Theory and Practice (3) [Rpt./12 units] I II P. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P. 430. May be convened with 496.

531. The Nature of Artistic Expression (3) II For a description of course topics, see 431. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P. 430. May be convened with 496.


596. Seminar I h. Current Issues in Art Education Theory and Practice (3) [Rpt./12 units] I II

630. History and Philosophy in Art Education (3) Critical examination of literature containing fundamental concepts that have shaped the development, scope, and current significance of art education.

633. Issues and Recent Research in Art Education (3) I I The identification of problems in art education at various curricular levels; examination of current research with possible implications for practice. P. T.T.E. 493B (in art), or teaching experience.

635. Art Instruction in Higher Education (3) I I Preparation for and teaching in higher education. Training in processes of instruction in art for community colleges, four-year colleges, and universities. P. 15 units of graduate study in art education, art history, or studio art.

Astronomy (ASTR)

949 N. Cherry Avenue, Room 203 (602) 621-2288


Associate Professors Adam Burrows, William J. Cocke, Craig Hogan, Robert C. Kennicutt, Jr., Charles L. Lackner, Renate Narayan, Andrzej G. Pacholczyk, Marcia Rieke, Raymond E. White, Erick T. Young.

Assistant Professors Jill Bechtold, Christopher Impey

The department offers the degrees of Bachelor of Science and Bachelor of Arts with a major in astronomy, Master of Science and Doctor of Philosophy.

The major for the B.S. is designed for students who plan to pursue graduate studies in astronomy or related sciences. The requirements for the major are 30 units of upper-division courses in astronomy, physics, and mathematics, including Astr. 400A-400B; other courses are to be selected in consultation with the department.

Entering freshmen should take a mathematics class (Math. 117E and/or Math. 118, or Math. 125A), followed by Astr. 271 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 35 units, including 120, 271-272, 400A, Phys. 330 and 3 additional upper-division units of physics; 6
units in the history or philosophy of science. The remaining units should be mostly upper division and must be courses chosen from the sciences, mathematics, engineering, history or philosophy of science. The minor need not be in the sciences.

With foresight in course selection, a student could maintain the goal of obtaining the B.S. or the B.A. degree in the senior year.

Honors: 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. Planetary work and night-time observing sessions and field trips as an integral part of the course. Primarily for non-science majors.

101L. Astronomy Laboratory (1) I II S Projects, telescope observing, planetarium work, discussions. Can be taken alone or with 100. Combination is equivalent to 110a. 

105. The Universe and History of Life (3) I (Identical with Pty.S. 105)

106. Survey of the Solar System (4) I II (Identical with Pty.S. 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, 110a, P. 110a, 110b. "Credit will be allowed for only one of the following: 110a or 110b."

120. Philosophical and Historical Aspects of Astronomical Thought (3) I A quantitative approach to general astronomy. P. Math. 125a.


556a-556b. Electrodynamics of Conducting Fluids and Plasmas (3-3) 1990-91 (Identical with Math. 560a-560b)

B.S. or the B.A. degree into the senior year. With foresight in course selection, a student could maintain the goal of obtaining the B.S. or the B.A. degree in the senior year.

150. "Interstellar Medium and Star Formation" (3) I II 1990-91 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.

210. Interstellar Medium and Star Formation (3) I II S A survey of astronomy, with attention to its interdisciplinary aspects and its relationships to other sciences. Planetary work and night-time observing sessions and field trips as an integral part of the course. Primarily for non-science majors.


430. Atmospheric Measurements (3) I II 1990-91 Theory and practice in the use of meteorological instruments; lab and field demonstrations and practices. 2R, 3L. Field trip. P. Math. 117RS. Credit will be given for both 236a and 236b.

171. Introduction to Meteorology and Climatology (3) I II Basic elements that constitute the effects of weather on society, including its influence on history, comfort and health, and music and art. Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see Writing-Emphasis Courses in the Academic Guidelines section of this catalog). P. 171 or 236b.

173. General Meteorology (3) I II 1990-91 Theory and practice in the use of meteorological instruments; lab and field demonstrations and practices. 2R, 3L. Field trip. P. Math. 117RS.

300. General Meteorology (3) I II 1990-91 Theory and practice in the use of meteorological instruments; lab and field demonstrations and practices. 2R, 3L. Field trip. P. Math. 117RS.

421. Physical Climatology (3) I II 1990-91 Interpretation of astronomical spectra: numerous and diffuse galaxies; radio sources, radio galaxies, active galactic nuclei, X-ray binaries, gamma-ray sources, and quasars. P. Math. 125a.

540. Air Pollution Meteorology (3) III 1990-91 Theoretical description and experimental practice relating to the dispersion of gases and particulate matter in the atmosphere. Attention given to both local and large-scale phenomena. Credit is allowed for 521.

450. Air Pollution Meteorology (3) I III 1990-91 Theoretical description and experimental practice relating to the dispersion of gases and particulate matter in the atmosphere. Attention given to both local and large-scale phenomena. Credit is allowed for 521.
and tropospheric systems, thermodynamic diagrams, 1R, 6L, P, CR, 441a, or 300. May be convened with 571.

521. Physical Climatology (3) II For a description of course topics, see 421. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter, P. 171. May be convened with 421.

530. Micrometeorology (3) I 1989-90. Theoretical aspects of atmospheric turbulence, including discussions of laminar flow, turbulent flow, the mechanical energy equations, and the meaning stress and the wind profile. P. 441b.

535. Air/Sea Interactions (3) I 1989-90 Physical characteristics of the oceans; the dynamics of ocean currents and their interactions with the atmosphere; El Niño and other teleconnections between the oceans and the atmosphere. P. 331.

541a-541b. Dynamic Meteorology (3-3) For a description of course topics, see 441a-441b. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. P. Phys. 121; Math. 254. May be convened with 441a-441b.


551a-551b. Physical Meteorology (3-3) For a description of course topics, see 451a-451b. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. P. Phys. 121; Math. 254. May be convened with 451a-451b.

560. Aerosol Science (3) I 1989-90 PHYS. 121, 122, 254; May be convened with CR, 441a, or 300. May be convened with 562a-562b.

565. Mesoscale Meteorology (3) I 1989-90 For a description of course topics, see 465. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter, P. 300. May be convened with 465.

571. Synoptic Analysis (3) I 1989-90 For a description of course topics, see 471. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter, P. CR, 441a, or 300. May be convened with 471.

572. Weather Forecasting (3) II 1990-91 For a description of course topics, see 472. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter, P. 471. May be convened with 472.

585. Tropospheric Chemistry (3) I 1989-90 A study of tropospheric chemistry, with emphasis on the control and feedbacks involving the major constituents, the cycles of the minor constituents, methods of measurement, and applications.


Biochemistry (BIOC)

Biological Sciences West Building, Room 445
(602) 621-5770

Professors Michael A. Wells, Head, Michael F. Brown (Chemistry), Herbert E. Carter (Emeritus), Michael A. Cusanovich (Chemistry), Leslie S. Forster (Chemistry), Eugene W. Gerner (Radiation Oncology), William J. Grimes (Associate Professor, Molecular and Celluar Biology), Darrel E. Gill (Nutrition and Food Science), Richard B. Hallick (Molecular and Cellular Biology), David J. Hartshorne (Nutrition and Food Science), Mark R. Haussler, John Hildebrand (Molecular and Cellular Biology), Victor J. Hruby (Chemistry), Richard G. Johnson (Science), Henry Koffler (Microbiology and immunology, Molecular and Cellular Biology), John H. Law (ARL, Division of Biotechnology), David W. Mount (Molecular and Cellular Biology), David O'Brien (Chemistry), John A. Rupley (Chemistry), Eugene G. Sander, Gordon Tolin (Chemistry), Henry I. Yamamura (Pharmacology, Associate Professor, Psychiatry)

Associate Professors Hans J. Bohnert (Molecular and Cellular Biology), Don P. Bourque (Molecular and Cellular Biology), Louise M. Candela (Family and Community Medicine), Robert J. Gillies (Radiology), Jennifer D. Hall (Molecular and Cellular Biology), Martinez J. Hewett (Molecular and Cellular Biology), Murray Korc (Internal Medicine), John W. Little (Assistant Professor, Molecular and Cellular Biology), Neil E. MacKenzie (Pharmaceutical Sciences), Roger Sunde (Nutrition and Food Science), Marc E. Tischler (Physiology)

Assistant Professors Danny L. Brower (Molecular and Cellular Biology), James F. Deatherage (Molecular and Cellular Biology), Carol L. Dieckmann (Molecular and Cellular Biology), Roger L. Miesfeld (Molecular and Cellular Biology), Elizabeth Vierling (Molecular and Cellular Biology)

Biochemistry provides the fundamentals for study of the molecular principles in biology, medicine, and the health sciences and agriculture. The faculty members are responsible for instruction in biochemistry in the Colleges of Agriculture, Arts and Science, and Medicine. These programs serve as an excellent background for graduate study in biochemistry or the many health-related sciences, including a major pre-professional program for qualification for professional schools of medicine, dentistry and veterinary medicine.

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. Applicants are not admitted directly to the Master of Science program. The degree is awarded only in rare instances when individuals admitted to the B.D. program apply for laboratory work. The major program includes B.S., Chem 103a-103b, 104a-104b, or 105a-105b, 214a-214b, 254a-254b, 325, 326, 480a and 480b or 481, Math. 125a-125b, Physics 122a-122b, Phys. 116, 121, 254, 462a-462b, 463, 494a, 496a (2 units), and 6 upper-division units in biology, chemistry, mathematics, or physics, exclusive of individual studies. Students will participate in a senior research practicum (594) 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.

The major for the B.A. Chem. 103a-103b, 104a-104b, or 105a-105b, 214a-214b, 245a-245b, 325, 326, 480a and 480b, Math. 117R/S 118, 241b, 245a-245b, 246a, 462a-462b, 463, 494a, 496a (2 units), 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 Admission Test (MCAT).

The minor for both undergraduate degrees consists of 20 units of lower-division courses in chemistry and mathematics. It includes BIOC 462a-462b and 463.

The department participates in the Honors Program.

181. Life: The Science of Biology (4) I (Identical with M.C.B. 182)
182. Life: The Science of Biology II (4) II (Identical with Ecol. 182)


463. Biochemistry Laboratory (2) I Introduction to experimental with biochemical systems, processes and compounds of biochemical importance. 1R, SL, P. 460 or 462a, and 562a or 563.

473. Recombinant DNA Techniques (3) I (Identical with M.C.B. 473) May be convened with 573.
501. Medical Biochemistry

1 Comprehensive treatment of general biochemistry, oriented towards human biology and biochemistry, with emphasis on basic concepts; protein and nucleic acid chemistry and metabolism, enzymology, metabolism of lipids and carbohydrates, metabolic regulation and closely related topics. P. Chem. 103b, 104b, 241b, 245b; Phys. 102b.

504. Intermediate Medical Biochemistry

An intermediate treatment of several areas of general biochemistry including metabolism and nutrition, genetics and membranes. Designed to build on the student's prior knowledge of biochemistry. Consult dept. before enrolling. P. 462a-462b.

510. Plant Molecular Biology


515. Molecular Mechanisms of Development

3 III 1990-91 (Identical with M.C.B. 555)

560. General Biochemistry

1 For a description of course topics, see 460. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. Open to nonmajors only. P. Chem. 241b. (Identical with Chem. 560) May be convened with 460.

564b. Biochemistry Laboratory

2 (Identical with M.C.B. 564b) May be convened with 460.

565. Enzymes

3 III 1990-91 Advanced consideration of enzyme structure and function. P. 462a, Chem. 480b. (Identical with Chem. 565)

566. Nucleic Acids

3 II 1990-91 Structure, function of nucleic acids; replication, transcription, translation, gene organization, regulation of gene expression, and nucleic acid metabolism. P. Both prokaryotic and eucaryotic systems will be considered. (Identical with Gene. 568, M.C.B. 566 and N.F.S. 568)

570. Molecular Biology of the Cell Membrane

3 I 1990-91 Cell membrane functions including biosynthesis, structures of membrane components, importance of cell communication, differentiation and function of membrane-bound organelles, cell response, and cancer. Discussions on the use of monoclonal antibodies, recombinant DNA technology, and DNA transfers in studies on the biology of cell organelles. (Identical with Chem. 570 and M.C.B. 570)

572. Metabolic and Hormonal Control of Cell Function

3 II 1990-91 Advanced treatment of the biochemical aspects of metabolic regulation and hormone action. P. 462a-462b and 575, or consult department before enrolling. (Identical with Chem. 572)

573. Recombinant DNA Techniques

3 II (Identical with M.C.B. 573) May be convened with 475.

574. Biophysical Techniques

3 I Survey of current physical techniques used in biochemical research including solution properties of macromolecules, optical spectroscopy, magnetic resonance and X-ray and electron diffraction. P. 462a-462b and Chem. 480a-480b. (Identical with Chem. 574)

586. Principles of Cellular and Molecular Neurobiology

4 I (Identical with Nsc. 586)

595. Colloquium

b. Topics in Electron Microscopy (2) [Rpt./2] 1989-90 II (Identical with M.C.B. 595b, which is home)

665. Chemistry of Food Proteins

3 II 1990-90 (Identical with N.F.S. 665)

681. Introduction to Biochemical Research

3 I 1990-91 Discussion of the biochemistry encountered in 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.

801. Medical Biochemistry

5

814. Intermediate Medical Biochemistry

5 I

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

Geology Building, Room 103 (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 Pomer (Aerospace and Mechanical Engineering) Associate Professor Bruce Simon (Aerospace and Mechanical Engineering)

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 including A.M.E. 485, A.M.E. 565, E.C.E. 411, 415, 417, 515, Ch.E. 485, 586; Phys. 410, 419 and S.I.E. 581. Additional courses in biomedical engineering are being developed, and supporting coursework 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.

The minor in black studies consists of at least 23 units selected by the student in consultation with the advisor of the black studies program. The 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) 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 (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)

396. Honors Proseminar

(3) II

429. Cultures and Societies of Africa

(3) II (Identical with Anth. 429)

435. The Coming of the Civil War

(3) I (Identical with Hist. 435)

436. Civil War and Reconstruction

(3) II (Identical with Hist. 436)

1861-1878

450a-450b. French Literature of Black Africa and the West Indies

3-3 1989-90 (Identical with Franc. 450a-450b)

452. American Ethnic History

(3) II (Identical with Hist. 452)

481. Race and Ethnic Relations

(3) I (Identical with Soc. 481)

485. Government and Politics of Africa

(3) II (Identical with Pol. 485)

488. 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. 488)

Black Studies (BLS)

1509 E. Helen Street (602) 621-5665

### Committee on Black Studies

Professors James W. Clarke (Political Science), Vine DeLoria (Political Science)

Associate Professors Edwin M. Gaines (History), Celestino Fernandez (Sociology)

Research Social Scientist Myra Dinnerstein (Women's Studies)

Acting Director Glenn Smith (Office of Student Affairs)

The minor in black studies consists of at least 23 units selected by the student in consultation with the advisor of the black 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.
551. Environmental Carcinogenesis (3) II (1990-91) (Identical with R.Onc. 551)
555. Cancer Biology (3) II (1990-91) (Identical with Micr. 555)
595. Colloquium
b. Special Topics in Cell Biology (2) [Rpt. 6 units] (Identical with Anat. 595d, M.C.B. 595d, Micr. 595d and R.Onc. 595d)
596. Seminar
f. Cancer Genetics and Cytogenetics (3) I
1989-90 P, undergraduate genetics

547. Race and Public Policy (3) I (Identical with Pol. 487)
495. Colloquium
b. Studies in Black America (3) I II (Identical with Hist. 485b, which is home)

**Business Administration (BAD)**
BPA Building, Room 230
(602) 621-2388

**Committee on Business Administration**

Professors William B. Barrett (Vice Dean), Chairperson; Gerald O. Bierwag (Finance and Real Estate), James C. Cox (Economics), William L. Felix, Jr. (Accounting), Roy E. Marsten (Management Information Systems), Jay F. Nunnemaker, Jr. (Management Information Systems), Robert A. Westbrook (Marketing) Associate Professors Gregory B. Northcraft (Management and Policy)

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) 621-2388

**Committee on Cancer Biology (Graduate)**

Professors Eugene Gerner, Head (Radiation Oncology), David Alberts (Internal Medicine), G. Tim Bowden (Radiation Oncology), Harris Bernstein (Microbiology and Immunology), Evan Hersh (Internal Medicine), Raymond Nagel (Pathology), Sydney Salmon (Cancer Oncology), Murray H. Hendrix (Anatomy), Robert L. Nagel (Pathology), Alvin E. May (Internal Medicine), Jeffrey Trent (Gene Therapy), Joseph F. Gross, Richard M. Edwards (Emeritus), Alan D. Randolph, Thomas R. Rehm, Jost O. L. Wendt, Donald W. Shadman Associate Professors William P. Cosart, Farhang Shadman
Assistant Professors Herberto Cabezas, Anne J. Pearlstein

Chemical engineering is concerned with utilization and application of scientific theory and principles to develop economically sound manufacturing processes in which chemical and/or pharmaceutical products are taken place. The curriculum prepares the student for employment in the research, development, design and operations aspects of the chemical, petroleum, metals, plastics, food, energy and related industries. The department offers the following degrees: Bachelor of Science in Chemical Engineering, Master of Science and Doctor of Philosophy with major in chemical engineering.

The major requires 136 units of science, engineering and humanities—social science courses as shown in the College of Engineering and the Graduate 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. P, Chem. 103a-103b, 104a-104b, Math. 125a, Engr. 101, 102.


204. Chemical Engineering Mass Transfer (3) I Theory and practice in the unit operations of distillation, gas absorption, extraction, drying, and filtration. P, 201, 203.


304. Chemical Engineering Operations Laboratory (3) Lab investigation of chemical process equipment. A field trip is made in mid-January of the junior year. Students will deposit travel expenses, not more than $150, with the University before trip. P, 201, 203, 204.


306. Chemical and Physical Equilibrium (3) II Applications of thermodynamics to equilibrium processes and physical properties of multicomponent systems. P, Chem. 480a.


418. Physiology for Engineers (4) I (Identical with Psio. 418)

419. Physiology Laboratory (2) I (Identical with Psio. 419)

421. Topics in Real-Time Computing (3) I Introduction to microcomputer- and minicomputer-based real-time computing for data acquisition and process control. Includes transport phenomena and operating systems. P, 2RL, 3L, May be convened with 521.


435. Corrosion (3) I May be convened with 435.


443. Chemical Engineering Plant Design (3) I Design project from sourcing and process selection, through material and energy balances, equipment design and sizing, to economic analysis of capital cost and operating expense. P, 442.


461. Chemical Process Simulation (2) I Use of existing and large computer programs for computer-aided process design and analysis; structure convergence, process controls. P, 423. May be convened with 561.


481. Bioreactor Engineering (3) I Introduction to biotechnology; chemistry of microorganisms; design of bioreactors; design of enzyme reactor models; use of continuous and batch bioreactors. P, Chem. 241a, 241b, 480a-480b. May be convened with 581.

485. Biomedical Transport Phenomena (3) I Transport phenomena in the cardiovascular system, thermodynamics, pharmacokinetics, enzyme kinetics, biocompatible materials, P, 305 or A.M.E. 331a, and Math. 223. May be convened with 585.
223. May be special project.

480a - 480b. May project.

Graduate-level requirements include air breathing engines, and fire safety. flamability limits, C-J detonation. Fossil fuel

557. Applied Combustion (3) II 1990 -91 Lami-

ments include a special project.

course topics, see 451. Graduate-level require-

545. Combustion Generated Air Pollution (3) May be convened with 435.

535. Corrosion (3) II (Identical with M.S.E. 535)

heterogeneous reactions involving a fluid and a

reactor stability, analysis of industrial reactors.

P 430.

532. Solid-Fluid Reactions (I) Characteriza-

ion of solid structural properties; principles of heterogeneous reactions involving a fluid and a reac-

ing solid. P 430 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 by 435.

545. Combustion Generated Air Pollution (3) II (Identical with A.M.E. 545)

551. Chemical and Physical Fundamentals of Air Pollution (3) II For a description of course topics, see 451. Graduate-level require-

ments include a special project. P 305, 430. May be convened by 451.

557. Applied Combustion (3) II 1990-91 Lami-

nary: transient, premixed and diffused flames; fluid combustion in furnaces, propellent combustion, air breathing engines, and fire safety. P 306. May be convened by 451.

545. Combustion Generated Air Pollution (3) II (Identical with A.M.E. 545)

551. Chemical and Physical Fundamentals of Air Pollution (3) II For a description of course topics, see 451. Graduate-level require-

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nary: transient, premixed and diffused flames; fluid combustion in furnaces, propellent combustion, air breathing engines, and fire safety. P 306. May be convened by 451.

557. Applied Combustion (3) II 1990-91 Lami-

nary: transient, premixed and diffused flames; fluid combustion in furnaces, propellent combustion, air breathing engines, and fire safety. P 306. May be convened by 451.
245a-245b. ** Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P: 103b and 104b, or 105b. Both 244a and 244b are offered each semester.

245a-245b. ** Organic Chemistry Laboratory (3-3) II General principles of organic chemistry. P: 103b and 104b, or 105b. Both 243a and 243b are offered each semester.

243a-243b. ** Organic Chemistry (3-3) I II General experimental methods for the synthesis of organic compounds and an introduction to the laboratory techniques of organic chemistry. 3L. Not open to B.S. chem. majors except with permission of dept. P: CR. CR: 241a-241b or 242a-242b. Both 243a and 243b are offered each semester.

245a-245b. ** Organic Chemistry Laboratory (2-2) Similar to 243a-243b. Designed for chem. majors and chemical engineers. 6L. P: CR. 241a-241b or 242a-242b.

302. Scientific Glassblowing (1 to 2) I Methods of design and construction of scientific glass apparatus. 6L. P: CR.

366. Seminar a. Reports on Current Research (1) I P. 103b or 104b.

369H. Honors Seminar (3) II P. 245b.

400a-400b. Chemical Measurements Laboratory (2-2) I II Lab. work in modern chemical measurements and instrumentation. 6L. 400a: P: CR for majors. S: E: 107 or 172. 400b: P: CR. Writing-Emphasis Course (400a). P: satisfaction of the upper-division writing-proficiency requirement (see Writing-Emphasis Courses section in the Academic Guidelines section of this catalog).

410. Inorganic Chemistry (3) I Fundamentals of inorganic chemistry. P: 480a or CR.

411. Inorganic Chemistry (3) II Standard inorganic lab. preparations, including coordination compounds, isomeric compounds, and compounds typical of the groupings of the periodic table. P: 243a or 243b. Both 243a and 243b are offered each semester of the fall term beyond the first year.

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, 325 or 322, Phys. 102b or 103b, 180b.

440. Qualitative Organic Analysis (3) II 1989-90 The systematic classification and identification of organic compounds. 6L. 241b, 242b, 243b or 243b, 325 or 322. 424 or 425a. P: 241b, 242b, 243b or 243b.

450. ** General Biochemistry (5) I (Identical with Bioc. 460) May be combined with 460a.

450a-460b. Physical Chemistry (3-3) Fundamental principles of physical chemistry. P: 103b and 104b, or 105b; Math. 125b; Phys. 102b or 103b or 116 or CR.


503. Intermediate Physical Chemistry (3) I Survey of physical chemistry, including thermodynamics, structure, and electronic spectroscopy. P: 480a.

504. Intermediate Inorganic Chemistry (3) I Principles of modern inorganic chemistry, including synthesis, structure, physical properties, and reactivity of inorganic compounds and materials.

510a-510b. Advanced Inorganic Chemistry (3-3) I II Survey at the advanced level of the nature of inorganic chemistry. P: 480a.

512. Advanced Inorganic Preparations (2 to 4) II Modern inorganic syntheses, including instruction in the use of high pressure, temperature, and microwave techniques in the manipulation of unstable compounds. 6L. P: 241b, 480b.

517. Structural Chemistry (3) II 1990-91 Introduction to the determination of structures of inorganic compounds using X-ray crystallography; the evaluation of structural information; current topics in structural chemistry. 2R, 3L.


521. Advanced Instrumental Analysis (3) II Topics in spectrophotometry, emission spectroscopy, chromatography, and electroanalysis, principles of instrumentation and data acquisition at an advanced level. P: 424, 480b.

522. Electroanalytical Methods (3) II 1990-91 Topics in electrochemistry and electroanalysis, including topics on electrochemical equilibria and kinetics, polarotometry, voltammetry, amperometry, coulometry, chromatography, and modern cyclic and pulse methods. P: 480a.


524. Chemical Instrumentation (4) I A data acquisition experiment control by analog and digital techniques; design of chemical instrumentation. 3L. P: 424.

525. Chemistry of Metal Complexes (3) I 1989-90 An introduction to the application of chemical analysis in metal complexes and in the synthesis of metal complexes. P: 424 or CR. 4L. P: 424.


528. Advanced Instrumental Laboratory (2) II Laboratory experiments in spectrophotometry, emission spectrometry, chromatography and electroanalysis. 6L. P: CR. 3L. P: 424.

530. Radiochemistry and Radiation Detection (3) I (Identical with N.E.E. 530).

540. Organic Syntheses (3) I Organic reactions and the methods by which they are applied to problems in organic chemistry. P: 241b, 480b.


560. ** General Biochemistry (5) I (Identical with Bioc. 560) May be combined with 561.

561a-561b. Introduction to Biochemical Literature (1-1) (Identical with Bioc. 561a-561b).

562a-562b. ** Biochemistry (4-3) I II Survey of the principal classes of organic molecules. P: 241b, 562a-562b. May be combined with 462a-462b.

565. Enzymes (3) II 1990-91 (Identical with Bioc. 565).


572. Metabolic and Hormonal Control of Cell Function (3) I 1990-91 (Identical with Bioc. 572).

575. Biochemical Techniques (3) I (Identical with Bioc. 575).


579. Molecular Spectroscopy (3) I (Identical with Bioc. 579).

580. Introduction to Quantum Chemistry (3) I An introduction to quantum mechanics, with applications to atomic structure and spectra, and the nature of chemical bonding and molecular structure. P: 480b.


582. Statistical Thermodynamics (3) I Advanced concepts in both classical and modern statistical mechanics with emphasis on ideal gases and liquid and solid solutions, equations of state and elementary solution theory. P: 480b.


585. Practical NMR Spectroscopy (3) I The basic principles of Fourier transform nuclear magnetic resonance (NMR) spectroscopy; the application and interpretation of NMR spectra. P: a course in physical chemistry.

586. Introduction to Molecular Spectroscopy (3) I Modern molecular spectroscopy including rotational, vibrational, and electronic spectroscopy and their various combinations. P: 480a-480b or consult department before enrolling.


599. Inorganic Compounds (3) II 1990-91 Compounds containing carbon-to-metal bonds, with emphasis on those of the transition elements, and the determination of their structures. P: 480a-480b or consult department before enrolling.

615. Coordination Chemistry (3) I 1989-90 Selected topics in the area of coordination compounds of transition metals, with particular emphasis on ligand field theory, the symmetry aspects of the spectral properties of transition metal complexes and their magnetic behavior. P: 480a or CR.


618. Computation in Chemistry (3) Rtp I (Rtp II) 1989-91 Applied computational methods in chemical research, including approximate and ab initio electronic structure methods, molecular mechanics, and modeling of complex organic molecules. P: 480 or consult department before enrolling.

Civil Engineering and Engineering Mechanics (CE/EM)

Civil Engineering Building, Room 206
(602) 621-2266

Associate Professors Gary L. Amy, Muniram Budhu, Mohammad R. Ehsani, Donald B. Hawes (Emeritus), Edward A. Nowatzki, Margaret S. Petersen, Robert H. Worton
Assistant Professors Robert G. Arnold, Curtis W. Bissell, Raymond J. Drouin, Fabio D. Kiousis, Tribikram Kundu, Bruce E. Logan, Harid Saadatmanesh

The department offers the Bachelor of Science in Civil Engineering, and the Master of Science 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

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: probability and statistics, air pollution, water quality, computer programming and engineering, construction engineering, hydraulic engineering, sanitary and environmental engineering, structural engineering, soils engineering, transportation engineering, information engineering, 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 spreadsheets, word processors, and basic software for civil engineering applications. 1R, 1L. Open to majors only. P, S.I.E. 170.


214. Statics (3) I I S GRD Equilibrium force systems; geometry; geometric properties of areas and solids; friction; virtual work; potential energy. Honor section is available. P, S.I.E. 170.

217. Mechanics of Materials (3) I I S GRD Material behavior; relationship between external forces acting on elastic and inelastic bodies and the resulting behavior; stress and deformation of beams, bars, shafts, and structures; stress and strain; combined stresses; columns. Honor section is available. P, S.I.E. 170.

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. P, 110, Math. 118.

300. Civil Engineering Projects (3) I Individual design study in fields of the student's major emphasis or completion of a research and a development project under direct staff supervision. P, 110.


330. Structural Engineering I (3) I I S Analysis of statically determinate structures, including beams, frames and trusses; influence lines, virtual work moment, conjugate beam; Beil's theorem and Castiglione's theorem. P, 217.

331. Structural Engineering II (3) I I S Analysis of statically indeterminate beams, frames, and trusses; use of computer programs. P, 310, CR. 302.


356. Transportation Engineering (3) I I S GRD Basis for planning, design, and operation of transport facilities; transport modes discussed include mass transit, commuter cars, bicycles, and pedestrian movement. P, 251, 214.


380. Materials Laboratory (2) I I S Mechanical properties of concrete, composite aggregates, steel and other metals as engineering materials. 1R, 3L. P, 217, Chem. 103b.

394. Practicum (1) I Students are urged to take this trip in the yr. J, fee not to exceed $40, determined and collected when trip is arranged.


417. Strength in Materials II (3) I I S Dimensional analysis of stress and strain, Gas-
423. Hydrology (3) I Discussion and analysis of major topics of the hydrologic cycle and their interrelationship, such as rainfall, infiltration, evaporation, and runoff. Statistical and probabilistic methods in water supply and flood hydrology. P. 321. (Identical with Hydr. 423) May be convened with 523.

424. Hydraulic Design for Civil Engineering Design (3) II Hydraulic criteria for design of bridges, stilling basins, grates, open-channel distribution and collection systems, sediment-transport effects, pipe networks and pumping systems. P. 322. May be convened with 524.

436. Advanced Structural Design in Steel (3) I Advanced problems in the analysis and design of steel structures: static and dynamic lateral and vertical loads; braced and moment-resistant frames; welded and bolted connections; computer methods. P. 336

437. Advanced Structural Design in Concrete (3) II Advanced problems in the analysis and design of concrete structures, design of slender columns and one- and two-way slabs; moment-resisting frames; computer analysis of multistory buildings; introduction to design for torsion and seismic forces; use of structural computer programs. P. 337

440. Field Surveying (3) II Settlement and bearing capacity of shallow and deep foundations; beam on elastic foundation; design of footings and pile foundations; foundations on metastable soils; the use of computer codes for foundation problems. P. 340. May be convened with 540.

441. Stability Problems in Geotechnical Engineering (3) I Stability analysis for earth slopes, retaining structures, circular or polygonal cuts, and composite-surface methods; analyses for static and steady-flow conditions; earth pressure theories and calculations for general problems; design of braced and tie-back shoring systems; design of reinforced earth walls; computer-aided analysis and design of shallow and deep foundations. May be convened with 541.

452. Surveying Engineering (3) I CDT Solar and Polaris observations; mineral, public, and private land surveys; route surveying, curves, and earthwork; photogrammetry, and modern engineering surveys. 2R, 3L. P. 251. May be convened with 552.

454. Photogrammetry (3) II Reading, interpretation, plotting and construction of aerial photographs; stereoscopic principles and their application in the production of planimetric and topographic maps. 2R, 3L. Field trips. P. 251, Math. 125a. May be convened with 554.

455. Irrigation Engineering (3) II (Identical with A.En. 455) May be convened with 555.

458. Drainage of Irrigated Lands (3) II (Identical with A.En. 458) May be convened with 558.

462. Bituminous Materials (3) I Manufacture and evaluation tests for the control of bituminous materials used in highway construction and maintenance. 2R, 3L. P. 340 or consult department before enrolling. May be convened with 562.

463. Traffic Engineering (3) I Methods for the efficient and safe operation of transport facilities through analysis of capacity, safety, speed, parking, and volume data. P. 360. May be convened with 563.

464. Airport Planning and Design (3) II Location, analysis and design of airports and airport facilities, including aircraft characteristics, site selection, capacity and terminal design. Field trips. P. 360. May be convened with 564.

465. Project Planning and Modeling (3) II Use of systems analysis in contemporary planning, including consideration of social, environmental, and physical constraints, study of growth patterns for development and use of computer-based simulation and gaming as an engineering and planning tool. P. senior standing in civil engineering or consult with department. May be convened with 565.

468. Urban Transportation Planning (3) II CDT Transportation planning in relation to urban development; techniques and procedures for developing long-range regional plans. P. 360 or consult department before enrolling. (Identical with Ping. 468) May be convened with 568.

471. Water Quality Control (3) II Aspects of water resource control; physical, chemical and biological factors in water and wastewater treatment and natural purification. 2R, 3L. Degree credit available for nonmajors only. P. Chem. 103b. (Identical with Hydr. 471 and Ws. M. 471) May be convened with 571.

472. Introduction to Hazardous Wastes (3) I II Management, planning, legal and engineering aspects of liquid and solid hazardous waste treatment and disposal. P. 370 or 471 or consult department before enrolling. May be convened with 572.

478. Introduction to Finite Element Methods (3) III For a description of course topics, see 402. Graduate-level requirements include research on a single aspect of the finite element method. May be convened with 402.

481. Construction Methods (3) II Introduction to estimating; construction planning and methods; selected topics of fundamental importance to construction; including the Critical Path Method and PERT. 2R, 3L. P. 336 or 337, 380 or CR.

486. Fundamentals of Industrial Hygiene (3) I (Identical with O.S.H. 486) May be convened with 586.

487. Advanced Industrial Hygiene and Safety (3) II (Identical with O.S.H. 487) May be convened with 587.


502. Advanced Numerical Methods in Subsurface Flow (3) II For a description of course topics, see 427. Graduate-level requirements include research on a single aspect of the subsurface flow analysis. May be convened with 427.

517. Strength of Materials II (3) For a description of course topics, see 431. Graduate-level requirements include research on a single aspect of the strength of materials. May be convened with 431.

521. River Engineering (3) II River geomorphology, stabilization and rectification of alluvial rivers, canalization, waterborne commerce, impacts of river engineering works. P. 322.

522. Hydropower Engineering (3) II Hydrologic analysis, evaluation of site potential, turbine selection, power plant civil works, project feasibility. P. 322, 423 or 523.

523. Hydrology (3) I For a description of course topics, see 423. Graduate-level requirements include a project paper. P. 321. (Identical with Hydr. 523) May be convened with 423.

524. Hydrologic Engineering Design (3) II For a description of course topics, see 423. Graduate-level requirements include a research paper and/or a design project. P. 322. May be convened with 424.

525. Water Quality Modeling (3) I Deterministic and stochastic modeling of surface water systems with particular emphasis on water pollution and modifications of Streeter-Phelps technique for predicting oxygen levels in streams. P. 321. (Identical with W.R.A. 525)

526. Water Quality Management (3) II (Identical with W.R.A. 526)

529. Analysis by Hydraulic Models (3) II 1950-91 types and theories of models. Advanced level requirements include the development of computer codes for the solution of specified foundation problems or an in-depth research project. May be convened with 440.

532. Advanced Strength of Materials (3) II Selected topics in advanced mechanics of deformable bodies.

533. Plastic Analysis and Design (3) II Material and member behavior to full plasticization; redistribution of forces; plastic design of continuous beams and frames; influence of axial and shear forces; deflections and rotations; alternating plasticity; shakedown analysis. P. 436 or consult department before enrolling.

536. Computer-Aided Geometric Design (3) II (Identical with A.M.E. 536)

537. Prestressed Concrete Structures (3) II Behavior, analysis, and design of statically determinate and indeterminate prestressed concrete structures. P. 337.

540. Foundation Engineering (3) I For a description of course topics, see 441. Graduate-level requirements include the development of computer codes for the solution of specified foundation problems or an in-depth research project. May be convened with 440.

541. Stability Problems in Geotechnical Engineering (3) II 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.

544. Soil Stabilization (3) II Purpose of soil stabilization: stabilization using mechanical means, cement, asphalt, lime, salt and resins; factors governing stabilization techniques; special stabilization methods.

546. Geotechnical Engineering (3) II For a description of course topics, see 446. Graduate-level requirements include a comprehensive survey project. P. 251. May be convened with 446.

554. Photogrammetry (3) II For a description of course topics, see 454. Graduate-level requirements include a comprehensive survey project. P. 251. May be convened with 454.

555. Irrigation Engineering (3) II (Identical with A.En. 555) May be convened with 455.

560. Ground-Water Management (3) II (Identical with W.R.A. 560)

562. Bituminous Materials (3) 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 comprehensive survey project or project. P. 360. May be convened with 463.

564. Airport Planning and Design (3) II 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 consultation 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 Pollution (3) II I For a description of course topics, see 471. Graduate-level requirements include a research paper or project on some aspect of water quality control. P. Chem. 103 or consult with Hyg. 571 and Ws. M. 571. May be convened with 471.

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, soil, and soil systems, and microbial degradations processes in the natural environment.

575. Microbiology of Environmental Engineering (3) I Application of microorganisms in the treatment of hazardous wastes and their application to natural and engineered systems for upgrading water and wastewater quality. CR, 576R.

576. Environmental Chemistry Laboratory (1) Laboratory exercises emphasizing the chemistry of natural waters, water and wastewater treatment processes. Chemical thermodynamics, equilibria and kinetics are applied to environmental systems. 3L, CR, 576R.

577. The Physiological Bases of Microbial Treatment Processes (3) II Principles of bacterial physiology including morphology, metabolism and genetics. Applications of importance to waste treatment and environmental quality. P. 370 or consult with department.

578. Introduction to Hazardous Wastes (3) I For a description of course topics, see 478. Graduate-level requirements include a report on an in-depth review of interdisciplinary aspects of controlled hazardous waste (with environmental 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 paper on a particular aspect of air pollution. May be convened with 479.

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. Sanitary and Environmental Engineering (1-3) I (1-3) b. Geomechanics/Mechanics (1) (Rpt./2) II (Identical with E. M. 596)

613. Theory of Elastic Stability (3) I (Identical with O.S. H. 596)

614. Channel Transport (3) I (Identical with O.S. H. 596)

621. Sediment Transportation (2) I Erosion, transport, and deposition of sediments by flowing water: sediment properties and their measurement; bed load and suspended load movement, river behavior and control. P. 321, 567.

622. Open Channel Hydraulics (3) I Continuity, energy, and momentum principles applied to steady and unsteady flow in open channels: channel controls, transitions, floo, and models. P. 322.

623. Flow through Hydraulic Structures (3) I 1989-90 Analysis of industrial and subsurface flows through culverts, bridges, spillways, stilling basins, transitions, bends, and long-term behavior of inlets, pumps, and turbines. P. 322.

624. Reinforced Concrete Members (3) I Inelastic behavior of beams and columns; short- and long-term behavior of concrete; combined bending, shear, and torsion in beams; behavior under load reversals; analysis and design of beam to column connections and shearwalls. P. 437 or departmental approval.

637. Soil-Structure Interaction (3) I 1989-90 Principles of soil mechanics are applied to environmental systems. CR, 576R.

640. Advanced Soil Mechanics (3) I Site investigation and in situ testing; shear strength of soils; analysis and design of shallow foundations, pile foundations, sheet-piles, bulkheads. P. 340.


673L. Advanced Water-Wastewater Treatment Systems (3) I II 1989-90 Study of geometric elements of streets and highways, design and analysis for traffic flow of streets and highways, design of traffic control systems, analysis and design of highway traffic, evaluation of safety, P. 463 or 563.

674. Urban Public Transportation Systems (3) I 1990-91 Development, operation, management, financing, evaluation and traffic demand estimation for urban public transportation systems. (Identical with Ping. 565)

673R. Advances in Water and Waste Reclamation and Reuse (3) II Theory, application, and evaluation of currently developing technologies for waste reclamation and reuse. P. 675.

673L. Advanced Water-Wastewater Treatment Laboratory (1) I II Experiments in chemical, physical, and biological treatment of wastewater designed to illustrate treatment design principles in that subject area. 3L, CR, 673R.

675. Toxic and Hazardous Waste Treatment (3) II The process engineering fundamentals from which treatment strategies and process treatment train can be synthesized to control toxic and hazardous wastes. Both traditional and modern technologies will be covered. Emphasis will be placed on integrated waste, 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 II Experiments in biological treatment of wastewater and anaerobic digestion designed to illustrate treatment principles. 3L, CR, 675R.

676L. Advanced Water-Wastewater Treatment System Design (3) I II Design and operation of water treatment plants; physicochemical treatment processes for potable water production. CR, 676R.

677. Water Treatment Laboratory (1) I II Experiments in advanced water treatment developed to illustrate design principles in the potable water production field. CR, 676R.

Engineering Mechanics

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 II (Identical with C.E. 502) May be convened with 402.

504. Continuum Mechanics (4) I 1989-90 Analysis of deformation, principal stresses and strains, velocity fields, and rate of deformation; constitutive and field equations; elementary plasticity.

508. Fracture Mechanics (3) I II 1990-91 Modes of fracture; energy balance; Griffith energy release; crack tip plasticity; J-integral; fatigue
Cracks; analytical and numerical techniques; constitutive models for damaged materials. P. 505 or consult department.

511. Advanced Finite Element Analysis (3) II Approximate solutions. Lagrangian and Hermitian interpolation, isoparametric elements and numerical integration; mixed; hybrid and boundary element methods, nonlinear analysis, nonlinear problems in solids under static and dynamic loads, time integration schemes; fluid and heat flow coupled problems and mass transport. P. 402 or consult department before enrolling. (Identical with A.M.E. 511)

539. Advanced Structural Mechanics (3) (Identical with A.M.E. 539)


603. Elasticity Theory and Application (3) I General three-dimensional equations of elasticity, problems in plane stress, plane strain, extension, torsion, energy and residual (Galericin methods); applications to rings, beams, plates, torsion and other problems. P. C.E. 217, 202.

604. Plasticity Theory and Application (3) II Yield conditions and flow rules for perfectly plastic and strain hardening materials; application to various elastic-plastic problems such as bars, cylinders and plates; effect of volume change behavior, isotropic and anisotropic hardening plasticity with expanding/contacting boundary segments. P. C.E. 217, 202.


635. Matrix Methods in Structural Mechanics (3) I Formulation of the force and displacement methods; the finite element method, with application to bar and beam, and plate and shell structures; organization and development of computer programs; linear and nonlinear systems. P. C.E. 331 or A.M.E. 436.

637. Plates and Shells (3) I Theory and analysis of circular, rectangular and continuous plates by classical, numerical and approximate methods; introduction to in-plane forces and shells. P. C.E. 336 or A.M.E. 434.


Classics (CLAS/GRK/LAT)

Modern Languages Building, Room 371 (602) 621-1699

Professors Norman Austin, Albert Leonard, Jr., Garnet D. Percy (Emeritus), David Soren

Associate Professors Robert P. Smith, John J. Worthen

Assistant Professors Margaret A. Fusco, Holt Jackson, Richard C. Jensen, Thomas D. Withrow

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 (1) may be used toward a supporting minor in other graduate programs. Requirements for the B.A. are as follows:

- The major in Latin: 34 units, including Grk. 101, 102, 201, 202, 19 units of Greek at the 400 level, and Clas. 250a-250b.
- The major in Latin: 34 units, including Lat. 101, 102, 201, 202, 20 units of Latin at the 400 level, and Clas. 250a-250b.
- 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 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 (3) Introduction to ancient Greek for students of the Bible and of the classical authors.

102. Elementary Modern Greek (3) Development of skills in conversation, composition, and reading with emphasis upon aural/oral skills.

103. Intermediate Modern Greek (3) Selection from classical Greek chosen in accordance with the student's needs and interest.


105. Intermediate Classical Greek (4) Second semester of intermediate Greek. May be convened with 104.

106. Intermediate Modern Greek (4) Pronunciation and vocabulary of modern Greek; development of skills in conversation, composition, and reading; emphasis on aural/oral skills. P. 103.


402. Greek Reading Course (3) May be convened with 502. Writing-Emphasis Course.

409. Greek Composition (3) May be convened with 509. Writing-Emphasis Course.

412. Readings in Greek Philosophy (3) Rpt.] Extensive readings in Greek in one of the following areas: Greek philosophy; the pre-Socratics; Plato's ethics and epistemology; Aristotle's Nicomachean Ethics. P. 202. (Identical with Phil. 412) May be convened with 509. Writing-Emphasis Course.

421. Greek Lyric Poetry (3) Study in Greek of the early Greek lyric writers from Archilochus to Bacchylides. P. 202. May be convened with 509. Writing-Emphasis Course.

422. Readings in Greek Drama (3) Rpt.] Study 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.


430. Readings in Greek Historians (3) (Identical with Ger. 430) Selections from Herodotus and Thucydides with an introduction to the critical literature. Reading P. 202. May be convened with 530. Writing-Emphasis Course.

431. Greek Orators (3) Readings in Greek from Lysias, Isocrates and Demosthenes as sources for ancient rhetoric, politics, and private life. P. 202. May be convened with 531. Writing-Emphasis Course.


497. Workshop in Techniques of Foreign Language Teaching (1) I (Identical with Ger. 497b, which is home)

501. Greek Composition (3) May be convened with 409. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. (Identical with Phil. 512) May be convened with 412.

521. Greek Lyric Poetry (3) 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 421.

522. Readings in Greek Drama (3) 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 424.

530. Readings in the Greek Historians (3) Rpt.] For a description of course topics, see 430. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 432.

531. Greek Orators (3) (Identical with 531) Readings in Greek from Lysias, Isocrates and Demosthenes as sources for ancient rhetoric, politics, and private life. P. 202. May be convened with 531. Writing-Emphasis Course.

532. Literature of Archaic Greece (3) For a description of course topics, see 532. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 532.

560. Greek Language and Literature (3) Open topics. P. 3 units of 400-level Greek. May be convened with 560.

Latin (LAT)

101. Elementary Latin (4) The Latin language presented as far as possible from the point of view of its influence on English.
110. The Study of English Words (3) Vocabulary building through the systematic study of English words derived from Latin and Greek. Readings in translation.


115. Latin Love Elegy (3) [Rpt.] Readings in Latin literatu on its relationship to the social, religious and political needs of the culture. A two-week study in Greece. Five-week tour in Greece. Fee.


122. Roman Satire (3) [Rpt.] Readings in Latin. May be convened with 518. Writing-Emphasis Course.


125. 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 Verres Orations) as well as selections from his letters, P, 202. May be convened with 525. Writing-Emphasis Course.

126. Greek Mythology (3) [Rpt.] The myths, legends, and foktales of the Greeks and their origins. Readings in translation. (Identical with Hist. 126)

127. Ancient History: Greek History (3) [Rpt.] (Identical with Hist. 204) May be convened with 526. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 426.

128. Seminar a. Latin Literature (3) Open to majors only. 

Clas. 105. Approaches to Literature (3) [Rpt. /6 units] May be convened with 486. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Latin. May be convened with 488.

501. Latin Reading Course (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 401. 

502. May Composition (3) 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 402.

510. Classical Philology (3) (Identical with Clas. 510)


513. Augustan Literature (3) 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.
225. Argumentation (3) II Study of the philosophy, theory, and practice of argumentation; analysis and comparison of classical and contemporary theories; critical examination of argument in public policy, legal, and debate settings.

280. The Nature of Inquiry in Communication (3) Introduction to communication research methods to enable students to become more qualified consumers of communication research literature.

300. Introduction to Communication Theory (3) Origin and development of basic concepts in communication theory and research; survey and analysis of theories and models in research. Writing-Emphasis Course. P. Satisfactory completion of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

399H. Honors Proseminar (3) I

403. Theories of Small Group Communication (3) I Consideration of social control and deviance in groups from the perspective of communication behavior. May be convened with 503.


409. Theories of Mass Communication (3) II An in-depth analysis of theories of the social effects of various mass media sources on society. May be convened with 503.

411. Communication and Conflict Management (3) II Consideration of theory and research pertaining to the handling of conflict across diverse contexts. May be convened with 551.

412. Organizational Communication (3) I (3) Analysis of interpersonal and group communication practices affecting goal achievement in business, governmental, and professional organizations.

415. Nonverbal Communication (3) I II 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 expression, regulation of interaction, social influence). May be convened with 517.

417. Relational Communication (3) I II III 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.

420. Communication and the Legal Process (3) I 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 Communication (3) I II Research and analysis of communication principles and practices in contemporary campaigns for elective office. May be convened with 521.

423. Topics in Rhetorical Theory and Criticism (3) [Rpt./1] Intensive study and analysis of the works of three rhetorical theorists. Each semester will focus on a specific era or perspective. May be convened with 523.

425. Theories of Argumentation (3) I Inquiry into the philosophical and theoretical assumptions and methods in the field of argumentation. P. Satisfactory completion of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

508. 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 Types of poetry analyzed, with emphasis on their differentiation for oral presentation; preparation for and presentations of a public recital. P. 106.

462. Communication and Human Relations (3) I II For a description of course topics, see 409. 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 450.

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 Human Relationships (3) 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 LI.S. 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 the development of interpersonal relationships.

620. Communication Theory II (3) II An overview of historical and theoretical perspectives on the intercommunication strategies used in interpersonal to mass media contexts.

621. Theory Construction in Communication (3) I II 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 (3) I S a. Political Behavior (3) [Rpt./2] II (Identical with Pol. 596, which is home)

700. Graduate Seminar (3) I II For a description of course topics, see 409. 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 409.

709. Theories of Mass Communication (3) II For a description of course topics, see 409. 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 409.

711. Communication and Conflict Management (3) II For a description of course topics, see 417. 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 417.

717. Relational Communication (3) II For a description of course topics, see 417. 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 417.

720. Communication and the Legal Process (3) I II For a description of course topics, see 420. Graduate-level requirements include an in-depth research paper on some single aspect of communication and social structure in some legal context. (Identical with Soc. 520) May be convened with 420.

721. Political Communication (3) I II For a description of course topics, see 421. Graduate-level requirements include an in-depth research project on some single aspect of communication and social structure in some legal context. May be convened with 421.

723. 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 on some single aspect of communication and social structure in some legal context. May be convened with 423.

Comparative Literature and Literary Theory (CPLT)

Modern Languages Building, Room 445 (602) 621-1780

Committee on Comparative Literature and Literary Theory (Graduate)
The Committee on Comparative Literature and Literary Theory offers programs leading to the Master of Arts and the Doctor of Philosophy degrees. Comparative literature and literary theory. The cooperating departments include English, French and Italian, Spanish and Portuguese, German, Russian and Slavic Languages, Classics, Philosophy, and History. May be convened with M.I.S. 421.

503a-503b. Introduction to Comparative Literature and Literary Theory (3-3) Major theories of East and West. 503b: Non-Western theories of literature (Amerind, Chinese, Japanese, Indian, and Arabic). (503a is identical with Engl. 503a; 503b is identical with Or.S. 503b).

505. Modern Theories of Criticism (3) I Twentieth-century theories of criticism most apposite to the study of literature, such as semiotics, structuralism, and postmodernism.

561. Linguistics and the Study of Literature (3) I, II An overview of the study of language as it bears on the study of literature. May be convened with Math. 443.) May be convened with 588.

562. Modern Theories of Criticism (3) II Continuing the study of modern theories of criticism. May be convened with 561.

115. Computer Science Principles (4) I II S Algorithms, programs and computers; problem solving; the computer program as a document, and the structure of computer science. May be convened with Math. 402.

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.


301. *Program and Data Structures (3) I S (Identical with M.I.S. 301)

327. Comparative Programming Languages (3) I I I 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 or C.E.E. 271b. (Identical with M.I.S. 327).

331. *Data Management Systems (3) I I S Identical with M.I.S. 331


403. Simulation Modeling and Analysis (3) I II The design and implementation of modeling and simulation programs in high-level computer languages such as FORTRAN. (Identical with M.I.S. 403) May be convened with 503.

412. *Mathematical Programming and Applications (3) II (Identical with M.I.S. 412)

420. Software Tools (3) I II The design and implementation of tools that assist in program development, such as file utilities, editors and text processors. Includes a substantial program development project. P, C.E.E. 271b; C.R. 430.

433. Theory of Graphs and Networks (3) I (Identical with Math. 443) May be convened with 534.


577. Principles of Operating Systems (3) I Concepts of modern operating systems; concurrent processes; process synchronization and communication; resource allocation; kernel structure and system resources. P, 237 or C.E.E. 271b; CR. 430.

427. Continuous-System Simulation (3) I (Identical with E.C.E. 427) May be convened with 547.

473. Theory of Computation (3) I II Mathematical preliminaries; finite automata, regular expressions, applications; context-free grammars, pushdown automata, parsing; computational models; Turing machines. P, 327, 430. (Identical with Math. 473) May be convened with 573.

474. Digital Logic Design (3) I I I (Identical with E.C.E. 474) May be convened with 574.

475a-475b, 475c. Mathematical Principles of Numerical Analysis (3-3) (Identical with Math. 475a-475b).

476. Computer Architecture (3) I An overview of computer systems from basic components to complete systems. Circuits; CPU, memory, and I/O organization; complete systems from microcomputers to supercomputers. P, 452. May be convened with 575.

479. Game Theory and Mathematical Programming (3) I 1989-90 (Identical with Math. 479) May be convened with 579.

481. Computational Linguistics (3) I Identical with Ling. 481) May be convened with 581.


510. Software Design and Implementation (3) I The specification, design, implementation and documentation of complex software systems. Includes a large programming project. P, 327, 430.

520. Principles of Programming Languages (3) I Global semantics of algorithmic languages, including scope of declarations, data types, retention, block structure, binding time, subroutines, coroutines, extensibility; implementation issues. P, 327, 430.

521a-521b. Advanced Systems Modeling and Simulation (3) I II (Identical with M.I.S. 521a-521b)

522. Principles of Concurrent Programming (3) I Fundamental concepts of concurrent programming; synchronization mechanisms based on shared variables and message passing; systematic development of correct programs; paradigms for distributed programming. P, 452, 525.

525. Principles of Computer Networking (3) I II Theory and practice of computer networks, emphasizing the principles underlying the design of computer networks and the role of the communication systems in distributed computing. Topics include data representation, channel semantics, synchronization, resource naming, and resource sharing. P, 452, 510.
530. Software Tools (3) I II For a description of course topics, see 430. Graduate-level requirements include additional and more challenging programming projects and different examinations. P. 271b, E.C.E. 271b, 342. May be convened with 430.

533. Computer Graphics (3) II Theory and practice of computer graphics; design and analysis of graphic algorithms, graphics hardware and device independence, graphics software, user interfaces, applications. P. 310, Math. 215.

541a-541b. Computer-Aided Information Systems Analysis and Design (3-3) (Identical with M.I.S. 541a-541b)

543. Theory of Graphs and Networks (3) II (Identical with Math. 543) May be convened with 443.

545. Analysis of Algorithms (3) I Time, space complexity; recurrences; algorithm design techniques, lower bounds; graph, matrix, set algorithms; sorting, fast Fourier transform, arithmetic complexity; intractable problems. P. 342, 473, Math. 362.

550. Strings and List Processing (3) I For a description of course topics, see 450. Graduate-level requirements include more extensive problem sets and different examinations. P. 342, 473, 413. May be convened with 450.

552. Advanced Operating Systems (3) II Operating system design, implementation and modeling, deadlock and memory management models; protection mechanisms, operating systems for parallel and distributed systems. P. 452, 510.

553. Translators and Systems Software (3) II Basic concepts of compilation of block-structured languages. Topics include lexical analysis, top-down and bottom-up parsing, semantic analysis, syntax-directed code generation, debugging. P. 473, 510.

555. Principles of Compilation (3) I Detailed study of more advanced aspects of compilation. Topics include translator writing systems, attribute grammars, flow analysis and optimization, register allocation, code generation. P. 553.


571a-571b. Digital Systems Design (3-3) (Identical with E.C.E. 571a-571b)

572. Continuous-Time Simulation (3) I (Identical with E.C.E. 572) May be convened with 472.

573. Theory of Computation (3) I II For a description of course topics, see 473. Graduate-level requirements include more extensive problem sets, different examinations, and additional readings from the literature. P. 227, Math. 243. (Identical with Math. 573) May be convened with 472.

574. Digital Logic Design (3) I II (Identical with E.C.E. 574) May be convened with 474.

575a-575b. Numerical Analysis (3-3) (Identical with M.I.S. 575a-575b)

576. Computer Architecture (3) I For a description of course topics, see 476. Graduate-level requirements include additional items on computer network, and additional readings on advanced architectures. P. 452. May be convened with 476.

578. Computational Methods of Algebra (3) II (Identical with Math. 578)

579. Game Theory and Mathematical Programming (3) II 1989-90 (Identical with Math. 579) May be convened with 479.

588. Computational Linguistics (3) I (Identical with M.I.S. 588) May be convened with 488.

620. 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.

630. Advanced Topics in Software Systems (1-3) (Rpt./12 units) I Problems in design and development of large systems of programs; specific topics to be determined by current literature and faculty and student interest.

635. Advanced Topics in Algorithm Analysis (1-3) (Rpt./12 units) II 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. Microprocessors, Minicomputers and Real-Time Distributed Processing (3) II (Identical with E.C.E. 673)

674. Sequencing, Circuits and Automata (3) I (Identical with E.C.E. 674)

696. Seminar
   a. Foundations of Computing (3) (Rpt./2) I S P, Ph.D. candidate or consult department before enrolling.

Consumer Studies
(See Family and Consumer Resources)

Correctional Administration
(See Management and Policy)

Counseling and Guidance
(See Family and Consumer Resources)

Creative Writing
(See English)

Criminal Justice Administration
(See Management and Policy)

Critical Languages (CRL)
1230 N. Park Avenue, Suite 214 (602) 621-3387

Committee on Critical Languages

Professors David Chisholm (German), Miguel Mendez (Spanish and Portuguese), Associate Professors Alexander Dunkel, Director, (Russian and Slavic Languages), Marie Chan (Oriental Studies), Richard Jensen (Classics)

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, Swedish, and Ukrainian. Additional languages (Albanian, Basque, Dutch, Korean, Polish, Russian, Slavic, Turkish, Vietnamese, Zulu) 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 I S Introduction to the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 6L, Fee. P. 101.

102. Elementary Language Study (4) (Rpt.)* II S Introduction to the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 6L, Fee. P. 101.

201. Intermediate Language Study (4) (Rpt.)* I I S Continuing study of the language with emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 6L, Fee. P. 101.

202. Intermediate Language Study (4) (Rpt.)* 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.

*Course may be repeated if language is different each time.

Dance (DNC)
Gittings Building, Room 14 (602) 621-4698

Committee on Dance
Professor John M. Wilson, Chairperson
Associate Professors Isa Bergsohn, Jory Hancock, Nina Janik
Assistant Professors Douglas Nielsen

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 Drama, the Committee on Dance offers programs of advanced study which lead to Master of Arts and Master of Fine Arts degrees in dance with a dance concentration. Interested students should consult the listings for Dance and Drama in the Graduate Catalog.

The major: Dance majors must audition for placement in dance technique courses. For information regarding the placement session, please contact the Committee on Dance. The following courses must be taken: Dnc. 143, 240a-240b, 241a-241b, 245a-245b, 259, 297, 340a-340b, 370, 400a-400b, 410b, 414a-414b: 431a-431b, 432b, 433b, 434b, 436, 439a-439b, 445, 490b, Mus. 107, 108, Phil. 111; any one of Dram. 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, drama, 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, 346, 349a-349b, must be taken in residence at the University of Arizona.

Honors: The Committee participates in the Honors Program.

100. Looking at Dance (3) I Origins of dance as human expression in ritual, social, and theatrical context. Twentieth century developments in ballet, modern dance, and contemporary dance. Open to nondance majors only.
112. Ballet 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
  c. Intermediate Modern Dance (2) I II S

175. Theatre Dance (1) I II S Jazz movement styles for the beginning dancer; basic steps, phrases, and performing techniques for musical form and modern dance entertainment. (Identical with Mus. 175)

207. Western Civilization and the Arts: The Twentieth Century (3) I II (Identical with F.A. 567)

209. Percussion for Dance Students (2) I 1990-91 (Identical with Mus. 209)

239a-239b. Beginning Ballet Pointe (1-1) [Rpt./1] Strength, stretch, and placement techniques for the beginning student in preparation for ballet pointe; barre and center practice. 25. P, 112c or audition.


241a-241b. Modern Dance Technique I (2-2) Wilson/Bergsohn

244a-244b-244c-244d. Jazz Dance Technique (2-2-2-2)

245-245b. Basic Choreography (2-2) Study of the elements of time, space, and energy; basic concepts of phrasing and structure leading to dance composition. 45. P 143. Bergsohn

259. History of Dance (3) II History of dance as theater art within the western world from 1581 to the present. Bergsohn

307. Western Civilization and the Arts: Palaeo-Ethnic through Renaissance (3) I II (Identical with F.A. 307)

317. Western Civilization and the Arts: Baroque through Nineteenth Century (3) I II (Identical with F.A. 317)


341a-341b. Modern Dance Technique II (2-2) P, 241b.

343a-343b-343c-343d. Dance Ensemble (2-2-2-2) a and b sections 1990-91; c and d sections 1989-90 and preparation, rehearsal methods, repertoire development, and performance of dance, with particular emphasis on ensemble. 6L. Enrollment by audition only.

346. Theories of Dance (3) I 1990-91 Theories of dance as an art form and as an educational discipline. 25. P 143a. Wilson


541a-451b. Ballet Repertoire (2-2) [Rpt./12 units] Repertoire from romantic, classical and contemporary ballets including works by Bouronne, Ashton, AsVERT, Balanchine, Christensen and others. 3S. P, 340 or by audition. May be convened with 551a-551b. Hancock

496. Seminar
  a. Dance-Related Art Forms (3) II 1990-91 (Identical with Dram. 496d) Bergsohn
  b. Dance Repertoire (2-2) [Rpt./4 units] I II For a description of course topics, see 445. Graduate-level requirements include completion of additional exercises. P, 245b. May be convened with 551a-551b. Nielsen

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. Nielsen

543. Dance Ensemble (2) [Rpt./1] II Rehearsal methods, repertorial development, and performance of dance with particular emphasis on ensemble. 45. P, repertory auditions; intermediate or advanced whose work is of classical and contemporary styles. P, 341a-b.

545. Advanced Choreography (2) I For a description of course topics, see 445. Graduate-level requirements include completion of a full-scale group composition, which will be evaluated by the dance faculty. P, 245b. May be convened with 445. Nielsen

546. Dance Program Administration (3) II 1990-91 Involves and current factors affecting career development in dance and dance-related fields; practical organization of programs. (Identical with Dram. 546) Wilson

551a-551b. Ballet Repertoire (2-2) [Rpt./12 units] For a description of course topics, see 445. Graduate-level requirements include completion of a full-scale group composition, which will be evaluated by the dance faculty. P, 245b. May be convened with 451a-451b. Hancock

595. Workshop
  a. Concert Production and Choreography (1-4) [Rpt./4 units] I II 4-8S. P, 445.

657. (See Nutrition and Food Science)

Drama (DRAM)

University Theatre Building, Room 104 (602) 621-7008

Professors Robert C. Burroughs (Emeritus), Irene F. Corer (Emerita), J. Michael Gillette, Robert A. Keyworth (Emeritus), Frank K. LaBan, Peter R. Marroney (Emeritus), Sam MacDonald, Mary Z. Maher, Jeffrey L. Warburton, Dianne J. Winslow

The Department of Drama offers the following degrees: Bachelor of Fine Arts with a major in drama production with options available in acting/directing, design/technical production, and theatre specialist; Bachelor of Fine Arts with a major in film and television; Bachelor of Fine Arts with a major in drama education; Bachelor of Arts in Drama with a major in dramatic theory; Master of Arts and Master of Fine Arts.

The Department of Drama 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 Drama 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 and cinema arts through classroom study, studio-laboratory training, and university theatrical 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. Drama majors are encouraged to complete a minimum of 40 units in the field of study, a total of 45 general education units described under the Bachelor of Fine Arts in the Faculty of Fine Arts section of this catalog, the following lower-division requirements must be met: Dram. 111, 113, 115, 116, 117, 119, 120, 123, 140b, 149, 151, 203, 204, 220, 223, 225 and 245. The requirements for the various programs are listed below.

Bachelor of Fine Arts (major in drama production): The Bachelor of Fine Arts with a major in drama production is an extensive professional training program for highly talented and motivated theatre students. Acceptance 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 major and others will evaluate each student's professional training, talent, ability, and potential 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 drama core curriculum at the end of the sophomore year. The following requirements must also be met: Dram. 250, 251, 305, 306, 430, 440a-440b, 449, 451, 452, 455, 457, 4 units 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 152a. At least 38 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 drama core curriculum. The following requirements must be met: Dram. 400, 423, 424, 425, 427, 429, 440a-440b, 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 40 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 degree with this major and
must enroll in Dram. 497 every semester after admission to the upper division (mini-
mum of four semesters).

Bachelor of Fine Arts (major in dramatic theatre): The Bachelor of Fine
Arts 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 Music and Committee on Dance, emphasizes an integrative
process of musical theatre and provides an intensive course of study in music, dance, and
drama. Admission to advanced division musical theatre coursework is by interview
and audition at the completion of the drama core curriculum at the end of the sopho-
omore year. At that time, the faculty will evaluate each student's potential,
trainability, and talent with coursework of work. Lower-division drama courses: Dram. 111, 113,
115a, 116a or 116b, 118, 140a or 140b, 149, 151, 203,
204, 250, 251, Music courses: 110a, 110b, 120a,
120b, 130a, 130b, 8 semesters of Voice (to include 4 units of 285v, minimum level of profi-
ciency), and 8 units of 200 (8 units Drama 497 will be substituted for approved production).

Bachelor of Fine Arts (major in drama education): Students may be admitted upon comple-
tion of drama general coursework. This major is designed for students preparing for a teaching position in the junior and senior high schools. The student must complete the following courses: Dram. 250, 251, 410,
440a, 440b, 451, 452, 454; 14 units of a declared specialty, and a total of 60 units for a degree with this major: 125.

Bachelor of Fine Arts in Drama (major in dramatic theatre): The Bachelor of Arts in Drama is
is recommended that additional general elec-
tives 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.

Drama minor/teaching minor (20 units): Design for the theatre generalist and
provides an appropriate basis for advanced study of theatre history, theatre criticism, and
playwriting at the graduate level. In addition to the general unit requirements described under the Bachelor of Arts in the
Faculty of Fine Arts section of this catalog, the following requirements must be met: Dram. 111, 113, 116a or 116b, 120a or 120b, 203, 204, 244a or 244b, 497f (4 units). Minimum total units required for a degree with this option: 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.

100. Acting for General College Students (3) I I S The craft of acting with emphasis on body, voice and
mind. Theoretical background and practical experience in the creation and performance
of selected scenes. Open to non-majors only.

103. Theatre Appreciation (3) I I I An introduction to the world of theatre, in philosophy, history, and
criticism, and the process by which we become theatre critics. Open to non-majors only.

111. Stagecraft (3) I I I Basic principles of the scenic process: construction and use of mate-
rials, shop techniques and practices. 1L.

113. Stagecraft Crew (1) [Rpt./2 units] I I I Crew work involved with costume construction and use.

115. Makeup (1) I I I History and fundamentals of makeup; basic techniques; effects on makeup; opportunity for
stage crew work involvement in department productions. Open to majors only.

116a-116b. Stage Costume History (3-3) I I I History of costume; selection and design of costume;
construction, directing, acting, technical production. Open to non-majors only.

120. Basic Theatre Graphics (I) I I I Scientific study of stage design and production. 4S.

123. Western Civilization and the Arts: The Twentieth Century (3) I I I (Identical with F.A. 207)

124. Scene Design Crew (1) [Rpt./2 units] I I I Crew work involved with costume construction and use.

125. Scene Design (3) I I I Basic principles of scenic design, painting techniques and shop practices.

204. Voice and Movement for the Actor I (3) I 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, 251, 252.

205. Musical Theatre (2) [Rpt./1] I I I S The craft of acting with emphasis on body, voice and
mind. Theoretical background and practical experience in the creation and performance
of modern plays from Ibsen to the present; presentation of speaker in drama, with emphasis on the physical and vocal qualities that project these characters; deals with modern masters, such as Shaw, Miller, and Williams.

239. Speaking in the Arts (3) I I I A studio course for students of acting in the fine arts who wish to develop their
oral and visual presentation and film; reading and analysis of representative plays.

250. Acting III (3) I I I Intensive work in expanding the versatility of the actor's instrument.
Improvisation, class exercises and scene work. P. 203, 250, audition, CR, 203.

251. Acting IV (3) I I I Non-realistic styles, including expressionism, absurdist and the
contemporary avant-garde; work with select exercises in both representational and presentational modes. 2S. Open to majors only. P. 203, 250, audition, CR, 204.

267. English Phonetics (3) I I I Study of the sounds of speech, emphasis on the fundamental qualities that
characterize speech and its origins, development and functions. 2S. Open to majors only. P. 203, 250, 251, audition.

304. Musical Theatre II (3) I I I Intensive text and score analysis in relation to the process of
characterization for the actor; singing, dancing and musical theatre. Individual and group perfor-
manace. Open to majors only. P. 205, 260 and 267.

305. Voice and Movement for the Actor III (1) [Rpt./1] I I I Intermediate voice and movement skills for the actor including
standard stage movement, voice and dance. 2S. Open to majors only. P. 204, 250, 251, 252.

306. Voice and Movement for the Actor IV (1) [Rpt./1] I I I Advanced voice and movement skills for the actor including
the development of physical character, dance skills and movement, emphasis on
Shakespearean style. 2S. Open to majors only. P. 204, 250, 251, 252.

307. Western Civilization and the Arts: Paleolithic through Renaissance (3) I I I (Identical
with F.A. 317)
329. Art History of the Cinema (3) I (Identical with Clas. 329) 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 actions of the plays being viewed. 338. Teaching of Theatre Arts (3) II Carries credit in education only. (Identical with T.T.E. 338) 391. Film/Video Production Financing (3) I (Identical with M.A.R. 371) 396H. Honors Premiere Seminar (3) II 401. Advanced Stagecraft I (3) I Advanced studies in scenic construction methods and techniques. P. 111. May be convened with 531. 404. Musical Theatre III (3) II Intensive study and exploration of the major historical styles for the American musical theatre. 2S. Open to majors only. P. 304 and audition. May be convened with 504. 410. Creative Drama (3) I Principles and processes of playwriting, creative playwriting techniques, and program development in creative dramatics applicable to the elementary and secondary school levels. P. 12 units of dance and drama. May be convened with 531. 414. Advanced Make-up (2) [Rpt./2] History and practical application of theatrical make-up design and construction such items as masks, prosthetic pieces, wigs and beards. P. 115. May be convened with 514. 415. Theatre Graphics II: Drafting (3) I Advanced theatrical perspective, scenographic and graphic techniques. P. 120. May be convened with 515. 416. Theatre Graphics III: Rendering (3) [Rpt./2] Practical color theory in pigment and illustration, rendering mediums and techniques. P. 120. May be convened with 516. 420. Advanced Lighting Design I (3) I Special problems, practice and trends in design for theatrical productions. P. 220. May be convened with 520. 421. Special Effects for Theatre (3) II 1989-90 Applied theory and techniques associated with the theatre production; design and construction of stage properties utilizing the use of materials and techniques. 3L. May be convened with 521. 422. Theatrical Properties (3) [Rpt./2] 1989-90 Construction and collection of stage properties emphasizing the use of scenic elements and properties. 3L. May be convened with 522. 422. Scene Painting (3) I Techniques and methods of scenic painting. May be convened with 523. 424. Advanced Scenic Design I (3) I Advanced techniques and methods of scenic design. P. 223. May be convened with 524. 425. Advanced Stage Costume Construction I (3) II Advanced techniques in costume construction, including period pattern design, cutting and draping techniques. P. 116. May be convened with 525. 426. Advanced Stage Costume Design I (3) I Advanced design techniques in costume design; the application of techniques in the design of costumes for specific types of theatre productions. P. 116. May be convened with 526. 427. Advanced Stage Costume Construction I (3) II Advanced techniques in costume construction, including period pattern design, cutting and draping techniques. P. 116. May be convened with 527. 428. Stage Management (2) I Principles and techniques of stage management, practical applications, problems and analysis of stage management. P. 111, 151. May be convened with 528. 341. Theatre Publicity and Box Office (2) I Publicity, press releases, sales, advertising, display techniques, subscription procedures. P. 12 units of dance and drama. May be convened with 531. 432. Theatre Management (2) II Amatuer, educational and professional theatre organization and management; theatrical contracts, professional unions and representative organizations. P. 12 units of drama. May be convened with 532. 440a-440b. History of the Modern Theatre (3-5) Major developments in theatrical art from 19th-century realism to the theatre of the present. Writing-Emphasis Course (440a). P. satisfaction of the upper-division writing-proiciency requirement (see “Writing-Emphasis Courses” in the Academic Guidelines section of this catalog). 449. Acting V (3) I Intensive study of classical acting; may be combined with Shakespeare’s plays through performance. (Identical with M.A.R. 371) 451. Acting VI (3) II Intensive study of classical acting; may be combined with Shakespeare’s plays through performance. (Identical with M.A.R. 371) 452. Acting VII (3) I (Rpt./2) Advanced techniques and research into problems of a professional career in the theatre, television, motion pictures and related fields. P. 25S. May be convened with 552. 453. Acting VIII (3) I (Rpt./2) Intensive scenic study and character analysis. Survey and review of major modern acting theories and techniques. P. 25S. May be convened with 553. 455. Directing I (3) I Techniques of stage directing including play analysis, director-actor communication and technical problems of movement, composition, picturization and blocking. P. 25S. May be convened with 555. 456. Directing II (3) I (Rpt./2) Techniques of stage direction with the study of factors leading to a completed production; special attention given to direction for television and the motion pictures. P. 25S. May be convened with 556. 460a-460b. Writing for Stage and Screen (3) I Preparation of scripts for stage and motion pictures, including scenic writing. Writing-Emphasis course for cinema option. P. 25S. May be convened with 560a-560b. 466. Dialects in Performance (3) Application of phonetic theory toward a systematic approach to acquiring dialects for performance in stage, television and radio presentations. 4S. P. 12 units of dance and drama. May be convened with 566. 474a-474b. Film Theory and Criticism (3-2) Advanced methods of circuitry and criticism. Historical examination of major film theories including formalism, realism, classical Hollywood, structuralism, semiotic and feminist analysis of modern cinema. P. 119, 321. May be convened with 574a-574b. 475. Screen Acting Techniques (3) I Principles and techniques of various performance methods; written and directed exercises and dramatic scenes. 3L. P. 151. Audition. May be convened with 575. 479. Seminar a. Technical Production (1-2) II b. Advanced Topics in Film Studies (3) [Rpt./2] II P. 109 or consult department before enrolling. 497. Workshop a. Technical Production (1-6) [Rpt./30 units] I P. 12 units of dance and drama. May be convened with 597a. b. Costume Production (1-6) [Rpt./20 units] I I May be convened with 597b. c. Lighting/Sound (1-6) [Rpt./20 units] I I May be convened with 597c. d. Production Design (1-6) [Rpt/20 units] II S May be convened with 597d. e. Scene Production (1-5) [Rpt./20 units] I S May be convened with 597e. 491. Performance (1-6) [Rpt./20 units] I I S May be convened with 591. 492. Theatre Production (1-6) [Rpt./20 units] I I May be convened with 592. 501. Directed Seminar (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 504. 504. Musical Theatre III (3) II For a description of course topics, see 504. Graduate-level requirements include an additional creative and/or research project. P. 111. May be convened with 501. 516. Theatre Graphics III: Rendering (3) I (Rpt./2) II For a description of course topics, see 475. Graduate-level requirements include an additional creative and/or research project. P. 120. May be convened with 515. 520. Advanced Lighting Design I (3) III For a description of course topics, see 520. Graduate-level requirements include an additional creative and/or research project. P. 220. May be convened with 521. 521. Special Effects for Theatre (3) III 1989-90 For a description of course topics, see 521. Graduate-level requirements include an additional creative and/or research project. P. 223. May be convened with 520. 525. Advanced Stage Costume Construction I (3) I 1989-90 Advanced techniques in construction and problem solving in technical theatre production; microcomputers, hydraulics, rigging, welding, plastics, fabrics. P. 223. May be convened with 526. 527. Advanced Stage Costume Construction I (3) II For a description of course topics, see 527. Graduate-level requirements include an additional creative and/or research project. P. 116. May be convened with 525. 529. Advanced Stage Costume Design I (3) I For a description of course topics, see 529. Graduate-level requirements include an additional creative and/or research project. P. 116. May be convened with 528. 530. Stage Management (2) I For a description of course topics, see 530. Graduate-level requirements include an additional creative and/or research project. P. 116. May be convened with 531. 531. Theatre Publicity and Box Office (2) I For a description of course topics, see 531. Graduate-level requirements include an in-depth research paper or project. P. 12 units of drama. May be convened with 531. 532. Theatre Management (2) II For a description of course topics, see 532. Graduate-level requirements include an in-depth research paper or project. P. 12 units of drama. May be convened with 532. 540. Theatre Graphics IV: Model Making (5) Study of the purposes, materials, tools, and techniques of scenic construction through practical application. P. 25S. 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) 1990-91
An advanced study of lighting design for opera and dance; theoretical (light plots) and practical (light lab projects). Pr. 476a and 476b.

543. Advanced Stage Lighting III (3) 1989-90
An advanced study of lighting design for musical theatre, theoretical (light plots) and practical (light lab projects). Pr. 476a and 476b.

544. Advanced Scene Design II (3) 1989-90
Advanced study of scenic design for opera and dance. Research on major historical and contemporary designers, preparation and presentation of design projects. Pr. 474.

545. Advanced Scene Design III (3) 1990-91
Advanced study of scenic design for musical and revues. Research on major historical and contemporary designers, preparation and presentation of design projects. Pr. 474.

546. Dance Program Administration (3) II 1990-91 (Identical with Dnc. 546)

547. Advanced Stage Costume Construction II (3) 1989-90
Advanced techniques in draping, period styles, tailoring, dyeing, painting fabrics and a study of a variety of fabrics and the sewing techniques of the 17th, 18th and 19th centuries. Pr. 475.

548. Advanced Stage Costume Design II (3) II 1989-90
Advanced costume design, emphasis on research, line and color analysis, and realization of design and the adaptation of directorial philosophies to the design. Pr. 151 and 475.

549. Acting V (3) For a description of course topics, see 449. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 449.

550. Literary Resources for Choreography (3) II 1989-90 (Identical with Dnc. 550)

551. Acting VI (3) 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) [Rpt./1] For a description of course topics, see 452. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 452.

553. Acting VIII (3) III For a description of course topics, see 453. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 553.

554. Directing I (3) For a description of course topics, see 455. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 555.

555. Directing II (3) For a description of course topics, see 456. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 556.

556. Directing III (3) For a description of course topics, see 457. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 557.

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] II 1990-91 The development and communication of a visual idea for performance art, exploring all mediums and techniques in the field of visual communication. P. 467.

568. Dialects in Performance (3) For a description of course topics, see 468. Graduate-level requirements include a close transcription of a selected dialect or dialects from oral presentation and a thorough analysis of the articulatory features. P. 468. May be convened with 469.

574a-574b. Film Theory and Criticism (3-3) a. Contemporary Trends (1-3) [Rpt./6 units] I II b. Special Topics in Acting (1-3) [Rpt./6 units] I II c. Special Topics in Directing (1-3) [Rpt./6 units] I II d. Musical Theatre Production (1-3) [Rpt./6 units] II e. Special Topics in Playwriting (3) [Rpt./6 units] II f. Special Topics in Stage Design (2-3) [Rpt./6 units] II g. Theoretical Design Style (1-3) [Rpt./6 units] II h. Special Topics in Scene Design (2-3) [Rpt./6 units] II i. Special Topics in Technical Production (1-3) [Rpt./6 units] II j. Special Topics in Lighting Design (2-3) [Rpt./6 units] II k. Special Topics in Scene Design (2-3) [Rpt./6 units] II l. Special Topics in Stage Design (2-3) [Rpt./6 units] II m. Special Topics in Lighting Design (2-3) [Rpt./6 units] II

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. 305, 449, audition. May be convened with 475.

595. Colloquium a. Evaluation of Dance and Body Techniques (2) I (Identical with Dnc. 595a)

597. Workshop a. Technical Direction (1-6) [Rpt./20 units] I II S May be convened with 497a.
b. Costume Design (1-6) [Rpt./20 units] I II S May be convened with 497b.
c. Light/Sound Design (1-6) [Rpt./20 units] I II S May be convened with 497c.
d. Property Design (1-6) [Rpt./20 units] I II S May be convened with 497d.
e. Scene Design (1-6) [Rpt./20 units] I II S May be convened with 497e.
f. Performance (1-6) [Rpt./20 units] I II S May be convened with 497f.

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 and form of thesis.

605. Advanced Voice and Movement for the Actor I (3) [Rpt./1] I For a description of course topics, see 458. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 458.

640. Dramatic Criticism: Tragedy (3) I Comparison in the staging of tragedy and theories of tragedy from antiquity to the present. Staged reading of stage writings and screen; writing of critical papers.

641. Dramatic Criticism: Comedy (3) II Comparative analysis of comedy and comic theory from antiquity to the present for stage and screen; writing of critical papers.

642a-642b. Studies in Theatre History (3-3) Concentrated study in theatre history, with emphasis on the period or periods to be covered. May be convened with 497c.

644. History of the American Theatre (3) II Studies in the American theatre and drama. Directed and individual projects will be assigned.

650. Experimental Theatre I (3) I Post-Stanislavsky experimental techniques and theories of the first half of the twentieth century. Rehearsal and performance of select projects.

651. Experimental Theatre II (3) II Theories and techniques of avant-garde theatre. Rehearsal and performance of select projects.

655. Advanced Directing I (3) I Techniques of stage directing, inclusive of play analysis, director-actor communication, director-designer communication, blocking, movement, composition; use of directorial style and the adaptation of directorial philosophies. 25

656. Advanced Directing II (3) II 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. 25 P. 449, 655.

574a. 1989-90 An advanced study of lighting design for opera and dance; theoretical (light plots) and practical (light lab projects). Pr. 476a and 476b.

574b. 1989-90 An advanced study of lighting design for musical theatre, theoretical (light plots) and practical (light lab projects). Pr. 476a and 476b.


577. 1989-90 Advanced study of scenic design for musical and revues. Research on major historical and contemporary designers, preparation and presentation of design projects. Pr. 474.
covering aspects of molecular, cellular, organismic, physiological, ecological, and evolutionary biology. The requirements are 181, 182, 200, 230, 320, M.C.B. 410R or Biol. 460R or 462R (first semester of a one-year course). Previous knowledge of Biochemistry and Molecular Biology is recommended. These requirements can be taken as 399 or 499 (independent study). Additional courses must be taken to a minimum of 35 credits in the major. These elective units may be selected from the departments of Ecology and Evolutionary Biology, Molecular and Cellular Biology, Microbiology and Immunology, and other departments upon the approval of the major advisor. No more than five of these elective units may be taken from any one department. The requirements result in the equivalent of majors in botany, physiology and zoology may be pursued. Other areas of emphasis are genetics, immunobiology, and medicine. Additional courses must be taken in the areas: genetics, medicine, and other appropriate professional preparation. The biology program has a structured minor in chemistry, physics, and mathematics.

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, 305, 453; in addition, Chem. 103a-103b, 104a-104b, or 103a-103b or 104a-104b or 101a-101b, 105a-105b, 110, 116, and 121, Math. 125a-125b, 223 and 226 which courses constitute a structured minor in chemistry, physics, mathematics. At least 12 upper-division units must be taken in courses designated as upper-division courses in the biology major. The major must be selected upon consultation with the major advisor. Courses may be selected from the departments of Ecology and Evolutionary Biology, Molecular and Cellular Biology, Microbiology and Immunology, and other departments upon the approval of the major advisor. At least 6 additional units of mathematics or nonbiological science are required (a list of acceptable courses is available from departmental advisors).

The major in ecology and evolutionary biology for the Bachelor of Arts degree is designed primarily for students who wish to pursue graduate study in ecology and evolutionary biology or a related science. The requirements for the major are 181, 182, 302, 304, 305, 453; in addition, Chem. 103a-103b, 104a-104b, or 103a-103b or 104a-104b or 101a-101b, 105a-105b, 110, 116, and 121, Math. 125a-125b, 223 and 226 which courses constitute a structured minor in chemistry, physics, mathematics. The major advisor will select courses in biology, including field trips. P, Ecol. 182, consult department before enrolling.

The major in ecology and evolutionary biology for the Bachelor of Arts degree is designed primarily for students who wish to pursue graduate study in ecology and evolutionary biology or a related science. The requirements for the major are 181, 182, 302, 304, 305, 453; in addition, Chem. 103a-103b, 104a-104b, or 103a-103b or 104a-104b or 101a-101b, 105a-105b, 110, 116, and 121, Math. 125a-125b, 223 and 226 which courses constitute a structured minor in chemistry, physics, mathematics. The major advisor will select courses in biology, including field trips. P, Ecol. 182, consult department before enrolling.

100. Biology Concepts (4) I II S Levels of biological organization from biosphere to atom provide a framework around which are developed concepts of diversity and unity of life forms, genetic continuity and evolutionary change, and functioning of organisms. Little or no calculus. Co-requirement: 3R, 3L. Field trips. 105R, Introductory Botany (3) I II Structure, function, and economic importance of flowering plants; brief overview of plant diversity. 3R, 105R must be taken concurrently.
563a-563b. Human Physiology Laboratory (1-1) For a description of course topics, see 463a-463b. Graduate-level requirements include an additional research project on a modern aspect of physiology. P, CR. 463a-464b. (Identical with Tox. 463a-463b) May be convened with 463a-463b.

564a-564b. Lectures in Human Physiology (4-3) For a description of course topics, see 464a-464b. Graduate-level requirements include additional literature review paper on a modern aspect of physiology. P, 304. Chem. 241b, 243b. (Identical with Tox. 464a-464b) May be convened with 464a-464b.

568R. Comparative Physiology (3) II For a description of course topics, see 468R. Graduate-level requirements include an additional literature review paper on a modern aspect of comparative physiology. P, 181, 182. May be convened with 468R.

568L. Comparative Physiology Laboratory (1) II For a description of course topics, see 468L. Graduate-level requirements include an additional research project on a modern aspect of comparative physiology. P, CR. 468R. May be convened with 468L.

570. Plant Diversity and Evolution (4) I For a description of course topics, see 470. Graduate-level requirements include a research paper on a relevant topic. Field trips. P. 4 units of biology or plant sciences. May be convened with 470.

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.

573. Legumes, Grasses, and Composites (2) I 1990-91 Identification and classification of the three largest flowering plant families of the Southeast, FL.

575. Freshwater Algae (4) II 1989-90 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.

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 enrolling. 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 an aspect of invertebrate zoology. P, 182. May be convened with 480.

582. Ichthyology (4) 1989-90 I For a description of course topics, see 482. Graduate-level requirements include a 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. Osteology (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.


587. Animal Behavior (3) II For a description of course topics, see 487. Graduate-level requirements include a research project or literature review paper on a modern aspect of animal behavior. P. 8 units of biology. May be convened with 488.

589. Selected Studies of Birds (2) [Rpt.] I For a description of course topics, see 489. Graduate-level requirements include an in-depth presentation of a single aspect of the course topic. P, 484. (Identical with W.F.Sc. 589) May be convened with 489.

590. Quantitative Morphology (3) II 1990-91 For a description of course topics, see 490. Graduate-level requirements include a research project, paper, and oral report. May be convened with 490.

596. Seminar (1) Evolutionary Ecology (1-2) [Rpt. /6 units] II b. Population Biology (1) [Rpt.] /6 I Open to majors only.

c. Macroevolution (1) [Rpt. /6 units] I Field trips. P. For biology majors only. May be convened with 496.

d. Sociobiology (2) [Rpt. /3] II e. Plant Population Ecology (1 to 3) [Rpt. /5] II Field trips. P. For junior or senior ecology majors. May be convened with 496d.

610a-610b. Research in Ecology and Evolution (1-4) [Rpt.] I I Introduction to the research methods currently being pursued by faculty and staff in the department. Open to majors only.

620. Human Genetics (3) I (Identical with Gene 620) Recent Advances in Genetics (2) I (Identical with Gene 670)

Economics (ECON)
Economics Building, Room 202
(602) 621-6224

Professors Edward E. Zajac, Head, Gerald O. Bierwag, Michael K. Block, Phillip J. Bryson, John E. Buehler, James C. Cox, Helmut J. Kroner, Michael P. Leidy, Ilchong Nam, Barbara N. Sands, Leslie Sundt

Lecturer R. Bruce Billings Professors Edward E. Zajac, Head, Gerald O. Bierwag, Michael K. Block, Phillip J. Bryson, John E. Buehler, James C. Cox, Helmut J. Kroner, Michael P. Leidy, Ilchong Nam, Barbara N. Sands, Leslie Sundt

ECON 201. Microeconomics I I Nature of economic problems; economic management and planning mechanisms; problems of international trade and integration; economic growth and stabilization. P, 302, or 304, or 361, or Math. 311.
313. *Economics of Futures Markets (3) I II (Identical with A.Ec. 313)
330. *Money and Banking (3) I II Nature of money and commercial banking; Federal Reserve System; monetary theories; domestic and international monetary policies. P, 200 or 201 b or 210.
332. * Aggregate Economic Analysis (3) I II Analysis of output, employment, interest rates, and the price level; the effects on these of changes in monetary and fiscal variables. P, 330.
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 201 b or 210.
383. *Labor Arbitration (3) I Study of the place and function of arbitration in the field of labor management relations. P, 200 or 201 b or 210.
396. *Honors Proseminar (3) I II An advanced course in economic analysis or research project for the M.A. degree. May be convened with 596.
405. * Comparative Systems (3) II Economic analysis of economic policy in market (capitalist) and non-market (planned) economies, and of economic ideology and planning in command (Soviet-type) economies. P, 330 or 361.
406. *Introduction to Experimental Economics (3) II Lab. experimental studies of economic behavior; applications to monopoly, bilateral bargaining, competition, public goods, and other economic models under various exchange rules; speculation, voting, using, and other economic models under various exchange rules; speculation, voting, and public goods. 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.
418. *Introduction to Econometrics (3) I II Statistical methods and techniques used for 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) I Comparative statics, stability, classical optimization, the Kuhn-Tucker theory, calculus of variations, linear algebra, and game theory, and the application of these techniques in economic analysis. P, 407, 500, 504, 507, 509, 520; consult with department before enrollment.
441. *International Trade Theory (3) I 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.
459. *Agricultural Economic Development in Latin America (3) I II May be convened with 559.
462. *Economics of Regulated Industries (3) I II Economic analysis of the regulated sector of the American economic, including communications, transportation and energy industries; impact of existing and alternative public policies. P, 300. May be convened with 475.
475. *Economics of Water and Land Resources (3) I I May be convened with 575.
476. *Natural Resource Economics (3) I II (Identical with A.Ec. 476)
480. *New Venture Market and Industry Analysis (3) I I May be convened with 480.
481. *Economics of Wage Determination (3) I Application of economic theory and empirical methods to economic policy and labor market discrimination. P, 300 or 361.
482. *Labor and the Economy (3) I II Labor and the economy; unemployment—causes and consequences. P, 300 or 361.
483. *Urban Economics (3) I II Problems of metropolitan areas; evaluation of alternative urban policies. P, 200 or 201 b or 210. (Identical with B.S. 483).
484. *Regional Economics (3) I Location theory, regional growth. P, 300 or 361.
500. Managerial Economics (3) I I Microeconomic theory and applications. P, M.I.S. 400 or 401 or 405 or 415 or 425 or 435. May be convened with 509.
501. *Advanced Economic Theory and Applications (3) I I May be convened with 514.
504. *Agricultural Economics (3) I I (Identical with A.Ec. 504)
507. Studies in Microeconomics (3) I II For a description of course topics, see 407. May be convened with 506. May be convened with 407.
509. *Economic Anthropology (3) I I (Identical with Anth. 509) May be convened with 409.
512. *International Agricultural Economic Development (3) I I (Identical with A.Ec. 512)
514. Cost-Benefit Analysis (3) I I (Identical with A.Ec. 514)
515. Research Methods in Applied Economics (3) I I I (Identical with A.Ec. 515)
518. *Introduction to Econometrics (3) I I For a description of course topics, see 407. May be convened with 518.
520. *Theory of Quantitative Methods in Econometrics (3) I I Quantitative methods for the estimation and testing of behavioral models or simulation studies of the statistical properties of an econometric estimation technique. May be convened with 520.
521. Mathematical Economics (3) I I Introduction to the theory and methods of mathematical economics and its applications. May be convened with 418.
530. Macroeconomic Aspects of Finance (3) I I The effects of changing economic conditions upon a firm's operations, including capital decisions as well as production decisions. P, 500.
534. Public Finance (3) I I The study of public finance and its role in the economy; public policy decisions; public goods and public services. P, 520; consult with department before enrollment.
552. *Econometrics (3) I I Econometric model-building, estimation, forecasting and simulation for problems in agricultural and resource economics. May be convened with 552.
554. Applied Econometric Analysis (3) I I Econometric model-building, estimation, forecasting and simulation for problems in agricultural and resource economics. May be convened with 554.
559. Agricultural Economic Development in Latin America (3) I I (Identical with A.Ec. 559) May be convened with 559.
560. Economic Organization and Governmental Policy (3) I I Structure, conduct, and performance of public economic agencies; governmental and policies affecting business. P, 300 or 361 or 500, 339 or M.I.S. 552. May be convened with 560.
561. Economics of Regulated Industries (3) I I 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 non-majors only; P 500 or 561 or 500. May be convened with 461.

562. Theory and Institutions in Industrial Organization (3) I II Major issues in the field of industrial organization. Theoretical issues presented with complementary material dealing with specific American industries. P 500.

568. Environmental Scanning (3) I Identical with M. A. 568.


575. Economics of Water and Land Resources (3) I Identical with A. E. C. 575. May be convened with 475.


597. Workshop

b. Computational Methods in Laboratory Economics (3) I Identical with R. 523 I II P, Math. 125a-125b; consult department before enrollment.

c. Economic Issues for Teachers (3) S Consult instructor before enrolling.

d. Summer Institute on the American Economy (3) I S Consult instructor before enrolling.

e. Economics Education Workshop (2) S Consult instructor before enrolling.

f. Economic Development for Educators (2) S Open to non-majors only. Consult with department before enrolling.

696. Seminar
a. Experimental Economics I (3) II

b. Experimental Economics II (3)

c. Economic Analysis of Organizations I (3) III

d. Economic Analysis of Organizations II (3) I

e. Econometric Modeling I (3) II

f. Econometric Modeling II (3) I

g. Monetary Economics (3)

h. Labor Economics I (3) II

i. Labor Economics II (3) I

j. Public Policy Analysis I (3) II

k. Public Policy Analysis II (3) I

l. International Economics I (3) II

m. International Economics II (3) I

n. Advanced Macroeconomic Theory I (3) II

o. Advanced Macroeconomic Theory II (3) I

p. Industrial Organization and Regulation (3) II

q. Industrial Organization and Regulation II (3) I

t. Advanced Microeconomic Theory I (3) II

u. Advanced Microeconomic Theory II (3) I

v. Mathematical Economics (3) II

w. Game Theory (3) I II

x. Public Choice I (3) I Identical with Pol. 696v

y. Public Choice II (3) I Identical with Pol. 696v

697. Workshop
a. Experimental Economics (3) I P, 696a, 696b.

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. Public 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.

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 various revised degree programs being considered for approval at the time the catalog was being edited. All current and prospective students should consult the Office of Student Services in the college or the appropriate division for information on current degree requirements.

Education (EDUC)

350. Schooling in America (3) I II S Nature and functions of schools in society; school reform proposals; moral dimensions of schooling; equality of educational opportunity; alternatives to schooling; nature of teaching profession.

489. Anthropology and Education (3) I Identical with Anth. 489. May be convened with 589.

500. Disciplined Inquiry in Education (3) I II S Introduction to research methods in education; analysis of research; writing of research reviews; applying research results in educational settings.

501. Foundations of Education (3) I II S Schools and social institutions; political and social influences on education; nature of the education profession; reform and implementation in education.

502. Variations in Learners (3) I II 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.

589. Anthropology and Education (3) I II Identical with Anth. 589. May be convened with 489.

600. Qualitative/Inferential Methods in Education (4) I II S Statistical knowledge for use in describing educational research data and relationships between sets of data; statistical relationships among various forms of educational research inquiry. P 500.

601. Qualitative Methods in Education (3) I II 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.

602. Research Design and Techniques in Education (3) I II S In-depth explorations of various research paradigms in educational inquiry and their research designs; critical analysis of the structure and logic of issues; preparation of research proposals. P 600, 601.

611. Comparative Education (3) I II Emphasis on comparative education methodology; analysis of selected national education systems, with 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 II S Analysis of values and conflicts in American culture as they relate to educational policy; critical examination of competing philosophies in the light of democratic ideals.

613. History of Western Education (3) I II S The historical development of western educational thought from its origin to the present.

615. Educational Sociology (3) I II S The school as a social institution; social functions of the school; processes of 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 Sheila Slaughter, Head, Harley D. Christiansen, Sarah M. Dinham, Fred D. C. Driscoll (Emeritus), Stanley Pogrow, Donal M. Sacken.

Assistant Professors Martin Ahumada, Sharon Conley, Marcello Medina, Gary Rhoades, Richard Ruiz.

The division offers programs leading to the Master of Arts and Master of Education degrees with majors in educational administration, educational psychology, foundations of education, and higher education. The Educational Specialist degree is offered with majors in educational administration and higher education. The Doctor of Philosophy degree is offered with majors in educational psychology, foundations of education, and higher education. The educational psychology and the foundations of education majors for the Doctor of Education degree and the educational administration major for the Doctor of Philosophy degree were under review at the time of catalog production. Admissions to these programs have been withheld, pending review. For information on concentrations, graduate admission, and graduate degree requirements, please consult the Graduate Catalog.

At the time the catalog was edited, revisions to many of these programs were pending approval. All current and prospective students should consult the Office of Student Services in the College of Education or the Division of Educational Foundations and Administration for information regarding the status and requirements of all programs and degrees.

Educational Administration (EDA)

Education Building, Room 635 (602) 621-3327

660. Administration and the Educational Environment (3) I II S Introduction to educational administration; overview of administration within school contexts and larger societal environment; organizational and leadership theory.

661. Administration of Bilingual Education Programs (3) S 1 Dynamics of the administration of educational programs for the bilingual learner including sociocultural realities, mandated federal and state funded educational programs, and effective community participation.

662. Educational Law: Policy and Practice (3) S 1 Evolution of modern educational law and the effects of law on educational policy formation and administrative practice.
# 663. Computer Applications in School Administration (3)
- Techniques for using computers to manage school personnel and funds more efficiently; using computers to enhance the management of information. P. 660 or CR.

# 664. Personnel Administration in Education (3)
- Course work in the functions and operations of personnel in the educational setting, including union and collective bargaining, evaluation of the performance of personnel, and procedures for personnel complaints. P. 660.

# 665. Instructional and Clinical Supervision (3)
- Emphasis on instructional supervision; organization, techniques, and skills for supervisory competency. P. 660.

# 666. Theory and Behavior in School Organizations (3)
- Emphasis on the nature of the individual in the school organization; nature of human behavior; development of individual-organizational relationships. P. 660.

# 667. Educational Governance and Collective Bargaining (3)
- Theory and practice of collective bargaining; history of negotiations in the educational sector; impact of statutes and governing authority. P. 660 or CR.

# 668. Managing Curriculum Change (3)
- 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.

# 669. School Finance (3)
- 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.

# 670. School Business Management (3)
- The general management of school business; administration and accounting of school funds; administration of equipment and supplies; other business operations. P. 660 or CR.

# 671. Administrative Leadership (3)
- Explores the leadership skills necessary to manage school administration more efficiently, including the use of power and authority in relation to existing social, organizational, and behavioral theories. P. 660, 661, or CR.

# 672. Law and Administrative Practice (3)
- Routine and continuous effects of law in public schools; tort liabilities, collective bargaining, influence of federal and state regulations, teacher discipline, student suspension, student services, and professional services. P. 693a and 15 units of educational administration, CR 693b.

# 673. The Principalship (3)
- Functions and activities of building- and department-level administrators, with emphasis on leadership; strategic decision making, and implementation of educational policies. P. 660, 661, or CR.

# 674. The Superintendent (3)
- Emphasis on the role of the superintendent as the leader of the school system, with focus on strategic planning and leadership development. P. 660, 661, 662.

# 675. Internship (a)
- Educational Administration (2) [Rpt./4 units] II P. 660, 661, 662 or CR.
- Advanced Educational Administration (4) [Rpt./8 units] II P. 693a and 15 units of educational administration, CR. 681 or 682.

# 676. Practicum (a)
- Educational Administration (1-3) [Rpt./12 units] II

# 677. Colloquium (a)
- Issues in Educational Administration (1-3) [Rpt./12 units] II

# 678. Seminar (a)
- Topics in Educational Administration (1-3) [Rpt./12 units] II

# 679. Workshop (a)
- Problems in Educational Administration (1-3) [Rpt./12 units] II

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# Educational Psychology (EDP)

## 690. Development Throughout Life (3)
- Life span development within the context of physical, intellectual, social, emotional, and moral development. Emphasis on the dynamics of personal growth.

## 691. Human Development (3)
- Human development from early childhood through late adolescence; integration of behavioral principles into the elementary school setting.

## 692. Theories of Human Development (3)
- Concepts of human development from early adolescence through young adulthood, including major influences on physical, cognitive, and social development. Emphasis within the school environment.

## 693. Learning in the Schools (3)
- Psychological principles applied to learning and development. Emphasis on learning and educational settings, emphasizing learning and instructional variables and their applications.

## 694. Practicum (3)
- Field experience in the administration, scoring, and interpretation of various intellectual assessment devices. 674a: Wechsler Adult Intelligence Scale. 674b: Intellectual assessment techniques. 2R, 3L. Open to majors and minors only. Credit allowed for 674a or 674b, but not for both. P. 673 or CR.

## 695. Child Psychotherapy (3)
- An overview of the major methods of and research related to child behavior disorders. P. 530.

## 696. Child Psychology (3)
- An overview of the major methods of and research related to child behavior disorders. P. 530.

## 697. Psychoeducational Assessment in the Schools (3)
- Psychoeducational assessment techniques; practice in designing and current viewpoints. P. 673b, 674b.

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# 698. Educational Program Evaluation Principles and Techniques (1-3) [Rpt./12 units]
- Developmental and current viewpoints, political context. Illustrative cases, technical skills for determining merit or making decisions about educational and social programs. P. 541, 558, 585.

# 699. Behavior Disorders and Adjustment (3)
- Diagnostic and assessment practices, theories, and research related to child behavior disorders. P. 530.

# 700. Theories of Human Development (3)
- History and analysis of psychological theories of human development; a comprehensive overview of major theoretical systems. P. 500 or 501.
degrees with majors in bilingual/bicultural education and reading. The division offers programs leading to the Educational Specialist, Doctor of Education, and Doctor of Philosophy in educational administration. For information on graduate admission and graduate degree programs, please consult the Graduate Catalogue.

At the time the catalog was being edited, revisions to many of the programs in the division were being considered for approval. All current and prospective students should consult the office of Student Services in the College of Education or the Division of Language, Reading and Culture for information regarding the status and requirements of all programs and degrees.

304. Decoding Skills in the Elementary School (2) I II Basic decoding skills needed in teaching reading; methods and materials used in teaching reading.

325. Foundations of Bilingual Education (3) I II An introduction to the theory and practice of bilingual education. (Identical with M.A. 456.)

406. Foundations of Reading Instruction in Spanish (2) I II Introduction to the theoretical and practical aspects of the reading process, including the interaction of school, community, cultural and family factors in the education of diverse populations. May be convened with 562.

427. Bilingual Curriculum Development (3) I II Theory and application of curriculum development to bilingual instructional programs: designs, organizational patterns, materials and media, change strategies, and evaluation.

435. Elementary School Reading in the Classroom (3) I II Procedures for evaluating and developing reading skills needed in content areas. May be convened with 535.

450. Children's Literature in the Classroom (3) I II A study of the interaction of children and contemporary children's literature of all genres, and its relationship to language, reading and culture. May be convened with 580.

494. Seminar in Language and Social Science (1-3) Rpt./2 units III

Language, Reading and Culture (LRC)

Educational Building, Room 517

(502) 621-1311

Professors Kenneth G. Goodman, Yetta M. Goodman, Amelia Meinik, Kenneth J. Smith, William J. Valmont

Associate Professors Judy N. Mitchell, Head, Adela A. Allen, Patricia L. Anders, John M. Bradley, Margaret B. Fleming, Luis C. Moll, James R. Rankin

Assistant Professors Arminda Fuentevilla, Richard Ruiz

The division offers programs leading to the Master of Arts and Master of Education in

514. Methods and Materials in Bilingual Education (3) I II Analysis and evaluation of methods and materials used in bilingual education; programs offered in first and second languages; contemporary and separate language approaches and cooperative models. P. 505.

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 political influences on the characteristics and needs of the bilingual learner.

531. Developing Language Arts Curriculum (3) I II A study of the role of curriculum models; staff development for implementing change; scope and sequence; planning effective learning experiences. P. 504 and 505.

530. Computer Application for Teachers (3) I II Microcomputer operation; computer-assisted instruction; software evaluation; use of author systems and word processors in the classroom; computer-managed instruction; organization for instructional design; communications networking; computer networking.

532. Pre-Reading and Beginning Reading Development (3) I II An examination of various current theories of 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 major project. P. 435.

547. 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.

551. Research, Writing and Texts: A Psycholinguistic Perspective (3) I II Readers and writers as users of language; reading and writing as language processes; what makes a text a text.

557. Application of Misuse Analysis (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.

559. Applied Linguistics in Education (3) I II The application to curriculum, teaching and learning of concepts from linguistics, psycholinguistics and sociolinguistics. P. 551 or CR.

555. Application of Misuse Analysis (3) I II Study of misuse 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 language and reading in the classroom. P. 504 or CR.

580. Children's Literature in the Classroom (3) I II For a description of course topics, see 420. Graduate-level requirements include an in-depth research paper or other project. May be convened with 420.

581. Multilingual Literature and Literacy (3) I II Analyses of the use of multilingual literature that
fosters self-concept, acceptance, and a sense of identity to develop literacy. Includes readings from the major categories of multilingual literature about Black, Native, Hispanic, and Asian Americans.

595. Colloquium
a. Issues in Language, Reading and Culture (3) I P 504, 505.
b. Language, Learning, and Reading Disabilities (3) II (Identical with S.R. 595b, which is home)
c. Issues in Educating Mexican American Children (3) I S P 504, 505.
d. Applications of Language and Literacy (3) [Rpt/9 units] II S

597. Writing Practice
a. Southern Arizona Writing Project (3-9) [Rpt/12 units] I II S (Identical with Engl. 597a)
b. Micro Analysis in Teacher Education (2-3) II
c. Teaching of English (3) I III S (Identical with Engl. 597b, which is home)

612. Grammatical Analysis (3) I (Identical with Engl. 612)

613. Second Language Acquisition in Formal Contexts (3) I (Identical with Engl. 613)

627. Curriculum Development and Supervision in Language Arts (3) II Organizational patterns of language arts curricula; approaches to improvement of language arts instruction; role of teacher. Designed for the language arts supervisor and school administrator. P. 527.

634. Reading Comprehension: Theories, Research and Practice: Emphasizing cognitive development, methods of influencing growth in reading comprehension; examination and analysis of instructional materials; relationships to comprehension and cognitive development. P. 507.

635. Reading and Writing in Content Areas (3) II Methodology appropriate for reading and writing to learn content; comparable organizational models; program implementation. P. 504, 505, 507 or 551 or CR.

638. Reading Diagnostic Laboratory (3-6) [Rpt/6 units] II Supervised practice in teaching reading and writing, progress analyzing and critical. Special preparatory programs for students. Open to majors only. P. 507, 537.

639. Reading Instructional Laboratory (3-6) [Rpt/6 units] II Supervised practice in teaching reading and writing, progress analyzing and critical. Special preparatory programs for students. Open to majors only. P. 507, 537.

653. Written Language Development (3) III S Study of latest research in the writing 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.
b. Research in Bilingual Education (1-6) II I

c. Research in Language and Literacy (1-6) [Rpt/9 units] II

795. Colloquium
a. Theoretical 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) 627-7822


The division offers programs leading to the Bachelor of Science in Education and Master of Science in Education with a major in rehabilitation. The division also offers programs leading to the Master of Arts, Master of Education, and Educational Specialist with a major in special education. The Doctor of Education and Doctor of Philosophy degrees are offered with majors in educational psychology, counseling, and law. Nondisabled and disabled individuals are encouraged to enroll in the program. Please consult the Graduate Catalog.

At the time this catalog was being edited, revisions to many of the programs in the division were being considered for approval. All current and prospective students should consult the Office of Student Services in the College of Education or the Division of Special Education and Rehabilitation for information regarding the status and requirements of all programs and degrees.

270. History of Deafness (3) I Study of history and culture of deaf people, history of sign language, the evolution of various sign systems, finger spelling and non-verbal communication in sign language.

301. Mainstreaming (1) I GRD An introduction to the integration of special students into the regular elementary classroom. Open to elementary education majors currently enrolled in student teaching. Open to majors only. P. T.T.E. 322, 323, 324, 326, 327. (Identical with T.T.E. 301)

370a-370b. American Sign Language (3-3) I II Basic and intermediate knowledge of the grammar and semantics of American Sign Language; a vocabulary of 600 signs. P. 270.

400. Diagnosis and Remediation of Learning Problems (3) I II Procedures, methods, strategies for informal diagnosis and remediation of children with learning problems in the academic areas of reading, spelling, handwriting, written expression and mathematics. Strategies and adaptations appropriate for use in the regular elementary or the special classroom. P. 400 or 501 and to students in the learning disabilities concentration. May be convened with 501.

402. Behavior Principles for the Handicapped (3) II I Use of behavior principles to modify the behavior of handicapped persons, especially moderately and severely handicapped. 3R. 1L. P. 400. May be convened with 501.

403. The Special Services in the Schools (3) I I S Information to aid teachers in dealing with responsibilities and concerns in school settings while in the special education concentration in regard to P.L. 94-142 Education for All Handicapped Children Act Section 504 of the Rehabilitation Act, Family Education Rights and Privacy Act, and other legal issues. May be convened with 503.

404. The Bilingual Exceptional Learner (3) I Provides a theoretical and practical approach to the study of special needs of the bilingual exceptional child; basic premises of bilingual special education and the interface of the two fields. May be convened with 504.

405. Introduction to Learning Disabilities (3) I II Study of learning disabilities and their impact on students; classification and characteristics, with consideration of educational, social, and psychological problems. P. 400 or CR. May be convened with 510.

411a-411b. Survey of Human Disabilities (3-3) I I Critical study of rehabilitation processes and services for handicapped individuals and groups. P. 400.

431a-431b. Advanced Sign Language (3) I II Advanced principles, methods and techniques of American Sign Language and Manually Coded English. P. 370b. May be convened with 531a-531b.

432. Interpreting for Deaf People (6) I I Introduction to theories, principles, and special settings of interpreting. Covers ethics, definitions and related topics of interpreting. Role playing and interpreted interpretation experiences will be included in the course. Principles, methods, and techniques of interpreting services, impact on families, psychosocial, cognitive and intellectual development and functioning of hearing impaired individuals. May be convened with 532.

431a. American Sign Language (3) I I Advanced study of American Sign Language including historical perspectives; educational and rehabilitative value of Sign Language. P. 531a-531b. May be convened with 531a-531b.

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.

450. Introduction to Behavior Disorders (3) I I Study of behavior disorders; history, definitions, characteristics, and theoretical perspectives. P. 400. May be convened with 550.

460. Introduction to Early Childhood Education for the Handicapped (3) I I Focuses on the handicapping conditions impacting on school-aged children, programs available to serve them and critical issues in this rapidly evolving field. P. 360. May be convened with 660.

482. Rehabilitation of the Aged (3) I I Emphasis on aging from the viewpoint of the aging person and those working with the aged.
483. Supervised Casework in Rehabilitation (3) I I Application of fundamental rehabilitation theories and skills in field settings. P. 400.

484. Problems of Drug Abuse (3) [Rpt/1] I I Survey course for teachers, counselors, and agency workers concerned with drug abuse; examination of community, cultural, and educational approaches to drug abuse and use. May be convened with 584.

485. Rehabilitating the Public Offender (3) I I Components in service delivery to the public offender; how the offender enters the criminal justice system, and treatment and rehabilitation services available.

494. Practicum a. Teacher Exceptional Children (1-10) I I P. 400, methods courses in area of emphasis.
b. Sign Language Laboratory (1-3) [Rpt/4]

495. Colloquium a. Substance Abuse Education (1) I I May be convened with 595a.

500. Introduction to Special Education and Rehabilitation (3) I I 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 I 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 401.

502. Behavior Principles for the Handicapped (3) I I 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 Exceptional Learner (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. The Bilingual Exceptional Learner (3) I 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 I 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.


507a-507b. Methods for Diagnosing Specific Learning Disabilities (3-3) I Educational and psychological assessment of academic areas and learning processes involving perception, integration, and expression, with emphasis on informal and formal assessment and diagnostic teaching. P. 406 or CR and permission of division; CR 593.

508. Teaching Learning Disabled Elementary Students (3) I I Remediation of academic areas and learning processes involving perception, integration, and expression, with emphasis on strategies for planning and implementing instructional programs at the elementary level. P. 406, 507a-507b, and permission of division; CR 593 and 594.

509. Introduction to Severe Disabilities (3) I 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.


511. Educating Students with Severe Disabilities (3) I I Appropriate and functional programming, integration, community-based instruction, and integrative source delivery for students who have multiple handicaps and who require an interdisciplinary approach to drug and abuse. May be convened with 584.

512. Teaching Learning Disabled Adolescents (3) I I Components in service delivery to the public offender; how the offender enters the criminal justice system, and treatment and rehabilitation services available.

520. Vision and Visual Functioning (3) I I For a description of course topics, see 420. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 420.

522. Orientation and Mobility of the Visually Handicapped (3) II Methods of teaching orientation and mobility skills to visually impaired and blind children; with particular attention to concept development, orientation skills, pre-cane skills, personal safety, and independent ambulation, including an introduction to long-cane techniques.


524. Methods of Teaching the Visually Handicapped (3) II Curriculum development and adaptation in various educational programs. 524a. Procedures for use with blind and partially sighted children and youth; emphasis on methods of teaching academic and nonacademic skills and on educating students with nonhandicapped peers. CR, 593; P, 420.

530. Education and Rehabilitation of Hearing Impaired Individuals (3) I I For a description of course topics, see 430. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 430.

531a-531b. Advanced Sign Language (3) I 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 (1-12) I I For a description of course topics, see 433. Graduate-level requirements include 10-hours practicum per semester. May be convened with 433.

534. Language Development for the Exceptional Child (3) I I 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) I I Educational and psychological assessment of bilingual students with emphasis on formal and informal evaluation methods and procedures for purposes of identification and educational planning. P. 507.

536. Teaching Bilingual Exceptional Learners (3) I I Emphasis on professional 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 Exceptional Learners (3) I I Development of reading and expressive language assessment; techniques of teaching language intervention and remediation for hearing impaired children and youth. P. 530.

538. Methods for Teaching Speech to Hearing Impaired (3) I I Methods for teaching auditory and speech skills to hearing impaired children and adolescents. CR, 593.

540. Education of Gifted Children (3) I I For a description of course topics, see 440. Graduate-level requirements include an in-depth paper(s) on single aspect of current issues in the field. May be convened with 440.

541. Teaching the Gifted: Questioning Strategies (3) I I Mastery of skills in developing abstract thinking abilities in gifted children by using the Hilda Taber Teaching Strategies. Emphasis on using these sequential questioning methods in all content areas and at all grade levels. P. 440.

542. Methods for Teaching the Gifted: Productive Thinking Models (3) I I Mastery of skills in developing productive thinking abilities in gifted children by using the teaching-learning models of Krathwohl, Bloom, Guilford, Renzulli and Treffinger at all grade levels and in all content areas. P. 440.

543. Teaching the Gifted: Hierarchical Models (3) I 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.

545. Teaching Children with Behavioral Disorders (3) I I Classroom and classroom management with behavior disordered children and youth. P. 450.

560. Introduction to Early Childhood Education for the Handicapped (3) I I For a description of course topics, see 460. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 460.

561. Methods of Teaching Preschool Handicapped (3) I I For a description of course topics, see 470. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 470.

562. Methods of Assessment for Preschool Handicapped Children (3) I 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. 400.

563. Client Assessment in Rehabilitation (3) I I Exploration of the world of work; critical review of vocational choice theories; experiences in the use and interpretation of individual assessment techniques. P. 555 or CR; Ed.P. 458.

565. Principles of Rehabilitation (3) I I Principles underlying rehabilitation programs and interdisciplinary relationships of agencies engaged in rehabilitation services.

568. Administration of Special Education Programs (3) I I For a description of course topics, see 480. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 480.

571. Supervision of Special Education (3) I I For a description of course topics, see 490. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 490.

578. Supervision of Gifted Education (3) I I For a description of course topics, see 500. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 500.

579. Administration of Gifted Education (3) I I For a description of course topics, see 510. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 510.
tion programs and services; curriculum development, service delivery models, staff development, program development, and legal issues and responsibilities.

572. Policy Analysis in Special Education (3) I Practical aspects of policy analysis and development in schools and other social agencies which serve the handicapped and the gifted.

573. Observation and Participation in Special Education Programs (1-3) II: Selection and implementation of psychological, educational, and occupational evaluation techniques in the division office.

578. Principles and Practices of Vocational Evaluation (3) I II Understanding work skills and labor market conditions, process of vocational evaluation, placement and rehabilitation of vocational rehabilitation clientele, collection and synthesizing evaluation data and writing meaningful reports.

583. Counseling Practices in Rehabilitation Setting (3) I II Facilitation training of rehabilitation professionals in their implementation of counseling practices with varied ethnic, age, disability, and dependency populations. 3R, 1L. Open to majors only.

584. Problems of Drug Abuse (3) I II For a description of course topics, see 484. Graduate-level requirements include an in-depth research project and a class presentation on a topic related to course content. May be convened with 484.

585. Vocational Planning and Placement (3) I II Problems of physical, mental, social, and emotional disability, as they relate to the formulation of a rehabilitation plan; exploration of the various sources of vocational and career choice information in a plan and development. P, M, 580, 563 or CR.


587. Construction and Development of Assessment Samples (3) I II Use of occupational information, career exploration and job analysis techniques; development, construction, standardization, and use of work samples and professional assessment techniques. P, M, 565, 582, 563.

588. Professional Problems in Rehabilitation Psychology (3) I I I Course will discuss professional problems such as research, publishing, membership in professional organizations, including participation and presentation, legislation, monitoring the profession and the development of new roles. P, M, 565.


590. Applied Research with Exceptional Learners (3) I II Review of principles and practices underlying applied research with exceptional learners; preparation of various psychosocial evaluation proposals; conduct of research emphasized.

593. Internship (1-12) II Note: Special sections in each concentration to be arranged in the division office.


331. Multicultural Education (1) I I Review of current methods, materials and practices relating to education in a multicultural context. Cultural conflicts of teachers as well as students they may encounter will be investigated. 2R, 2L, 2P, Ed.P. 301, 310, or CR. 403.

332. Classroom Organization (2) I I Study and application of theoretical models and educational research related to effective elementary classroom management, organization, and communication. P, 322, 323, 324, 326, 327, or 323, 376, 377, 379, 326, 324.


b. Business (3) I I


d. Science (3) I I

e. Art (3) I I

f. Music (3) I I (Identical with Mus 338m).

g. Theatre Arts (3) I I (Identical with Dram. 338h).

h. Social Studies (3) I I

i. Mathematics (3) I I

Note: Several specific method courses, or courses in the teaching of the several high school subjects, are listed under the general number 338, with letters designating the teaching areas. Other methods courses are: 408, 410, 411, 412, 414. Required of prospective secondary teachers.

377. Early Childhood Education (3) I I I S Curriculum practices in the primary grades. P, Ed.P. 301, 310, or CR.

383. Introduction to Business Communications (3) I I I S Introduction to writing clear and concise sentences and paragraphs in basic office communications.

389. Foundations of Business Education (3) I I I S Curriculum construction and implementation in business and distributive education; objectives, history, philosophy of the system for vocational and distributive education; development and administration of vocational student organizations.

405. Mathematics in the Secondary School (3) I I Study and analysis of curriculum changes in school mathematics, with emphasis on the design and content of experimental programs such as SSMCS, P, 3 units of education; Math. 125b. (Identical with Math. 405).

408. English as a Second Language in Bilingual Education (3) I I I S (Identical with Englli. 301).


410. Teaching English Composition (3) I I I S (Identical with Engli. 410).

411. Teaching of Literature (3) I I I S (Identical with Engli. 411).

412. Teaching of English Language (3) I I I S (Identical with Engli. 412).

414. Teaching of Modern Languages (3) II I S Specific methods, objectives, organization of subject matter, and evaluation in modern languages. (Identical with Fre. 414, Ita. 414, Span. 414, Port. 414) May be concurred with 514.

417. Media in Instruction (3) I I I S Basic design of production of media for instruction; selection and integration of materials; equipment operation. (Identical with M.S. 417).

418. Office Administration (3) I I Analysis of office operations; the organization and administration; development and use of office manuals; selection, training, and promotion of office employees; quantity and quality office use.

424. Word Processing Concepts (3) I I S Basic concepts of information/word processing with emphasis on personal utilization of people, procedures, and equipment.

426. Teaching Vocational Office and Distributive Education (3) I I Development of vocational and career education, the organization and methods of teaching office and distributive education.

455. Cooperative Vocational Education Programs (3) I I I S The role of the teacher-coordinator and the coordination, teaching, guidance, public relations, and administration of work-experience programs.

493. Internship I I


b. Student Teaching in Secondary School (6-12) I I, P, Ed.P. 311, 329, 330, L.R.C. 435, professional education, proficiency examination, 338 or CR 494b. Students must meet all other College of Education requirements and have satisfied the formal subject and professional courses. Application should be made several months in advance.

494. Practicum I I


497. Workshop I I


498. Teaching of Modern Languages (3) I I For a description of course topics, see 414. Graduatc-level requirements include lesson plans, class observations, and a research project. (Identical with Fre. 514 and Span. 514) May be concurred with 414.

515. Orientation and Supervision of Student and In-Service Teachers (3) I I I S Research-based strategies to supervise and critique teaching events, and to determine positive ways of thinking and acting in classrooms.


518. Research Trends in Instructional Technology (3) I I Past, present and future research on and trends in instructional technology used in K-12 classrooms.


520. The School Curriculum: Science (3) I I I S Elementary and secondary science curricula in terms of their aims content/processes, instructional methods and assessment. These science curricula are placed within a historical perspective and are examined from a theoretical and research base. P, CR. 338e.

521. The School Curriculum: Mathematics (3) I I I S Elementary and secondary mathematics curricula in terms of their aims content/processes, instructional methods and assessment. These mathematics curricula are placed within a historical perspective and are examined from a theoretical and research base. P, CR 338b.

522. The School Curriculum: Social Studies (3) I I I S Elementary and secondary social studies curricula in terms of their aims content/processes, instructional methods and assessment. These social studies curricula are placed within a historical perspective and are examined from a theoretical and research base. P, CR 338a.


526. Investigations in Early Childhood Education (3) I I I S Critical study and evaluation of research findings and learning theories with emphasis upon pedagogical implications related to early childhood education.

527. Developing Programs for Young Children (3) I I I S Conceptualization, design and implementation of educational programs with an emphasis upon the child's changing needs in the home, school and society. Criteria unique to particular ECE program selected to analyze the development of program goals.


536. Alternatives in the Secondary Classroom (3) I I I S Theoretical bases, methods and strategies for delivering instruction in secondary classrooms. Course work in selected areas of the hidden curriculum, ethnic/racial and sex equity and prejudice and methods for combating racism and sexism.

539. Recent Research on Teaching and Schooling (3) I I I S An overview of the concepts, methodologies and findings of recent
research on teaching and schooling practices. 452. The Middle School/High School (3-4) I 5 History, psychology, and organization. An introduction to the professional responsibilities of the middle school teacher. P, 542.


597. Workshop (1-3) I Print Media in the Classroom (1-3) I P, CR. Both 271a and 271b will be offered with Psio. 418.

610. Applied Curriculum Theory (3) I The theories, techniques, and organization of curriculum construction are discussed, evaluated, and applied. P, 545.

612. Staff Development (3) I I 2 Concept, content, processes and evaluation models of staff development as enacted in school settings.


621. Instructional Research in School Subjects: Mathematics (3) I I 2 Examination of procedures for curriculum development, implementation, improvement, and evaluation at the middle school level. P, 542.

b. Research on Teaching (3) I I 2 P, 539, 545 and Edu. 500.

640. Teacher/Student Cognition and Instruction (3) I I 2 Examination of cognitive models related to teacher comprehension, planning, and decision making; and to students' cognitive change and their interpretation of classroom events. P, 539, 696b and Edu. 500.

642. Middle-Level Curricular Process (3) I I 2 Examination of procedures for curriculum instructional development, implementation, and evaluation at the middle school level. P, 542.

Electrical and Computer Engineering (ECE)

ECE Building, Room 230
(602) 621-2434


423. Introduction to Digital Simulations with Personal Computers (3) I 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. P. 340.

426. Modern Filtering and Signal-Processing Techniques (3) II Operational amplifier circuits, nonlinear amplifier limitations, active RC filter design, nonlinear wave shaping, switching; AV and DIA components; interfacing. P. 320. May be convened with 526.


431. Fiber Optics Laboratory (3) I II Signal analysis techniques associated with modulation and demodulation in systems such as AM, FM, and PCM, with special emphasis on techniques for coherent and noncoherent detection. P. 351. May be convened with 568.

434. Electrical and Optical Properties of Semiconducting Materials (3) I I (Identical with M.S.E. 434) May be convened with 534.


436. Introduction to Coding Techniques (3) II Error-correcting codes used in modern digital communications systems, with emphasis on hardware implementation and performance on real channels. 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. P. 340.

442. Digital Control Systems (3) II Modeling, analysis, and design of digital control systems; AV and DIA conversions, Z-transforms, time and frequency domain representations, stability, microprocessor-based designs. 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. Linear Circuit Design (3) I Design of discrete and integrated solid-state circuits for small-signal applications; flow graph analysis; DC operational and wide-band amplifier design; power amplifier design. P. 351. May be convened with 553.

455. Elementary Digital Circuit Design (II) I II Emphasis on analysis and design of digital control and signal processing systems, including applications to data acquisition, control, and display. P. 351. May be convened with 555.

456. Optoelectronics (3) I Properties and applications of optoelectronic devices and systems. Topics include radiation sources, detectors, fiber optics, and electro-optical components. P. 352 and 381. May be convened with 556.


461. Energy Conversion (3) I Principles and operating characteristics of rotating machines and electromagnetic transducers, single-phase and polyphase transformer operation, laboratory demonstrations and tests of transformers and related machinery. P. 320. May be convened with 561.

462. Symmetrical Components (3) I Three-phase circuit analysis; analysis of fault conditions in power systems. Field trip. P. 320. May be convened with 562.

463. Power Components in Energy and Power (1-4) [Rot/P] II I (Identical with N.E.E. 465)

466. Power Plant Electrical Design (3) II Basic elements of power plant electrical design for a generating system and the plant auxiliary system, including selection and sizing of major electrical equipment. P. 461 with 566. (Identical with N.E.E. 466)


468. Photovoltaic Systems Engineering (3) I I (Identical with N.E.E. 468) May be convened with 568.

470a-470b. Optics Laboratory (3-3) (Identical with Opt. 470a-470b)

472. Continuous-System Simulation (3) I II Continuous system simulation, mainly digital; modeling, state equations, languages, sensitivity and optimization. P. 340. (Identical with C.Sc. 472)

473. Software Engineering Concepts (3) I In-depth consideration of each of the phases of the software project life cycle. Includes a large-scale project involving the development and implementation of a project involving groups of students. 3L. May be convened with 573.

474. Digital Logic Design (3) I II Tabular minimization, state table generation, introduction to computer-aided design. P. 371. May be convened with 574.

475. Microcomputer-Based Design (3) I Design of microprocessor-based real-time test and control systems, use of development systems and emulators. 3L. May be convened with 575.

478a-478b. Data Communications Networks (3-3) I II Discrete-time open systems, interconnection reference model, capability of interface and network models, transmission, data link layer functions, protocols. 3L. May be convened with 578a-578b.


482. Electromagnetics (3) I I Electromagnetics and magnetostatics, review of Maxwell's equations, plane waves, rectangular and circular waveguides, resonators, and antennas. P. 381 or 582. May be convened with 582.


485. Radio Waves (3) III 1990-91 Geometrical ray tracing, diffraction and scattering, ground wave propagation, magnetio-ionic theory, random media effects, fading and shadowing influences, satellite communications, and fiber optic transmission. P. 381. May be convened with 585.

486. Microwave Engineering (3) III Waveguide and transmission line theory; microwave components and networks; transistors and MESFET amplifiers; IMPATT diode and Gunn oscillators; microwave integrated circuits; microwave properties. P. 381. May be convened with 586.

487. Fiber Optics Laboratory (3) II 1990-91 (Identical with Opt. 487)

493. Internship a. Senior Practicum in Design (3) I II 302. Writing-Emphasis Course.*

495. Optics Laboratory (3) I II P, CR 494a and senior standing. Writing-Emphasis Course.*

*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. Linear Systems Theory (3) I Mathematical descriptions of linear systems, state-space models, analysis methods, stability, controllability and observability, implementation of design techniques, design of feedback controllers and observers.


503. Introduction to Statistical Communications (3) I II Random Processes and Noise (3) I I Probabilistic models, stochastic processes, and their relation to communications systems analysis; correlation functions and spectra, impulse noise and other signal transmission effects, random wave forms, noisy networks. P. 381.

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 417. Graduate-level requirements include additional homework and a term project. (Identical with A.M.E. 517) May be convened with 417.

522. Active and Passive Filter Design (3) I For a description of course topics, see 422. Graduate-level requirements include additional homework and a term project. May be convened with 422.


524. Active RC Filters (3) I II Modern techniques for designing active RC filters. P. 381.

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.


531. Image Processing Laboratory (3) I Introduction to hardware and software used in image processing: image sampling and display systems, image enhancement and information extraction; applied problems in
natural resources, remote sensing, 3R, 3L. (Identical with Opt. 531)

532. Computer Vision (3) II Computer pattern recognition; theory of analysis, Theory, algorithms, and applications of computer vision and artificial intelligence. P. 531, 533. (Identical with Opt. 532)

533. Image Processing: Devices, Systems and Applications (3) II 1989-90 Image formation; resolution; noise; linear processing; display, discrete images; sampling; coding; maximum entropy methods and model. P. 502 or background in theory of linear systems. (Identical with Opt. 533)

534. Electronic and Optical Properties of Semiconducting Materials (3) I (Identical with M.S.E. 534) May be convened with 434.

535. Noise in Communication Systems (3) II For a description of course topics, see 435.
Graduate-level requirements include additional homework and a term project. P. 431, Stat. 361. May be convened with 435.

536. Introduction to Coding Techniques (3) II For a description of course topics, see 436. Graduate-level requirements include additional homework and a term project. P. 431, Stat. 361. May be convened with 436.

537. Nonlinear Control Systems (3) II 1990-91 Qualitative features of nonlinear systems, analysis by perturbation, averaging and graphical methods, describing functions, stability analysis by Lyapunov and Popov techniques, design of nonlinear control systems. P. 501.


540. Analog Integrated Circuits (3) I Non-switching aspects of analog integrated circuits utilizing bipolar or CMOS technologies. Biasing, DC behavior, static and dynamic characteristics, MESFETs, JFETs, BJTs, MOSFETs: structure, terminal behavior, and frequency response, models.

541. 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.


547. Direct Energy Conversion (3) II (Identical with N.E.E. 547) May be convened with 447.

550. Advanced Physical Electronics (3) I Review of classical and quantum mechanics, crystal structure, reciprocal lattices, thermal properties, scattering, Boltzmann transport theory, band structure, conduction in semiconductors, atomic physics, and the tight binding model. P. 552. Solid-State Devices (3) II Ohmic contacts, Schottky barriers, diodes; static and dynamic, MESFETs, JFETs, BJTs, MOSFETs: structures, terminal behavior and frequency response, models.

553. System Design and Implementation (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.


557. Integrated Circuit Technology Laboratory (3) II Theory of and experiments in diffused-structure, epitaxial structure, and fabricated circuit. (Identical with M.S.E. 557)


560. Aerosol Science (3) I 1989-90 (Identical with C.E. 560)


568. Photovoltaic Systems Engineering (3) I (Identical with N.E.E. 568) May be convened with 468.

569. Industrial Energy Utilization and Management (3) II (Identical with N.E.E. 569)

570. Computer-Aided Engineering for Integrated Circuits (3) II Industrial CAD systems for integrated circuits; programs for process and device simulation; terminal models of bipolar and MOS devices, automated circuit analysis, methodology, programs, use of computer graphics. P. 555, 552.

571a-571b. Digital Systems Design (3-3) 571a: Computer organization and architecture, computer system design, processor design, logic design, input-output. 571b: Advanced I/O, bus arbitration, interface design, fault tolerance, associative, cache, and virtual memory, RISC architectures. P. 552.

572. Continuous-System Simulation (3) II For a description of course topics, see 472. Graduate-level requirements include additional homework and a term project. (Identical with C.S.C. 572) May be convened with 472.

573. Software Engineering Concepts (3) II For a description of course topics, see 473. Graduate-level requirements include additional homework and a term project. May be convened with 473.

574. Digital Logic Design (3) I II For a description of course topics, see 474. Graduate-level requirements include additional homework and a term project. (Identical with C.S.C. 574) May be convened with 474.

575. Distributed Discrete Event Simulation (3) II Introduction to simulation methodology and its implementation on multi-processors. Modular hierarchical discrete event model simulation, queuing simulation, and simulation of telecommunications architectures. Prior course in simulation recommended.

576. Knowledge-Based System Design (3) II Provided with framework for constructing computer-aided environments to support engineering design. The framework will employ methods of artificial intelligence, theory of modeling, and simulation techniques. Term project involves team work on a selected design problem. P. course in artificial intelligence recommended.

578a-578b. Data Communications Networks (3-3) I For a description of course topics, see 478a-478b. Graduate-level requirements include additional homework and a term project. May be convened with 479.

579. Principles of Artificial Intelligence (3) I For a description of course topics, see 479. Graduate-level requirements include additional homework and a term project. May be convened with 479.

580. Electromagnetic Field Theory (3) II Methods used in solving electromagnetic problems. May be convened with such as appearing in IEEE transactions on microwave theory and techniques, antennas and propagation, and electromagnetic compatibility, and radio science. P. 502 or Math. 422b, E.G.E. 482 or Phys. 415b.

583. Remote Sensing and Image Interpretation (3) III. Development of instrumentation and techniques required for electromagnetic remote sensing applications with emphasis on atmospheric remote sensing. P. 482.

584. Advanced Antenna Theory and Design (3) II 1990-91 Electromagnetic radiation and diffraction; dipoles, slots, open wave guides, horns, apertures, reflectors, and arrays; inverse scattering (optical and radio), applications to practical radar and communications problems. P. 581.

585. Radio Waves (3) I 1990-91 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. 481. May be convened with 485.

586. Electromagnetism (3) I 1989-90 Earth resistivity, principles of electromagnetic induction and loop-loop coupling, earth conduction effects in power systems, well logging, geomagnetics, magnetotellurics and tunnel transmission. P. 482, 502 or Math. 422b; Phys. 415b. (Identical with Geos. 586)

587. Plasma Etching (3) III 1990-91 Practical methodology of basic etch processes in silicon, silicon oxide and nitride, and aluminum. Plasma physics and chemistry, computer simulation. P. familiarity with processing techniques, or consent of department before enrolling.

589. Atmospheric Electricity (3) I 1989-90 (Identical with Atmo. 589)

615. Advanced Instrumentation and Measurements (3) II 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. 481. May be convened with 485.

634. Electronic, Magnetic and Optical Materials (3) II (Identical with M.S.E. 634)

636. Information Theory and Coding (3) II Definition and measure of information and study of its properties; introduction to channel capacity and error-free communications over noisy channels; encoding and decoding systems, with emphasis on error correcting and error detecting codes for noisy binary channels. P. 503. (Identical with Math. 636)

639. Methods of Communication and Detection Theory (3) I 1989-90 Communication, detection and measurement as statistical decision problems; principles of communication in the presence of noise; matched filter and correlation detection; coherent detection. P. 503.

651. Active Linear Circuit Design (3) I II For a description of course topics, see 485. Graduate-level requirements include additional homework and a term project. May be convened with 485.

534. Electronic, Magnetic and Optical Materials (3) I (Identical with M.S.E. 534)

536. Information Theory and Coding (3) I Definition and measure of information and study of its properties; introduction to channel capacity and error-free communications over noisy channels; encoding and decoding systems, with emphasis on error correcting and error detecting codes for noisy binary channels. P. 503. (Identical with Math. 636)
652. Advanced Solid-State Devices (3) II High-level pin-junction theory, BJTs and MOSFETs: modern device structures, advanced models, Microwave and photonic devices.

653. Advanced Topics in Semiconductor Devices (3) I Preparation of approximately three one-hour presentations, including a formal written and oral presentation; topics will reflect current interests. Topics selected require instructor's approval. P. 551 or 552.


672. Microprocessors, Minicomputers and Real-Time Distributed Processing (3) II Real-time distributed processing using microprocessors and minicomputers. Applications to multiprocessor simulation, random-process measurements, and instrumentation. Multi- processor sizing techniques. P. 475. (Identical with CSE 672)

674. Sequential Circuits and Automata (3) I Analysis and synthesis of sequential circuits, partitioning and state assignment, linear sequential circuits, iterative networks, fault test generation and design automation. P. 474. (Identical with CSE 674)

678. Integrated Telecommunication Networks (3) II Analysis and design of integrated voice, data, and image networks for integrated telecommunications applications. Protocols for LANs, ISDNs, and WANs and interoperability issues. Network software designs for ISDN, 576, 579.


683. Principles of Atmospheric Remote Sensing (3) II 1990-91 (Identical with Atmo. 683)

685. Inertial Confinement Controlled Fusion (3) I (Identical with N.E.E. 685)

687. Magnetic Confinement Controlled Fusion (3) II (Identical with N.E.E. 687)


693. Interstellar a. Clinical Engineering (1-3) II P enrollment in clinical engineering option.

696. Seminar a. Knowledge-Based Systems and Simulation Models (3) [Rpt/6 units] I P, 574 or 576 or 579.

Elementary Education (See Education)
not required to participate in the University Honors Program but will find the program in English very compatible with it. Interested students must apply for consideration to the Director of English Honors.

Courses taken to fulfill the university requirement for freshman composition may not be used as part of an English major or minor. Satisfactory completion of the freshman composition requirement is prerequisite to all other courses in English.

Students may fulfill the English requirement for graduation by completing one of the following sequences: Engl. 100, 101, and 102; 103H and 104H; for ESL students: 106, 107, and 108. Students are placed in Freshman Composition or Advanced Placement (in consultation with the Academic Guidelines section of this catalog.)

*NOTE: All entering foreign students must take a placement requirement. (See Advanced Placement under Honors Program.)

English Education majors are strongly advised to take 304a: The art of translating literature into film as an introduction to the relationship between literature and film. Freshman Composition (in consultation with the Academic Guidelines section of this catalog.)

304a - 304b. Literature and Film (3 - 3) Aesthetic relationships between literature and film. 304a: The art of translating literature into film as aesthetic expression. 304b: The artistic and ideological aspects of the major works of film today. May be convened with 305.

305. Non-fiction Writing (3) I I P. 207 or 210.

304. Intermediate Fiction Writing (3) I Prerequisite: 207 or 210.

306. Advanced Fiction Writing (3) II Study of aspects of composition. May be convened with 305.

309. Poetry Writing (3) I I Practice in writing poetry. P. 209.

310. The Novel (3) II I The origin and evolution of the novel as a literary form. P. Freshman Composition.


320a-320b. Literature of the Bible (3-3) 320a: Old Testament; legendary and historical narratives, prophetic literature, and poetry. 320b: New Testament: The Gospels, the Epistles of Paul, and Revelation. (Identical with Reli. 320a-320b)

331. Shakespeare's Major Plays (3) I I A close reading of six to eight plays, including a comedy, a history, a tragedy, and a farce.

350. Oral Tradition (3) I I A study of oral tradition with emphasis on American Indian myth, legend, and lore. P. Freshman Composition. (Identical with A.H.S. 350)

370a-370b. English Literature (3-3) 370a: A survey of major writers in their literary and historical contexts. 370b: From Old English to Renaissance literature. May be convened with 305.

371a-371b. American Literature (3-3) A survey of major writers in their literary and historical contexts. Both 370a and 370b are offered each semester.


419a-419b. Non-fiction Prose (3-3) 419a: The essay in English. 419b: Other prose forms. P. Freshman Composition; upper-division standing.
420. Contemporary American Usage (3) III S
Consideration of the varieties of contemporary American language usage, social and regional, written and oral. P, upper-division standing.


427. Chaucer (3) III I The Canterbury Tales and other poems in Middle English.

430. The Anthropology of Visual Art (3) II (Identical with Anth 430) May be convened with 530.

431a-431b. Shakespeare (3-3) 431a: Twelve comedies, histories and tragedies from the period 1590-1600 (including Hamlet). 431b: Ten comedies, tragedies and tragicalomies from the period 1601-1613. 431a is not prerequisite to 431b.

432. Renaissance Drama (3) II Critical and historical study of Marlowe, Jonson, Middleton, Webster, and other contemporaries of Shakespeare.

434a-434b. Renaissance Literature (3-3) 434a: Critical and historical survey of major authors, including such works as Spenser and Shakespeare. 434b: Bacon and Hobbes; Ben Jonson and his Tribe; Donne and the Metaphysicals; Milton.

444. Milton (3) I Survey of Milton's English poetry, with emphasis on Paradise Lost.

445. Introduction to TESL: An Overview (2) I The development of English as a second language with emphasis on current trends, the influence of linguistic theories, and the international role of English. May be convened with 545.

446. Restoration Drama (3) I Critical and historical study of major plays from Dryden to Sheridan (1660-1780).

448a-448b. Folklore (3-3) 448a: Forms of Verbal Folklore: myth, legend, folktale, riddle, proverb, folk ballad, etc. 448b: Non-verbal Folklore: custom, belief, folk art and craft, food, medicine, dress, festival, and drama. (Identical with Anth 449a and Anth 449b-449b) May be convened with 549a-549b.

450a-450b. Literature of Restoration and Eighteenth Century (3-3) 450a: Survey of Restoration and Eighteenth Century literature (1660-1745). 450b: Poetry, fiction, drama, and essays from 1745 to 1800.

451b-452b. The English Novel (3-3) 451b: Defoe, Richardson, Sterne, Smollett, and Austen. 452b: Scott, the Brontes, Dickens, Thackeray, Eliot, Trollope, and Hardy.

460a-460b. Romantic Literature (3-3) 460a: Wordsworth, Coleridge, and Wordsworth's circle. 460b: Blake, Byron, Shelley, and essayists.

461. Linguistics and the Study of Literature (3) II Designed for graduate teaching assistants in English.

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 Victorian heritage.

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 Continental Drama (3) I The development of Continental drama from 1875 to the present: Ibsen, Chekhov, Strindberg, Brecht, Pirandello, Giraudoux, Anouilh, Beckett, Ionesco, and other playwrights.


481. Literature of the Early Republic (3) I Satire, drama, essays, novels, and poetry of the Revolutionary and post-Revolutionary periods; Franklin, Fréneau, Crevecoeur, the Connecticut Wits, Irving, Cooper. P, upper-division standing.

483. American Realism (3) I The development of realism and naturalism in American literature; Twain, James, Crane, Dreiser, and other writers.

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) III Analysis of such literature themes as the frontier, the American Adam, American humor, sex and society.

487. Major American Author (3) II A consideration of the major works of one author, including such authors as Hawthorne, Melville, James, Hemingway, Faulkner, and others.


490. Colloquium a. Honors for Juniors (3) II b. Honors for Seniors (3) III

496. Seminar a. Studies in a Literary Period (3) [Rpt.* units] II b. Critical and Historical Themes (3) [Rpt.* units] II c. Literary Genres (3) [Rpt.* units] II d. Major Authors (3) [Rpt.* units] I S e. Comparative Literature (3) [Rpt.* units] I f. Literature and Other Disciplines (3) [Rpt.* units] I S

501. Advanced Nonfiction Writing (1 to 4) [Rpt.*] II Graduate-level requirements include extra assignments. P. 301. May be convened with 401.

502. Business Report Writing (3) I II For a description of course topics, see 402.

503a. Introduction to Comparative Literature and Literary Theory (3) I (Identical with C.P.L.T. 503a)

505. History of the English Language (3) III I For a description of course topics, see 411. Graduate-level requirements include a special in-depth paper. P, nine units of literature. May be convened with 411.

513. Poetry in Forms (1 to 4) [Rpt.*] II For a description of course topics, see 413. Graduate-level requirements include a special in-depth paper. P, 405/406, 405/406. May be convened with 413.

515a-515b. Theories of Linguistic Structure (3-3) 515a: Plato through the 19th century. 515b: Modern criticism. (Identical with Anth 515a-515b)

516b. Theories of Linguistic Structure (3-3) 516a: The American tradition in linguistics. 516b: The European tradition in linguistics. 516a is not prerequisite to 516b.

520. History of the German Language (3) III 1899-1953 (Identical with Ger 520)

525. Beowulf (3) II (Identical with Ger 525)

526. Advanced Studies in Chaucer (3) II


530. The Anthropology of Visual Art (3) II (Identical with Anth 530) May be convened with 430.

531. Advanced Studies in Shakespeare (3) III

533. Studies in the Renaissance (3)

541. Studies in the Restoration and Eighteenth Century (3) II

545. Introduction to TESL: An Overview (2) I For a description of course topics, see 445. Graduate-level requirements include an in-depth paper. May be convened with 445.

549a-549b. Folklore (3-3) For a description of course topics, see 449a-449b. Graduate-level requirements include an in-depth paper. P, 549a-549b. May be convened with 449a-449b.


561. History of Children's Literature (3) II (Identical with Li.S. 561)


577. Ethnic Literature a. North American Indian Literature. (3) Graduate-level requirements include a special in-depth paper. (Identical with Anth 577a) May be convened with 477a.

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt.* units] (Identical with Ger 585)

591. Preceptorship a. Methodology of Essay Writing (1) II Designed for graduate teaching assistants in English.

595. Colloquium a. Rhetoric of Epistle (1) II Designed for graduate teaching assistants in English.

596. Seminar a. Medieval Literature (3) III b. Renaissance Literature (3) III c. Modern British Literature (3) III d. Restoration and Eighteenth-Century Literature (3) [Rpt.*] III
**Entomology (ENTO)**

**Forbes Building, Room 410**

(602) 621-1511

Professors Elizabeth A. Bernays, Head; William S. Bowen, Thomas R. Tobin, Adjunct; Richard C. Collins (Adjunct), Eddie W. Cupp, Eric H. Erickson (Adjunct); Paul D. Gerhardt (Emeritus), Henry H. Hagedorn, John G. Hildebrand, Roger T. Huber, Leon Moore, William L. Nutting (Emeritus), Donald M. Tuttle (Emeritus), George W. Ware, Theo F. Watson, Floyd G. Werner, Gordon T. Weller (Adjunct)

The Department of Entomology provides instruction to students planning careers in entomology and for those specializing in related fields including plant and animal protection. Career opportunities in entomology include teaching, research and technical positions with colleges and universities, experiment stations, governmental agencies, military services, private and industrial organizations.

Undergraduate studies lead to the Bachelor of Science in Agriculture degree under the agricultural sciences curriculum. The department also offers opportunities for study toward the degrees of Master of Science and Doctor of Philosophy. For graduate admission and degree requirements, consult the Graduate Catalog.

Agricultural sciences curriculum: Minimum of 16 units in entomology, including the following courses selected in consultation with the student's advisor.

- 404. Ecol. 204, PL 100, Chem. 103a-103b, 104a-104b, 241a-241b, 243a-243b, 3 units each of physics, ecology, and genetics.

151. Insects and Man (3) I Introduction to the biology, ecology, and management of insects affecting man and his interests. Intended for non-majors. Olson

214. Bee Biology and Pollination (2) II Natural history of bees stressing their mutualistic relationships with plants. The biology of honey bees. Other managed bee species and various wild bees. Methods of harvesting honey. 2R, 3L. P, one course in entomology or Ecol. 182.

215. Biological Entomology (1) I Principles underlying the management of arthropods in agricultural systems. Identification, sampling methods, sampling units and sampling procedures. 2R, 3L. Field trips. P, one course in entomology. May be convened with 568. Byrned/Terry

485. Agricultural Entomology (3) I Principles underlying the management of arthropods in agricultural systems. Identification, sampling methods, sampling units and sampling procedures. May be convened with 568. Byrned/Terry

495. Aquatic Entomology (3) I Principles of the biology of aquatic insects. Ecological and economic importance of aquatic insects. 2R, 3L. Field trips. P, one course in entomology. May be convened with 505. Wheeler

544. Insecticide Toxicology (3) I Principles of the biology of insecticides and related chemicals. Mechanisms of action, resistance in arthropods, and environmental distribution and effects. P. 3 units of organic chemistry or biochemistry. May be convened with 505. Smith

545. Insect Neurobiology (1) I Principles of the biology of insecticides and related chemicals. Mechanisms of action, resistance in arthropods, and environmental distribution and effects. P. 3 units of organic chemistry or biochemistry. May be convened with 505. Smith
Environment and Behavior (ENV)

Psychology Building, Room 517
(602) 621-7430

Committee on Environment and Behavior (Graduate)

Professors Robert Bechtel, Chairperson (Psychology), Thomas G. Rowland (Ecology), Terry Daniel (Psychology), Donald Davis (Hydrology), William Havens (Renewable Natural Resources), Robert Hershberger (Architecture), Warren Wiltson (Psychology), David King (Renewable Natural Resources), Kirby Lockard (Architecture), William Rhathe (Anthropology), Thomas F. Saarinen (Geography), Leonard Sellstedt (Psychology), Ervin H. Zube (Renewable Natural Resources)

Associate Professors 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 in family and consumer 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.

Current information on studies in environment and behavior can be obtained from the Chairperson, Committee on Environment and Behavior, Department of Psychology. Courses identified as having content which deals specifically with environment and behavior include:


Economic Studies

(See American Indian Studies, Black Studies, and Mexican American Studies)

Exercise and Sport Sciences

(See Health-Related Professions)

Family and Consumer Resources (FCR/CT/CS/COUN/FS/HEE/ID)

FCR Building, Room 205
(602) 621-1075

Professors Victor A. Christopherson, Acting Director, Oscar C. Christensen, Roger J. Daldrop (Emeritus), Kathryn L. Hatch, James R. Hine (Adjunct), Theodore Jacob, Jean R. Kearns, Amy Jean Knorr (Emeritus), Doris E. Mann (Emeritus), Shirley O'Brien (Adjunct), Naomi A. Reich, Robert R. Rice, Carl A. Ridley, George B. Sproles, Mary Adele Tindal (Emerita)

Associate Professors Richard L. Erickson, Ellen Goldsberry (Adjunct), Donna R. Iams, Roger M. Kramer, Philip J. Lauver, Jessica Lazarus (Adjunct), Mary H. Marion, Betty J. Newlon, David C. Rowe, Joel Rudd, Elizabeth K. Sproles, Mari S. Wilhelm

Assistant Professors Oscar A. Blazquez, Brenda M. Brandt, Windy Gamble, Maureen E. Kelly, Mike L. Looker, Catherine Surr

Extension Specialists Norma J. Reeder, Cornine J. Stinson (Emerita), Frank R. Williams

Lecturer Chet J. Ross

The School of Family and Consumer Resources strives to research, create, and apply knowledge of human development and related environments and activities. This multidisciplinary professional career-oriented option facilitates with an environment and behavior emphasis into majors in family and consumer 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 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.

Current information on studies in environment and behavior can be obtained from the Chairperson, Committee on Environment and Behavior, Department of Psychology. Courses identified as having content which deals specifically with environment and behavior include:


Economic Studies

(See American Indian Studies, Black Studies, and Mexican American Studies)

Exercise and Sport Sciences

(See Health-Related Professions)
114. Apparel Analysis (2) (I) II Introduction to the many facets of the fashion industry with emphasis on six basic components: textiles as the tool of the trade, design, apparel analysis, manufacturing, retailing, and consumerism.

145. Fashion Concepts and Theory (3) (I) Theories of consumer's choice and use of clothing and fashion ethics.

234. Apparel Design (3) (I) II Application of intermediate apparel construction and fitting techniques to arrive at aesthetically pleasing and functionally correct garments.

284R. Textile Science (3) (I) II Practical science concerning fibers, yarn, fabric construction and finishes, use of scientific data related to selection, use and care. P. Chem. 101a, 102a, or physics.

284L. Textile Science Laboratory (1) (I) Lab. analysis of fibers and fabrics. P. 284R or CR.

304. Merchandising Analysis (3) (I) Development of merchandising policies and procedures used in retailing with emphasis on retail mathematics. P. Acct. 200.

325. Historical Analysis of Dress and Fashion (3) (I) II Western dress and the development of the fashion system from an historical perspective from ancient to modern periods, with special emphasis on twentieth century fashion. P. Hist. 103, 104, Hist. 116, 120, 250b; or 6 units of Art 117, 118, 119, or Dram. 140a-140b. Writing Emphasis Course*

393. Internship

a. Merchandising, Textiles, and Clothing (1)
   (I) Open to clothing and textiles and to merchandising and fashion promotion majors only.

b. Practicum
   a. Advanced Apparel Design (3) (I) P. 115, 234.
   b. The Fashion Industry (3) (I) II Operations of the wholesale and retail channel, and development of retail strategy by different types of retail outlets. P. C.T. 304, Mktg. 361: May be convened with 584.

444. Dimensions of Clothing Behavior (3) (I) Analysis of psychological, social, cultural, historical, economic, and aesthetic dimensions of clothing as reported in literature. P. 145, Soc. 100, Psych. 101, Econ. 201a. May be convened with 544.

445. Clothing for Special Needs (3) (I) Selected research and accessories for special needs; based upon research. (Identical with Gero. 445) May be convened with 544.

454. New Developments in the Textile Field (3) (I) For a description of course topics, see 544. Graduate-level requirements include an research paper suitable for publication and an oral presentation. P. 284R. May be convened with 544.

454. Aspects of Clothing Design (3) (I) (Rpt. 9 units) For a description of course topics, see 454. Graduate-level requirements include completing additional design projects and preparing an oral presentation. P. 284R. May be convened with 544.

544. New Developments in the Textile Field (3) (I) For a description of course topics, see 454. Graduate-level requirements include research report suitable for publication and an oral presentation. P. 284R. May be convened with 544.

545. New Developments in the Textile Field (3) (I) For a description of course topics, see 544. Graduate-level requirements include an research paper suitable for publication and an oral presentation. P. 284R. May be convened with 544.

411. Consumer Fraud in Nutrition (3) (I) (Identical with N.F.S. 411)

416. Management of Family Finances (3) (I) II Management of family finances throughout the family life cycle to achieve financial well being in the face of personal and societal problems, the consumer movement, and business and consumer rights and responsibilities.

386. Consumer Protection (3) (I) II Techniques of consumer protection including principles and application of principles of consumer protection among consumers, businesses, and government agencies. Writing Emphasis Course*

411. Consumer Fraud in Nutrition (3) (I) (Identical with Phr. 445)

503. Principles of Adlerian Psychology (3) (I) II For a description of course topics, see 403. Graduate-level requirements include an additional term paper dealing with theoretical aspects of Adlerian psychology. May be convened with 403.

115. Personal Resource Management (3) (I) Principles of management as applied to individuals and home situations; time, money, and energy studies.


356. Social and Economic Aspects of Housing (3) (I) Neighborhoods and sites, family requirements, characteristics of a good house, physical, psychological, and social environment, buying and selling old houses, equipment and maintenance.

376. Consumer Problems (3) (I) The consumer-relationship, with emphasis on consumer problems, the consumer movement, and business and consumer rights and responsibilities. A study of consumer protection.

386. Consumer Protection (3) (I) Techniques of consumer protection including principles and application of principles of consumer protection among consumers, businesses, and government agencies. Writing Emphasis Course*

411. Consumer Fraud in Nutrition (3) (I) (Identical with N.F.S. 411)

416. Management of Family Finances (3) (I) II Management of family finances throughout the family life cycle to achieve financial well being in the face of personal and societal problems, the consumer movement, and business and consumer rights and responsibilities.

386. Consumer Protection (3) (I) II Techniques of consumer protection including principles and application of principles of consumer protection among consumers, businesses, and government agencies. Writing Emphasis Course*

411. Consumer Fraud in Nutrition (3) (I) (Identical with Phr. 445)

503. Principles of Adlerian Psychology (3) (I) II For a description of course topics, see 403. Graduate-level requirements include an additional term paper dealing with theoretical aspects of Adlerian psychology. May be convened with 403.
521. Techniques of Interviewing (3) I, II For a description of course topics, see 421. Graduate-level requirements include an in-depth research paper on an interview techniques topic. May be convened with 421.

549. Counseling and Guidance Laboratory (1 to 3) [Rpt.] I, II Supervised observation and participation in selected counseling and guidance activities: campus, public school, and community settings.

550. Counseling and Human Sexuality (3) S Sexual function, dysfunction, and disorders in context of individual and couple; interview techniques and intervention strategies.

555. Addictions Counseling (3) S An analysis of the diagnosis counseling principles and applications in various treatment settings, including chemical dependency, eating disorders, and other addictions.

562. Topics in Counseling (3) I An analysis of current theories, research, and interventions in specific areas of counseling.

572. Counseling the Adult (3) I Adult crisis, midlife, and developmental patterns; counseling techniques and intervention strategies.

571. Counseling Women (3) I Examination of the counseling needs of contemporary women and current types of intervention designed to meet these needs. (Identical with W.S. 571)

581. Human Relations Training (3) I, II Interdisciplinary approaches to the development and assessment of communicative and interpersonal skills. Applications in the home, business, educational, and community settings.

597. Workshop (3) S i. Self-Management Techniques j. Anger, Depression and Grief (3) k. Family Psychodrama (3) S

601. Foundations of Counseling (3) I, II Relationship and contributions of various fields to the work of the counselor at all levels, in current and historical perspective; derivation of principles and objectives; integrated lab. experience in selected settings. Open to majors only.

622. Appraisal of the Individual (3) I, II Methods of appraising and reporting individual behavior, with emphasis on nonpsychometric data. Open to majors only.


631. Career Counseling (3) I, II Theories of vocational development; types, sources, and use of career information; techniques used to assist in career counseling and decision making. P. 601 or CR

644. The Counseling Process (3) I, II Introduction to theories of counseling; collation and interpretation of counseling data; the counseling process; study of cases. P. 601, 622.

645. Theories of Counseling (3) I, II Rationale, development, and research underlying major counseling theories. P. 631, 644.

647. Premarriage and Marriage Counseling (3) I, II Contemporary issues, concepts, and procedures in premarriage and marriage counseling. P. 581, 622.

648. Procedures in Family Counseling (1 to 3) I, II Theory and practice in family counseling; problem-solving techniques applied to marital and family conflict; lab. experience. P. 403.


672. Cross-Cultural Counseling (3) S, I, II Research on cross-cultural counseling techniques and applications in counseling with culturally different persons. Open to majors only. P. 601, 622.

683. Group Counseling (3) I, II Theory and process in group counseling; applications in school, college, and community settings; lab experience. P. 644.

693. Internship in Counseling (1-9) [Rpt.] I, II Practicum P. 24 units of counseling courses. Supervised practice is offered on the basis of need and demand in the following areas: counseling, career counseling, social work, educational counseling, and psychology. P. at least 6 units of counseling.

d. Agency Counseling (1-9) [Rpt.] I, II

e. Family Counseling (1-9) [Rpt.] I, II

596. Seminar (3) I, II Ethics and Professional Practice (3) I, II Open to majors only. P. 601, 622, 644.

795. Colloquium (3) I, II Professional Practice (1-3) [Rpt.] I, II

796. Counseling Theory (Theory varies) (1-3) I, II

c. Career Development (1-3) I, II

Family Studies (FS)

T. Jacob, Program Leader

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: child studies, family studies, or a combination of the two.

The major in family studies: Majors must complete five general education study areas, as described in the College of Agriculture section of the catalog 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. 117R/5; M.I.S. 111. Major requirements include: F.S. 117, 137, 223, 247, 337, 457; Eng. 308; F.C.R. upper-division course outside the major; and 11-12 units from F.S. 327, 347, 407, 427, 427, 487, C.S. 416; N.F.S. 101. A minimum of 21 units should be chosen from the following areas: anthropology, education, family studies, clothing and textiles, interior design, arts and humanities, home economics and family housing, psychology, economics, and family and consumer sciences.

The major in early childhood education: At the time of catalog printing, this major was under review. For further information, consult the School of Family and Consumer Resources or the College of Education.

517. Human Development and Relations (3) I, II Behavioral science approaches to personal development and interpersonal competence through the life span.

117. Education for Marriage (3) I, II Practical study of factors involved in courtship, mate selection, marital adjustment, and parenthood.

223. Child Development (3) I, II Growth, development, and socialization of the child within the family setting, from conception to the middle school years through adolescence.


267. Human Development and Socialization (3) I, II Growth, development and socialization of the child from the middle school years through adolescence.

327. Parent Education and Guidance (3) I, II Theoretical perspectives and current literature applying to child guidance and parent education; practical considerations of principles and procedures involved in parent study programs.

337. Family Relations (3) I, II The modern family and its relationships. Comparative, functional, and institutional factors are examined.


413. Issues in Aging (3) I, II Introductory course in gerontology, with emphasis upon contemporary issues. (Identical with Ger. 413)

417. Advanced Human Development and Relations (3) I, II Behavioral science approaches to interpersonal competence within various social contexts.

427. Problems in Marriage and the Family (3) I, II Identification and analysis of major problem areas in marriage and the family, including economic, sexual, conflict, emotional disorders, and childrearing.


487. Readings in Family Relations (3) I, II Critical analysis of selected studies and research. P. 137, or 337, or Soc. 321.

500. Life Span Development (3) I, II (Identical with Ed.P. 500)

503. Advanced Adolescent Development (3) I, II (Identical with Ed.P. 503)

507a-507b. Research Methods in Social Science (3-9) I, II 507a: Problem selection, literature review, research design, data analysis, and other related topics, leading to the development of a research prospectus. 507b: Introduction to computer usage in social sci.; critical assessment, writing and presentation of research, including literature review, problem formulation, and research design.

547. Theories of Family Development (3) I, II Integration of the major theories of individual and family development within a social context; evaluation of theoretical formulations in selected content areas of human relations and individual growth. P. 9 units of family studies, psychology or sociology.

557. Methods in Marital Therapy (3) I Theories and principles of counseling for premarital, marital, and group counseling situations. (Identical with Coun. 557)

573. Family Development (3) I Internal development of families over the life cycle, with emphasis on family goals, structure and functioning in the context of American society. P. 223, Soc. 100, or Psy. 101.

607. Topics in Child Development and Family Relations (1 to 3) [Rpt.] I, II Variable content: cognitive development, biological theories of development, role theory, middle childhood, and others.

507. Experiences in Human Relations (3) I Philosophy, content, and resources for understanding, teaching and working in the field of human relations.

*Writing-Emphasis Courses. P. Satisfaction of the upper-division writing requirement (see “Writing-Emphasis Courses” in the Academic Guidelines section of this catalog).
Home Economics Education (HEE)

E. Sproles, Program Leader

The program area of home economics education provides instructional programs for home economics education, including secondary education and family life education. The major in Home Economics Education leads to certification in home economics and journalism, 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 home economics education must present evidence of having completed 56 units of work applicable to the Bachelor of Science in Family and Consumer Resources degree with a minimum grade-point average of 2.25. Those who register for H.E.E. 489 and T.T.E. 338g must have a cumulative grade-point average of 2.5 in F.C.R. and N.F.S. course work.

The major in home economics education: 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; H.E.E. 428 plus 3 additional communications units; Math. 117RS; computer skills (3 units). Major requirements include: F.C.R. 129; F.S. 117, 223; C.S. 116, 316, 356, 416 or 446; C.T. 145, 234, 284/R/L; L.D. 115, 365; F.S. 137, 347; F.C.R. upper-division course outside the major.

The major in home economics education (family life education track) prepares students for work in schools, communities, businesses, and 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 NCFS Family Life Education Certification guidelines, this track will prepare students for certification as a Family Life Education Specialist following 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 Engl. 101 or 103H; 102 or 104H; 6 units of communications from an approved list; Math. 117RS; Ed. A. 487. Major requirements include: F.C.R. 129; F.S. 117, 223; C.S. 116; H.E.E. 288; Ed.A. 350; T.T.E. 494b; L.R.C. 435; C.S. 116, 316, 356, 416 or 446; C.T. 145, 234, 284/R/L; L.D. 115, 365; F.S. 137, 347; F.C.R. upper-division course outside the major.

250. Non-Fiscal Education (3) I (Identical with A.Ed. 220)

288. Professional Presentations and Techniques (3) I Theory and practice of educational techniques in non-formal settings in positions in business, government and human services. 3R, 3L. May be convened with 289.

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 required first semester of the junior year. P. T.T.E. 338g; CR H.E.E. 489.

509. Occupational Home Economics Programs (3) I 1989-90 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. T.T.E. 338g; CR H.E.E. 408 and 489 or teaching experience. May be convened with 508.
Interior Design (ID)
R. Kramer, Program Leader

Majors in interior design acquire expertise in various aspects of the interior environment. The expected result of this learning experience is the development of creative individuals who can synthesize information and analyze design problems from many different perspectives.

The major in interior design requires two years of preprofessional and a two-year professional phase. Prior to entering the professional phase, the student must select one of two tracks of study: design or merchandising. The design track focuses on the relationships between people and their interior environments. The merchandising track focuses on the retailing, marketing, and business aspects of interior design. An application for admission to the professional phase, design track, must be filed with the program leader by the last day of classes of the spring semester preceding the intended fall admission. The application shall consist of a portfolio, an admission, a completed application form, and a transcript. Applicants will be evaluated on the basis of the following criteria: grade point average (60 units of school work, including 36 units of high school courses); course work, statement of intent, portfolio review, successful completion of the qualifying examination, and creative endeavors. (It is highly unusual for a student with a grade point average lower than 3.00 in design courses and 2.00 overall will be admitted to the design track.) For application the student must have completed the following units, including I.D. 5, 15, 155, 265a, 265b; Arch. 101; Art 101; 6 units of art history; and Art 101.

The major in interior design (design 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 101H; 302; 104H; Math. 117R or 111 or approved course. Math requirements include: I.D. 115, 155, 265a, 265b, 335, 335, 375, 375, 393i, 485, 485; C.T. 284R; C.S. 356; Arch. 101; L.A.R. 202; Art 3 (units) or I.D. 493i; Ex.S.S. (2 units); F.C.R. upper-division course outside the major.

The major in interior design (merchandising 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 101H; 302; 104H; Math. 117R or 111 or approved course. Math requirements include: I.D. 115, 155, 265a, 335, 335, 375, 375, 393i, 485; C.T. 304; C.S. 356; Soc. 100; A.C.C. 200; M.Kgt. 361, 458; 6 units from 1.D. 493i, M.Kgt., M.A.P., Ex.S.S. (2 units); F.C.R. upper-division course outside the major (3 units).

115. Fundamentals of Design (3) I II GRD Elements and principles of design; theory and appreciation of design; an introduction to the professional phase. P. 115.

265a-265b. Presentations (4-4) 265a: Drafting, rendering, and production of design ideas. 265b: Lectures in design and production of presentation models; 265c: Lectures in model-building techniques; 265d: Lectures in design and production of presentation models. P. 115, Art 101.

335. Interior Furnishings Industry (3) I Patterns of production and distribution in the inte-
rior furnishings industry, the market area, and in merchandising techniques. P. 155.

345. Interior Perspective (3) S Application of design principles and theories to 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 perspective techniques. P. 265a-265b or drafting course.


365. Housing (3) I Historical aspects of housing, including housing legislation, current issues and trends. P. 361.


388. Design for Living (3) S Elements and principles of interior design; planning for space, personal lifestyle, and budgeting, lighting, heating, and merits and furnishings; designed for nonmajors.

393. Internship I Interior Design (1) I II Open to interior design majors only.

405. Barrier Free Design (3) I II Current research in architecture, interior design, product design, physical therapy, behavioral sciences, and rehabilitation reviewed and applied in design problem-solving.

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. 265b, 355, L.A.R. 345.

493. Ethics and Practice for Interior Design (3) I II Readings in the interior fields, with emphasis on professional individualism. P. 375.


499. Internship I Interior Design (1 to 12) [Rpt./1] I II Open to interior design majors only.

*Writing-Emphasis Courses. P. Satisfactory of upper-division writing proficiency requirement (see "Writing Emphasis Courses" in the Academic Guidelines section of this catalog).

Finance and Real Estate (FIN)
Harvill Building, Room 226 (602) 621-7574


Associate Professors Erich K. Bleck, Joseph S. Gerber (Emeritus)

Assistant Professors Allen B. Atkins, Corinne M. Bronman, Pat Datta, William V. Harlow III, John D. Schatzberg

Lecturers Thomas C. Moses

Majors in finance are prepared for corporate financial management, investment portfolio management, brokerage, and investment banking. Those who concentrate in real estate are exposed to the practical aspects of appraising, financing and managing real property in addition to the economics of land use.

Undergraduate majors in finance and real estate are offered through the Bachelor of Science in Business Administration (see the College of Business and Administration section of the catalog). Nonbusiness students interested in a minor in one of these areas should contact the department head for information. A Master of Science in a major in Business Administration and the Doctor of Philosophy degrees with a major in business administration.

201. Personal Finance (3) I II Principles of personal money management and financial planning for the individual and family, including analysis of home buying, credit purchases, insurance, savings, and investments. Not open to nonmajors.

221. The Stock Market (3) I II Analysis of the markets for securities of both public and private issuers: brokers, dealers, investment bankers, organized and over-the-counter markets; the flow of funds and the investment risk and merits of all classes of securities. Open only to nonmajors.

261. Real Estate Principles (3) I II Survey of the business aspects of real estate.

262-265. Real Estate Finance (3) I II Factors influencing real property values; application of three approaches in determining the value of residential, commercial, and industrial properties. P. 261.


422. *Securities Analysis (3) I II Current practices and techniques of evaluating common stocks, bonds, and commodity markets; theory and practice in construction and management of investment alternatives. P. 393.

431. Financial Intermediaries (3) I II Financial markets and institutions; effects of economic conditions and government policy on financial institutions, the flow of funds, and interest rates; term structure of interest rates; financial institution management. P. 311. Econ. 330.


465. *Advanced Real Estate Appraisal (3) I II Valuation of income-producing property; the capitalization process, discounted cash flow, concepts of investment analysis. P. 361, 362.

511. Managerial Finance (3) II Integration of the basic principles and underlying theory of finance, with emphasis on analytical financial management in business firms and other organizations. Students with credit in Fin. 412 should take Fin. 512. Open only to students admitted to a BPA graduate program. P. Acct. 566.

512. Advanced Corporation Finance (3) II Financial theory applied to capital structure; investment decisions; corporate valuation; and corporate financing. P. Fin. 412 or 511.


521. Investment Analysis (3) I Portfolio theory with applications to the markets for equities, fixed income securities, and options. Risk analysis and investment strategies. P. 511.


537. 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. Fin. 511, Econ. 500a-500b, Mktg. 500. (Identical with M.A.P. 537)

539. Planning of New Ventures (3) II (Identical with M.A.P. 539)

569. Information and Financial Decision Support for Investment Planning (3) I (Identical with Acct. 569)

601. Financial Decision Making Under Uncertainty (3) II Theoretical and applied financial economics relating to uncertainty in markets, information, and choice. P. Fin. 513.


695. Colloquium a. Research and Finance (3) [Rpt/J.I] I


Food Science (See Nutrition and Food Science)

Food Service Management (See Nutrition and Food Science)

Foundations of Education (See Education)

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) II 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 Mus. 207, Dnc. 207, Dram. 207, Art 207, M.Ar. 207)

307. Western Civilization and the Arts: Paleolithic Through Renaissance (3) II 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 Mus. 307, Dnc. 307, Dram. 307, Art 307, M.Ar. 307)

317. Western Civilization and the Arts: Baroque Through Nineteenth Century (3) II 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 Mus. 317, Dnc. 317, Dram. 317, Art 317, M.Ar. 317)

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), Associate Professor Robert Ariew, Edward G. Brown, Ingeborg M. Kohn, Henri Servin, Gianni Spera, Ronnie H. Terpening Assistant Professor Lise Leibacq Lecturers Gerald Brown, Ingeborg M. Kohn, Henri Servin, John L. Gesell, Jean Goetinck, Annamaria Kelly (Emerita) (FRE/ITA)

The Department of French and Italian offers a course of instruction at the elementary, intermediate, and advanced levels. In addition, courses (taught in their respective languages) are offered in the literature and culture of France and Italy. Students in the language classes will be placed in the appropriate course based on placement test results. P. 102 or placement.

101. Elementary French I (4) I I S CDT Listening, speaking, reading, writing; an introduction to the basic structures and vocabulary of French. (Does not count toward the French major or minor.) Also see 113, 211.

102. Elementary French II (4) I I S CDT Listening, speaking, reading, and writing; an introduction to the basic structures and vocabulary of French, continuation. P. 101. Placement (Does not count toward the French major or minor.) Also see 113, 211.

202y. Intensive Review and Elementary French (4) I Review at the 102 level for students who want to 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 study in an interactive or a Studio program and prepare for 201 in the following semester. Admission is by assignment based on placement test results. P. 101. Placement.

112. Accelerated French I (6) S 112 is the equivalent of 101 and 102. Credit is awarded for 112 only. P. 101 and 102.

113. Intermediate French I (4) I 113 is the equivalent of 101 and 102. P. knowledge of another foreign language at the 305b level or consult with department before enrolling.

201. Intermediate French I (4) I I S CDT Continued skill development; reinforcement of basic language skills. P. 102 or placement.
1990–91 (Identical with Span. 422) May be con-
erary and technical. P, 375b or 370b.

ture from its beginnings to the Renaissance. (Identical with T.T.E. 414) May be convened with

414. Teaching of Modern Languages (3)

514. Teaching of Modern Languages (3) (Identical with T.T.E. 514) May be convened with 515.

515a. Literature of the 20th Century (3-3) 1990-91 515a: Novel. 515b: Poetry and drama. 515a is not prerequisite to 515b.

515b. Literature of the 20th Century (3-3) 1990-91 515b: Poetry and theatre. 515b: Novel and short story; intellectual current. 516a is not prerequisite to 516b.

516a. Literature of the 16th Century (3-3) 1990-91 516a: Early Renaissance, Reformation, Rabelais, the Pleiad. 51b: The Humanists, Montaigne, D'Aubigné, the drama. 51b is not prerequisite to 51b.


520a-520b. Old French Language and Literature (3-3) 1990-91 520a: Old French language. May be convened with 520b.

522. Introduction to Romance Philology (3) (Identical with Span. 522) May be convened with 422.

531. Contemporary French Philosophy (3) I 1989-90 For a description of course topics, see 431. Graduate-level requirements include more demanding oral and written reports. May be convened with 531.


541. Contemporary French Philosophy (3) II 1989-90 Discussion course, with readings in the works of Bergson, Camus, Simone Weil, Teilhard de Chardin, Sartre, Lévi-Strauss, Lupascu. P, two 300-level French courses or consult department before enrolling. May be convened with 531.

542. French Literature of Quebec (3) I 1989-90 May be convened with 551.

543. Culture and Civilization of North Africa (3-3) 1989-90 Historical, religious, social, and literary influences on the civilization of North Africa. P, 305b if taught in French. May be convened with 543.

544. Literature of the Maghreb and Lebanon (3) II 1990-91 Francophone literature of Algeria, Lebanon, Morocco and Tunisia. P, 305b if taught in French. May be convened with 554.

545. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] I 1990-91 May be convened with 535.

546. Francophone Literature of the Maghreb and Lebanon (3) II 1990-91 For a description of course topics, see 451. Graduate-level requirements include more demanding readings and other assignments. May be convened with 545.

550a-550b. French Literature of Black Africa and the West Indies (3-3) 1989-90 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.

551. Literature of the Fantastic (3) [Rpt./6 units] I 1989-90 For a description of course topics, see 451. Graduate-level requirements include reading additional texts and writing additional papers, as well as a research paper.

552. French Literature of Quebec (3) II 1989-90 May be convened with 542.

553. Culture and Civilization of North Africa (3) I 1990-91 For a description of course topics, see 453. Graduate-level requirements include more demanding readings and assignments. P, 305b if taught in French. May be convened with 453.

554. Francophone Literature of the Maghreb and Lebanon (3) II 1990-91 For a description of course topics, see 454. Graduate-level requirements include more demanding readings and other assignments. P, 305b if taught in French.

557. Rousseau (3) 1990-91 Rousseau's political thought, his ideas concerning education. The Confessions, the beginning of intellectual life, the end of life, etc.

558. Realism and Naturalism in the Novel (3) 1989-90 Flaubert, Zola, Maupassant, etc.

559. Contemporary Theatre (3) I 1990-91 Theatre from 1900 to the present time. Ionesco, Beckett, Genet, Arrabal, Obaldia, Tartuffe, Dubuclard, etc.

563. Problems in Teaching College French (1) Taught in English. 520: Lower-division literature. Discussion of broader issues of language, pedagogy, teaching and learning, history of foreign language education, college teaching as a career.

555. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] I 1989-90 For a description of course topics, see 455. Graduate-level requirements include more demanding readings and assignments. P, 305b if taught in French. May be convened with 455.

556. Seminar a. Romance Philology (3) I I b. Topics in French Literature (3) I [Rpt./2 units] I c. Old French Literature (3) I I d. 16th Century (3) I I e. 17th Century (3) I I f. 18th Century (3) I I g. 19th Century (3) I I h. 20th Century (3) I I i. Foreign Language Pedagogy (3) [Rpt. I I 2R, 1L] P, 579
### General Biology

**Biosciences West Building, Room 114**

(602) 621-1784

**Committee on Genetics (Graduate)**

- **Professors**: Margaret G. Kidwell, Chairperson, (Ecology and Evolutionary Biology), Harris Bernstein (Microbiology and Immunology), Ronald I. Strock (Ecology and Evolutionary Biology), Robert G. McDaniel (Plant Sciences), Neil H. Mendelson (Molecular and Cellular Biology), Richard E. Michod (Ecology and Evolutionary Biology), Robert T. Ramage (Plant Sciences), Donald Ray (Animal Sciences), Nobuyoshi Shimizu (Molecular and Cellular Biology), Oscar G. Whitfield (Molecular and Cellular Biology), Samuel Ward (Molecular and Cellular Biology)
- **Associate Professors**: Danny Brower (Molecular and Cellular Biology), Suzanne Cassidy (Pediatrics), Eugene Hoyme (Pediatrics), David Rowe (Family and Consumer Resources), Jeffrey Trent (Radiation Oncology)
- **Assistant Professor**: Sue K. DeNise (Animal Sciences)

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.

### Genetics (GENE)

497. **Workshop**
- b. Techniques of Foreign Language Teaching 1 (1) (Identical with Ger. 497b)

696. **Seminar**
- a. Italian Literature 3 (Rpt. I II)

**General Biology** (See Ecology and Evolutionary Biology)

450. **Renaissance Studies** (4) Taught in English. On-site study of the birth and development of the Italian Renaissance with emphasis on Florence. Offered only in Florence, Italy.

455. **Molecular Mechanisms of Development** (3) II 1990-91 (Identical with M.C.B. 555)

568. **Nucleic Acids** (3) II (Identical with Bio. 568)

570. **Molecular Genetics** (3) I 1989-90 (Identical with M.C.B. 570)

571. **Molecular Gene Cloning** (3) II 1990-91 (Identical with Micr. 571)

573. **Recombinant DNA Techniques** (3) II (Identical with M.C.B. 573) May be convened with 425.

595. **Colloquium**
- a. Genetics (1) [Rpt. I II]

596. **Seminar**
- a. Carbohydrates and Cytogenetics (3) I 1989-90 (Identical with CBio. 596f, which is home)

620. **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. 2R, 3L, P. Ecol. 320 or 321. (Identical with Ecol. 620, Renewable Natural Resources)

627. **Advanced Genetics** (3) I 1990-91 (Identical with PLS. 627)

635. **Advanced Cytogenetics** (4) II 1990-91 (Identical with PLS. 635)

638. **Genetics of Plant Cell Cultures** (2) I 1990-91 (Identical with PLS. 638)

666. **Human Microevolutionary Studies** (3) I 1990-91 (Identical with Anth. 666)

670. **Recent Advances in Genetics** (2) I Recent advances in the field of genetics. (Identical with Ecol. 670)

### Geography and Regional Development (GEOG)

513. **Principles of Animal Breeding** (3) I (Identical with AnS. 413)

414. **Animal Breeding Systems** (2) I (Identical with AnS. 414)

423. **Cytogenetics** (3) II (Identical with Ecol. 423) May be convened with 523.

528R. **Advanced Microbial Genetics** (3) II (Identical with M.C.B. 528R) May be convened with 528R.

435. **Evolution** (3) I (Identical with Ecol. 435) May be convened with 535.

473. **Recombinant DNA Techniques** (3) II (Identical with M.C.B. 473) May be convened with 573.

513. **Quantitative Genetics** (3) I 1990-91 (Identical with AnS. 513)

515. **Somatic Cell and Molecular Genetics** (2) I (Identical with M.C.B. 515)

520. **History of Genetics** (1) I 1990-91 Experiences and discoveries which have led to the present state of knowledge in the various areas of genetics. 2R, 3L. P. Ecol. 320 or 321.

523. **Genetics** (3) II (Identical with Ecol. 523) May be convened with 423.

524. **Theoretical Population Genetics** (3) I (Identical with Ecol. 524)

525. **Analysis** (2) I (Identical with Ecol. 525)

528R. **Advanced Microbial Genetics** (3) II (Identical with M.C.B. 528R) May be convened with 528R.

435. **Evolution** (3) I (Identical with Ecol. 435) May be convened with 435.

539. **Statistical Methods** (4) II I (Identical with A.Ec. 539)

555. **Molecular Mechanisms of Development** (3) II 1990-91 (Identical with M.C.B. 555)

568. **Nucleic Acids** (3) II (Identical with Bio. 568)

570. **Molecular Genetics** (3) I 1989-90 (Identical with M.C.B. 570)

571. **Molecular Gene Cloning** (3) II 1990-91 (Identical with Micr. 571)

573. **Recombinant DNA Techniques** (3) II (Identical with M.C.B. 573) May be convened with 425.

595. **Colloquium**
- a. Genetics (1) [Rpt. I II]

596. **Seminar**
- a. Carbohydrates and Cytogenetics (3) I 1989-90 (Identical with CBio. 596f, which is home)

620. **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. 2R, 3L, P. Ecol. 320 or 321. (Identical with Ecol. 620, Renewable Natural Resources)

627. **Advanced Genetics** (3) I 1990-91 (Identical with PLS. 627)

635. **Advanced Cytogenetics** (4) II 1990-91 (Identical with PLS. 635)

638. **Genetics of Plant Cell Cultures** (2) I 1990-91 (Identical with PLS. 638)

666. **Human Microevolutionary Studies** (3) I 1990-91 (Identical with Anth. 666)

670. **Recent Advances in Genetics** (2) I Recent advances in the field of genetics. (Identical with Ecol. 670)

### Geography and Regional Development (GEOG)

513. **Principles of Animal Breeding** (3) I (Identical with AnS. 413)

414. **Animal Breeding Systems** (2) I (Identical with AnS. 414)

423. **Cytogenetics** (3) II (Identical with Ecol. 423) May be convened with 523.

528R. **Advanced Microbial Genetics** (3) II (Identical with M.C.B. 528R) May be convened with 528R.

435. **Evolution** (3) I (Identical with Ecol. 435) May be convened with 535.

473. **Recombinant DNA Techniques** (3) II (Identical with M.C.B. 473) May be convened with 573.

513. **Quantitative Genetics** (3) I 1990-91 (Identical with AnS. 513)

515. **Somatic Cell and Molecular Genetics** (2) I (Identical with M.C.B. 515)

520. **History of Genetics** (1) I 1990-91 Experiments and discoveries which have led to the present state of knowledge in the various areas of genetics. 2R, 3L. P. Ecol. 320 or 321.

523. **Genetics** (3) II (Identical with Ecol. 523) May be convened with 423.

524. **Theoretical Population Genetics** (3) I (Identical with Ecol. 524)

525. **Analysis** (2) I (Identical with Ecol. 525)

528R. **Advanced Microbial Genetics** (3) II (Identical with M.C.B. 528R) May be convened with 528R.

435. **Evolution** (3) I (Identical with Ecol. 435) May be convened with 435.

539. **Statistical Methods** (4) II I (Identical with A.Ec. 539)
fields of physical geography, human geography, and regional geography. At least 21 units must be at the upper-division level. Students may select from the following options:

The general geography option: 3 additional units in each of the four subfields.

The applied geography option: 12 units selected from 102a, 102b, 275, 371, 393, 402, 417, 457, 481, 483 and 6 units of either human or physical geography.

The environmental analysis option: 12 units from 305, 330, 360, 362, 417, 461, 463, 464 or 483.

The planning and urban geography option: 18 units from 110, 275, 301, 359, 360, 371, 379, 393, 407, 453, 456 or 457.

The regional geography option: 12 units in each of the four subfields.

The supporting minor may be in biological sciences, earth sciences, languages, social sciences, or other fields approved by the departmental advisor. The major in regional development, 36 units, includes at least 20 units from 102b, 110, 275, 301, 359, 379, 393, 407, 453, 461, and at least 6 units from 110, 303, 379, 414, 453, 456, 461 and 3 units of regional geography.

The supporting minor may be in biological sciences, earth sciences, languages, social sciences, or other fields approved by the departmental advisor. The major in regional development, 36 units, includes at least 20 units from 102b, 110, 275, 301, 359, 379, 393, 407, 453, 461, and at least 6 units from 110, 303, 379, 414, 453, 456, 461 and 3 units of regional geography.

The supporting minor may be in biological sciences, earth sciences, languages, social sciences, or other fields approved by the departmental advisor. The major in regional development, 36 units, includes at least 20 units from 102b, 110, 275, 301, 359, 379, 393, 407, 453, 461, and at least 6 units from 110, 303, 379, 414, 453, 456, 461 and 3 units of regional geography.

The supporting minor may be in biological sciences, earth sciences, languages, social sciences, or other fields approved by the departmental advisor. The major in regional development, 36 units, includes at least 20 units from 102b, 110, 275, 301, 359, 379, 393, 407, 453, 461, and at least 6 units from 110, 303, 379, 414, 453, 456, 461 and 3 units of regional geography.
481. Geographic Applications of Remote Sensing (3) I Use of satellite and aircraft imagery for monitoring landforms, soils, vegetation and land use, with the focus on problems of land-use planning, resource management and related topics. Field trip. P, two units of remote sensing or equivalent experience. (Identical with Ping. 483) May be convened with 583. Marr, 597a.

497. Workshop a. Geography for Teachers (S) S May be convened with 597a.

500. Current Geographical Research (3) I Major trends and issues in human and physical geography. Field trips. Kirby


507. The American Landscape (3) II For a description of course topics, see 407. Graduate-level requirements include the completion of an original research paper on an approved topic. Field trip. P, two units of remote sensing or equivalent experience. (Identical with Ping. 507) May be convened with 407. Zubrzycki.

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. P, two units of remote sensing or equivalent experience. (Identical with Ping. 508) May be convened with 408. Marr.

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) I For a description of course topics, see 411. Graduate-level requirements include three tutorial sessions and a research-paper review. 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-paper review. May be convened with 412. Pederson.

513. Africa (3) II For a description of course topics, see 413. Graduate-level requirements include the completion and oral presentation of an original research paper on an approved topic. May be convened with 413. Altschul.

516. Rural Area Development (3) I (Identical with A.Ec. 516) May be convened with 416. Marr.


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) May be convened with 453. Mulligan.

553. Location Analysis (3) II 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.

556. Urban Systems Analysis (3) I Theoretical and applied analysis of urban growth models, residential and facility decisions, and urban transportation. (Identical with Ping. 556) Mulligan

559. Graduate 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 Law 659 and Ping. 659)

560. 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) I 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. Altschul.

567. Geosciences (GEOS) (See Mining and Geological Engineering)

585. 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 policies. (Identical with Ping. 565) May be convened with 465. Altschul.

589. History of Geographic Thought (3) II History of geographic philosophy and methodology. P, 15 units of geography. Pederson

596a. a. Economic Geography (3) [Rpt. /2] I I

b. Cultural Geography (3) [Rpt. /2] I I

c. Physical Geography (3) [Rpt. /2] I I

d. Political Geography (3) [Rpt. /2] I I

e. Area Study (3) [Rpt. /2] I I

658. Planning Law (3) II Land-use controls, the law of zoning, exclusionary zoning, restrictive covenants, comprehensive plan, environmental protection, eminent domain, nuisance. (Identical with Ping. 608)

696. Seminar g. Urban Geography (3) [Rpt. /9 units] I I

h. Economic Geography (3) [Rpt. /2] I I (Identical with W.R.A. 596, which is the same)

ii. Interdisciplinary Environment-Behavior-Design (3) I (Identical with IDS. 596u, see home)

597. Workshop a. Geography for Teachers (3) S May be convened with 597a.

605. Project 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)

607. Spatial Analysis (3) II Formal analysis and modeling of spatial structures and processes; conceptual evaluation of point pat- terns, networks, surfaces and interaction. P, 457 or 557, (Identical with Ping. 657) Reeves

610. Planning Process (3) I For a description of course topics, see 460. Graduate-level requirements include the completion of an original research paper on an approved topic. May be convened with 460. Bonine.

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)

616. Department and Courses of Instruction

685. History of Geographic Thought (3) II History of geographic philosophy and methodology. P, 15 units of geography. Pederson

689. Geosciences (GEOS) (See Mining and Geological Engineering)

Geology (See Geosciences)

Geosciences (GEOS)

Gould-Simpson Building, Room 208 (602) 621-6024


Associate Professors Owen K. Davis, Judith Tot- man Parris, P. Jonathan Patchett, Randall M. Pardee, Stanley T. Price, Assistant Professors Lawrence M. Anovitz, Andrew S. Cohen, George E. Gehrke, Roy A. Johnson, Joaquin Ruiz, Eleanor A. Snow

Lecturer Peter L. Kresan

Laboratory of Tree Ring Research

West Stadium Building, Room 109 (602) 621-6469

Professors Malcolm K. Hughes, Director, Bryant Bannister (Emeritus), Jeffery S. Dean, Harold C. Fritts, William J. Robinson, Charles W. Schreiber, Jr., Marvin A. Stokes, Andrew S. Cohen, George E. Gehreis, Roy A. Johnson, Joaquin Ruiz, Eleanor A. Snow

Geosciences, or those sciences dealing with the study of the Earth, incorporate the various fields of study that are applicable to an understanding of the formation and development of the chemical, physical, and biological aspects of the Earth. Academic and research pursuits in the geosciences lead toward a professional career in solving or helping to solve the current and projected issues dealing with land use, urban development, the search for energy...
An introduction to fossil identification, principles of paleoecology, stratigraphy, and applied problems in geosciences. Field trips. P. 101, 103, 106.

106. Survey of the Solar System (4) II (Identical with Pty.S. 106)

209. Introduction to Crystallography and Mineralogy (4) II (Identical with Crystallography) introduction to recognition of selected minerals in hand specimen; relation of properties of minerals to their internal structure; mineral genesis. 3L, 101, 103, Chem. 105a-105b; 104a-104b, Snow.

225. Introduction to Paleontology (4) I GRD Basic principles and methods of stratigraphic analysis; sedimentation and depositional environments; facies relations, evaluation of unconformities, stratigraphic correlation, and interpretation of depositional environments and palaeogeography; applications of basin fill. 3R, 3L. Field trips. P. 402. 104 or Ecol. 101 or 104, Fesssa.

Principles of Stratigraphy and Sedimentation (4) I GRD Basic principles and methods of stratigraphic analysis; sedimentation and depositional environments, facies relations, evaluation of unconformities, stratigraphic correlation, and interpretation of depositional environments and palaeogeography; applications of basin fill. 3R, 3L. Field trips. P. 402. 104 or Ecol. 101 or 104, Fesssa.


321. Structural Geology (4) I GRD Description and analysis of geologic structures of deformational origin; stereographic and experimental work in lab.; structure mapping in the field. 3R, 4L. P. 101, G. Gehrels.

322. Economic Geology (3) GRD Physical principles applied to problems in earth science including seismology, gravity, magnetic, heat flow, plate tectonics. P. 116 or 104b and 160b. Butler.

330. Introduction to Remote Sensing (3) I (Identical with Geog. 330)

346H. Minerals, Metals, and Mankind (3) I The earth's resources, environmental geoscience, geology of metallic and nonmetallic minerals to their internal structure; mineral genesis. 3L, 101, 103, Chem. 105a-105b; 104a-104b, Phys. 116, 117, 121, and 410 or E.C.E. 411; a computer science course approved by the advisor; plus approved electives from geosciences and supporting fields to total 131 units.

The B.S. in Geosciences: In addition to the requirements of the College of Arts and Sciences, the following courses are required for the B.S. in Geosciences (geology concentration): Geos. 101, 102, 103, 104, 209, 225, 302, 315a-315b, 321, 322, any 400-level Geos. course, 401, 402, 403, 404, 405, and 410 (or equivalent), plus 3 units of 400-level "applied" geosciences; Math. 124 or 125a, 125b, and one additional course from Math. 215, 222, 223, 224, 225, and 226; Phys. 103a-103b, 180a-180b, or Phys. 100, 116, 121; a computer science course approved by the advisor; plus approved electives from geosciences and supporting fields to total 131 units.

The B.S. in Geosciences (geophysics concentration) degree program, in addition to the requirements of the College of Arts and Sciences, requires the following courses: Geos. 101, 102, 103, 104, 209, 302, 321, 412, 416, 420, and 424 or 432 or 434; Math. 124 or 125a, 125b, 222, 254, and 422; Chem. 103a-103b, 104a-104b; Phys. 116, 117, 121, and 410 or E.C.E. 411; a computer science course approved by the advisor; plus approved electives from geosciences and supporting fields to total 131 units.

Students who have completed the Bachelor of Science in Education major (enrolled in the College of Education in any major) may also be admitted to the Department of Geosciences. Students must apply for admission, and submit the following to the College of Education for their junior and senior years. The advisor; plus approved electives from geosciences and supporting fields to total 125 units.

A variety of geosciences minor options are available to students in other departments: earth resources, environmental geoscience, geoarchaeology, geochemistry, geophysics, mineralogy, and paleontology. A minor split 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, 105a-105b, and 106a-106b, or 3 minor in chemistry or physics; general education requirements, including Math. 117 or Math. 118.

101. Introduction to Geology (3) I Earth's materials: surface and internal geologic processes, development of plate tectonics model.

104. Introduction to Geology Laboratory (1) Practical applications of rock and mineral identification, topographic and geologic maps, and applied problems in geosciences. Field trips. CR. 101.

403. Introduction to the Solar System (3) I 1989-90 (Identical with Pty.S. 403) May be convened with 504.

405. Optical Mineralogy and Petrography (3) I Introduction to optical properties of minerals, and the use of the petrographic microscope. 1R, 6L. P. 209, Phys. 121 or 123b and 180b.

407. Photogeology (3) II (Identical with G.En. 407) May be convened with 507.

408. Mammalian Phylogeny and Evolution (3) II 1991-92 A study of the mammalian fossil record, emphasis on morphology and phylogenetic evolution of selected mammal orders. 2R, 3L. Field trips. P. 402. May be convened with 508, Lindsay.

411. Introduction to Paleontology (3) I 1990-91 (Identical with Pty.S. 411)


413. Geology Field Camp II (3) S Field studies in geology, with emphasis on geologic mapping. P. 412.


416. Field Studies in Geophysics (3) II S (Identical with G.En. 416) May be convened with 516.


418. Advanced Mineralogy (3) I Structure and crystal chemistry of minerals, microstructural petrology and kinetics of mineral reactions, and transformations, with application to determining geohistory of rocks. P. 209 or consult department before enrollment. May be convened with 518. Snow.


425. Regional Tectonics (3) I Discussion of the geology, geophysics, petrology, and geochemistry of different tectonic settings. P. 101 or 103. May be convened with 525. Conly.

431. Hydrogeology (3) I II (Identical with Hdr. 431) May be convened with 531.


438. Biogeography (3) II (Identical with Ecol. 438) May be convened with 538.

440. Geodynamics (3) II (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 enrollment. May be convened with 540. Chace.

441. Mining Geology (2) I 1989-90 (Identical with G.En. 441) May be convened with 544.


488. Geophysical Exploration: Potential
Field Methods (4) I Principles of gravity, magnetic, and electrical exploration; acquisition and interpretation of geophysical data; applications to structural and evaluating resources. 3R, 2L. P, Phys. 110, 116, Math. 223 (Identical with G.En. 448) May be convened with 548. Chase/Steinberg

501. Environmental Education (3) II For a description of course topics, see 491. Graduate-level requirements include an original research proposal. P, 209 or consult department before enrolling. May be convened with 591.

519. Global Tectonic Processes (3) II For a description of course topics, see 419. Graduate-level requirements include a term paper in public. May be convened with 530. Petromagnetism and geophysical modeling of tectonic processes. P, Math. 254, Phys. 121. (Identical with Pty.S. 510) May be convened with 419. Richardson/Chase


522. Well Logging Interpretation (3) II (Identical with G.En. 552)

523. Advanced Geologic Mapping (3) [Rpt/3] II For a description of course topics, see 434. Graduate-level requirements include a term paper in the field. P, CR, 504 or consult department before enrolling. May be convened with 592.

526. Cordilleran Tectonics (3) I I Geologic and tectonic evolution of the North American Cordilleran based on analysis of geologic, palaeomagnetic, and paleobiogeographic constraints and tectonic models. Gehrels

527. Organic Systems (3) I I Analysis of the geology, geophysics, and geohistory, 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 pre-Phanerozoic times. Chase


530. Chemical Evolution of the Earth (3) I I 1990-91 Transformation and evolution of earth's mantle and crust according to major-element, trace-element and isotopic characteristics of neodymium, hafnium, strontium, lead and other elements. May be convened with 419. Richardson

531. Hydrogeology (3) I I (Identical with Hydr. 531) May be convened with 431. A. Davis

532. Introduction to Seismology (3) I I For a description of course topics, see 434. Graduate-level requirements include a term paper in public. P, Math. 254. May be convened with 432. Wallace

534. 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, 255, 257, 258, 261. May be convened with 434. Richardson

535. Aquifer Mechanics (3) I I (Identical with Hydr. 535)

536. Development of Groundwater Resources (3) I I (Identical with Hydr. 536)

538. Biogeography (3) I I (Identical with Ecol. 538) May be convened with 438.


540. Petroleum Geology (3) [Rpt/3] II For a description of course topics, see 440. Graduate-level requirements include a term paper in publications and a research project. P, CR, 504 or consult department before enrolling. May be convened with 592.

549. Introduction to Vertebrate Paleontology (3) I I For a description of course topics, see 449. Graduate-level requirements include an original research proposal. P, 102, 104 or Ecol. 102. May be convened with 402. Lindsay

550. Glacial and Quaternary Geology (3) I For a description of course topics, see 452. Graduate-level requirements include an original research proposal. P, 102, 104; Ecol. 110, 112. May be convened with 453. Glacial and Quaternary Geology (3)

551. Analytical Techniques in Geology (4) II Strengths and limitations of methods and analysis of geologic material including XRF, XRD, Raman microprobe, AA, thermoluminescence, and K-Ar. May be convened with 557. Long

552. Petrology (3) II (Identical with G.En. 505) May be convened with 401. Martin

553. Hydrogeology (3) II For a description of course topics, see 408. Graduate-level requirements include a research paper on topic-related problems. P, 408. Graduate-level requirements include a research paper on topic-related problems. P, 408, 502. May be convened with 408. Lindsay

554. Geology of Arizona (3-4) I Systematic coverage of Basin and Range province and Colorado Plateau geology as part of the Southern Cordilleran, with emphasis on significant problems. Field trips. Consent of the instructor. P, 102, 104 or Ecol. 102. May be convened with 402. Lindsay

555. Applied Multispectral Imagery (3) II For a description of course topics, see 434. Graduate-level requirements include a term paper in public. P, CR, 504 or consult department before enrolling. May be convened with 431. A. Davis

556. Analytical Techniques in Geology (4) II Strengths and limitations of methods and analysis of geologic material including XRF, XRD, Raman microprobe, AA, thermoluminescence, and K-Ar. May be convened with 557. Long

557. Advanced Geologic Mapping (3) [Rpt/3] II For a description of course topics, see 434. Graduate-level requirements include a term paper in public. P, CR, 504 or consult department before enrolling. May be convened with 431. A. Davis
consult with department before enrolling. May be convened with 440. Chase

541. Soil Genesis (3) II (Identical with S.W. 541)

542. Ore Deposit Petrology (3) II 1990-91 Orthomagmatic, porphyry base metal, skarn, and leached capping lithologic-mineralogic studies by petrographic microscopy, electron probe, and advanced techniques. 8L. P 425 or CR 546a. Guilbert

543. Mathematical Theory of Magma-Hydrothermal Systems (3) II 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 1989-90 (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 models. Norton

546. Economic Mineral Deposits (3) II GRD For a description of course topics, see 446. Graduate-level requirements include an independent research project or term paper in publication format. May be convened with 446. Guilbert/Tilley

547. Industrial Minerals and Rocks (3) I 1989-90 For a description of course topics, see 447. Graduate-level requirements include a term paper. P. 446. May be convened with 446. Guilbert/Tilley

548. Geophysical Exploration: Potential Field Methods (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, 121. (Identical with G.En. 548) May be convened with 446. Chase/Steinberg


550. Geomorphology (4) I For a description of course topics, see 450. Graduate-level requirements include panel leadership on environmental discussion sessions, and additional lab exercise questions. 3R, 3L. P 101, 103. Bull. May be convened with 450. Nagy

551. 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

552. Petroleum Geology (3) I For a description of course topics, see 452. Graduate-level requirements include a term paper regarding some aspect of a major course topic. May be convened with 452. Nagy

553. Geology and the Urban Environment (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. Bakhov


556. Quantitative Dendrochronology (3) I 1989-91 Analysis of tree-ring and other geophysical data series using a wide variety of statistical and time-series techniques. Comparison of tree-ring and various climatological and hydrological records for the purpose of the reconstruction of past variations. 2R, 3L. P. 46a-46b or 56a-56b. Stat. 461. (Identical with Ws.M. 566) Stockton

557. Low Temperature Geochemistry (3) II For a description of course topics, see 457. Graduate-level requirements include an independent research project or a term paper in publication format. P. 101, 103, 500 or Chem. 480a. Chem. 103b, 104b. (Identical with Hydr. 557) May be convened with 457. Long

558. Electric Field Detection Methods (3) I (Identical with G.En. 558)

559. Paleolimnology (3) I (Identical with Anth. 559)

560. 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 trip. P. 101. May be convened with 462. O. Davis

561. Isotope Hydrology (3) I Theory and applications of a technique to determine ages and concentrations of chemical components in natural fluid-rock systems. Radiometric dating of ground water. (Identical with Hydr. 563) Long

562. Introduction to Quaternary 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. Field trips. (Identical with Ws.M. 564a-564b and WS.M. 564a-564b) May be convened with 464a-464b. Swetnam

563. Isotopic Geology (3) II Theory and application of light stable isotopes to paleontological, geological, and environmental problems. Long

564. Botanical Basis of Dendrochronology (3) II 1989-90 Examination of the environmentally modified processes of development of tree physiology and wood anatomy and their applications. Field trip. (Identical with Ws.M. 566) Ijewele


566. Advanced Seismology (3) II 1989-90 Computational techniques in seismology. The application of synthetic seisograms to model source processes and complex structure. P. 432, Math. 422b. Wallace

567. 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. John

568. Introduction to Paleocology (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. Field trips. P. 225, 302. May be convened with 470. Flessa

569. Constitution and Evolution of the Terrestrial Planets (3) I 1989-90 (Identical with PHY.S 571)

570. Geology and the Urban Environment (3) II For a description of course topics, see 473. Graduate-level requirements include an independent research project or a term paper in publication format. P. 106. May be convened with 473. McLaughlin

571. Cenozoic Mammalian Faunas (3) II 1989-90 For a description of course topics, see 475. Graduate-level requirements include an independent research project or a term paper. P. or CR. 402 or 502. May be convened with 475. Lindsay

572. Vertebrate Paleontology (1-4) II (Rpt./6 units) I.

573. Paleoclimatology (3) I For a description of course topics, see 482. Graduate-level requirements include an additional research project. May be convened with 482. Parrish

574. Geomorphology of Carbonate Rocks (3) II Origin, depositional environments, and diagenesis of carbonate and associated chemical and biochemical sedimentary rocks. 2R, 3L. Field trips. (Identical with E.C.E. 574) May be convened with 487.

575. Geo-Electromagnetism (3) I 1989-90 (Identical with E.C.E. 576)


577. Seminar a. Petrography-Petroleum (1-4) [Rpt./6 units]

578. Organic Geochemistry (1-4) [Rpt./6 units]

579. Petrology of Carbonate Rocks (3) II Application of quantitative methods to geologic processes, landforms, and soils; paleoclimatic and earth history. 2R, 3L. Field trips. (Identical with E.C.E. 574) May be convened with 487.

579. Paleoclimate Evidence (1-4) [Rpt./6 units]

580. Paleoclimatology (3) I For a description of course topics, see 482. Graduate-level requirements include an additional research project. May be convened with 482. Parrish

581. Quaternary Palynology (4) II 1989-90 For a description of course topics, see 496. Graduate-level requirements include an independent research project or a term paper in publication format. Field trip. May be convened with 496. Schwab

582. Geologic Field Methods (4) II (Rpt./6 units)

583. Geologic Field Methods (4) II (Rpt./6 units)


585. 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. 446, 450. Chem. 480a or CR. Tilley/Guilbert


587. Structural Geology (3-3) [Rpt./6 units] I (Identical with G. En. 587) May be convened with 492.

588. Tectonic and Cyclic Geomorphology (3) II 1989-91 Effects of tectonic movements and climatic changes on geomorphic processes, landforms, and soils; paleoclimatic and earthquake-hazards interpretations. 2R, 3L. Field trips (includes spring break field trip). Bull

589. Field Geology (3-3) [Rpt./6 units] I For a description of course topics, see 498. Graduate-level requirements include an additional research project. May be convened with 498. Parrish

590. Field Geology (3-3) [Rpt./6 units] II (Identical with Anth. 590)
German (GER)

Modern Languages Building, Room 571
(602) 621-7385

Professors Renate A. Schulz, Head, David H. Chisholm, Max Duffer (Emeritus), David J. Woloshin (Emeritus).

Associate Professors Dennis I. Greene, Richard C. Helt, Babette Luz (Emerita), Steven D. Martinson, Roland Richter

Assistant Professors Albrecht Classen, Mary Wildner-Bassett

Lecturer John R. Wendel

The Department of German provides instruction designed to develop proficiency in oral and written communication, knowledge of German literature, and insights into German cultural tradition. 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-302b, 315a-315b, 400a-400b, and 409a-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 minor in German culture: includes 8 units of language study beyond 102, and 12 units selected from the following: 275, 276, 320, 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 ACTFL/ETS Oral Proficiency Advanced or the equivalent. The work done in the College of Education will include T.T.E. 409b, which carries up to 10 units of credit. The student may proceed to student teaching after demonstrating the required level of oral proficiency.

The teaching minor: includes 302a or 302b, 315a-315b, 400b, 410a-410b, 475a, and 479 and 480. A minimum of 9 upper-division units must be taken in the Department of German. Candidates must demonstrate oral proficiency in German at 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 the College of Education and in the Honors College. Interested students should consult the Honors College for information on Honors Program requirements.

The department provides instruction 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. It may be convened with 579a. 579d.

475a. Advanced Grammar and Stylistics (Ger. CDT) Practice in the use of 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. It may be convened with 579a. 579d.

479. Topics in Foreign Language Teaching (I) Modern methods of language teaching and learning are explored. P. 202. No credit. May be convened with 579a. 579d.

480. Applied Linguistics for Foreign Language Teaching (I) 1989-91 Instruction in applied linguistics will be offered in the form of a seminar. P. 202. No credit. May be convened with 579a. 579d.

485. Linguistic and Computer-assisted Translation (Ger.) 1989-91 Application of computers to literary and authorship, vocabulary measures, indexes and concordances, metrics and versification. P. 3. It may be convened with Fre. 495a, Clas. 495b, Russ. 495a, and Span. 495b.

497. Seminar in Modern German Literature (Ger.) 1989-90 Critical 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 pre-1945 and the cinema of the present. Lectures and readings in English. P. 202. 307a is not prerequisite to 307b.

501. German Lyric Verse from the Reformation to the Present (Ger.) 1990-91 Study of the important lyric poets from the Reformation to the present: Klopstock, Lessing, Wieland, Goethe, Schiller, Heine, and other authors. P. 6 units of upper-division German. Chisholm

502. German Lyric Verse from Romanticism to the Present (Ger.) 1989-90 Introduction to the principles and forms of poetry: analysis and interpretation of outstanding examples of German lyric verse from the 18th through the 20th centuries. P. 6 units of upper-division German. Chisholm

503. Eighteenth-Century German Literature (Ger.) 1990-91 Historical and critical background to the literature of the 18th century. P. 6 units of upper-division German. Chisholm

508. German Literature from 1848 to 1918 (Ger.) 1989-91 The prose and dramatic works of the second half of the 19th century in German. P. 6 units of upper-division German. Richter

509. German Literature from 1900 through
the Weimar Republic (3) II 1989-90 Readings of major prose and dramatic works between 1900 and 1933, in German. P. 6 units of upper-division German.

510. Graduate Literature from 1933 to the Present (3) I 1990-91 Readings of major prose and dramatic works after 1933, in German. P. 6 units of upper-division German.

511. Middle High German Language and Literature (3) II 1990-91 Introduction to Middle High German language and literature; selective readings from representative literary works of the period. P. 302b, 315b. Classen

520. History of the German Language (3) II 1989-90 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) Classen

525. Departm (3) II (Identical with Engl. 525; which is home)

527a. Studies in Medieval Language and Literature (3) (Identical with Engl. 527a)

555. Workshop German Literature (3) I 1990-91 For a description of course topics, see 455. Graduate-level requirements include two oral reports or lectures-recitals on specific topics. P, 310b. 555 is not prerequisite to 575. May be convened with 455.

575a-575b. Advanced Grammar and Stylistics (3-3) CDT For a description of course topics, see 575s. Graduate-level requirements include an in-depth review of a German literary or expository text. P. 315b. 575a is not prerequisite to 575b. 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. Schulz/Wilder-Bassett

580. Applied Linguistics for Foreign Language Teaching (3) II 1990-91 For a description of course topics, see 480. Graduate-level requirements include an in-depth research paper on an aspect of applied linguistic research. May be convened with 480. Schulz/Wilder-Bassett

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II For a description of course topics, see 485. Graduate-level requirements include an additional oral report and an in-depth research paper. P. 3 units of literature at the 300 level or above. (Identical with Engl. 585. Fr. 585. Clas. 585. Lit. 585, Russ. 585, and Scan. 585) May be convened with 485.

594. Practicum
a. Translation (2 to 5) [Rpt./3 P. 496a or departmental proficiency exam.

596. Seminar
i. Germanic Linguistics (3) [Rpt.] I I (Identical with Engl. 596; which is home)

597. Workshop
a. Translation (3) [Rpt/] I I P. competency at third-year undergraduate level or pass departmental placement test

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. Chisholm/Classen

696. Seminar
a. Literature (2 to 4) [Rpt.] I I
b. Linguistics (2 to 4) I I (Identical with Engl. 696c)
c. Psychology (2 to 4) I I (Identical with Engl. 696c)
d. Pedagogy (2 to 4) [Rpt.] I I
e. Translation (2 to 4) [Rpt.] I I

Gerontology (GERO) Anthropology Building, Room 214 (602) 621-4086 Committee on Gerontology


Associate Professors Alfred W Kazsniak (Psychology), Douglas J. McAdam (Sociology), Jesse V. Pergino (Nursing), Pamela G. Reed (Nursing), Stella Mae Smith (Special Education and Rehabilitation).

Assistant Professor Evan W. Kligman (Family and Community Medicine)

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 gerontology courses 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 support 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 involved, 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 an undergraduate may satisfy requirements for a minor or for Subject Area III in interdisciplinary studies by following an approved curriculum. The committee coordinator serves as a minor advisor and also a Research in Gerontology (1)

1. Research in Gerontology (3) (Identical with Ph.Pr.447) May be convened with 447.

2. Perspectives in Geriatrics Laboratory (3) (Identical with Ph.Pr.454) May be convened with 454.

3. Law of the Elderly (2) (Identical with Ph.Pr. 506) May be convened with 406.


5. Economics of Aging (3) I I (Identical with C.S. 536) May be convened with 436.

6. Problems in the Biochemistry of Aging (2) 1989-90 (Identical with N.F.S. 538)


9. Economics of Aging (3) I I (Identical with C.S. 536) May be convened with 436.


11. Law of the Elderly (2) (Identical with Ph.Pr. 506) May be convened with 406.


13. Economics of Aging (3) I I (Identical with C.S. 536) May be convened with 436.


15. Law of the Elderly (2) (Identical with Ph.Pr. 506) May be convened with 406.


17. Economics of Aging (3) I I (Identical with C.S. 536) May be convened with 436.

18. Problems in the Biochemistry of Aging (2) 1989-90 (Identical with N.F.S. 538)


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 106
(602) 626-2425

Professor Anne E. Alwater, Acting Head
Associate Professors: Johnson, L.; Sorensen, R.
Assistant Professors: Clifton D. Crutchfield, M.D.
Van Ert
Lector Judith A. Nevin

The Division of Community and Environmental Health provides instructional programs to prepare students for careers in school health education, occupational safety and health administration, and other related fields. Undergraduate studies lead to the Bachelor of Science in Health Sciences with one of two major areas: health education or occupational safety and health administration. Graduate degrees in these programs are accredited by the National Council for Accreditation of Teacher Education (NCATE). Students intending to minor in health education should consult the Graduate Catalog.

**Health Education (HLTH)**

178. Introduction to Health Science (3) I, II Introduction and analyzes basic personal and community health, the principles of anatomy, physiology, and the effects of stress on health. Prerequisites: HLTH 176, 306, 330, 343, 437, 439a 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 developed. All current and prospective students should consult the Graduate Catalog.


330. Human Sexuality (3) I, II Discussion of the basic aspects of human sexuality, including male and female anatomy, physiology, and the effects of stress. Prerequisites: HLTH 176, 306, 330, 343, 437, 439a 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 developed. All current and prospective students should consult the Graduate Catalog.


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Activity Courses

Activity courses without an * are available to all students. Courses with an * are available only to those with a major in physical education, and courses with ** are available only to students majoring in physical education. Students who have completed an intermediate course may repeat that 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 locker will result in a financial encumbrance.

100. Adapted Physical Activities (1) I II

103. Aerobic Dance (1) I I S
a. Beginning Aerobic Dance
b. Intermediate Aerobic Dance

109. Backpacking (1) I I S Two-day field trip.

110. Badminton (1) I
a. BeginningBadminton

114. Basketball (1) I I
a. Beginning Basketball
b. Intermediate Basketball

116. Body Dynamics (1) I I S

123. Country Swing (1)

128. Diving (1)

129. Golf (1)

132. Fencing (1)

135. Folk Dance (1)

143. Fred Astaire Dance (1)

148. Karate (1) I I S

150. Lifesaving (1) I I P, 169d.

157. Personal Defense (1) I I S

159. Racketball (1) I I S

161. Scuba Diving (2) I I S
b. Advanced Scuba Diving [Rpt.], 1 I I R, 3L.

164. Soccer-Speedball-Speed-A-Way (1) I I
a. Beginning Soccer-Speedball-Speed-A-Way

166. Softball (1) I I S

169. Swimming (1) I I S
a. Beginning Swimming
b. Intermediate Swimming
c. Advanced Swimming

170. Swimming for Fitness (1) I I S, 169c.

173. Tennis (1) I I S

208. Aerobic Dance Fitness (1) I I I *

210. Personal Defense (1) I *

211. Beginning Weight Training

213. Basketball (2) I I I *

216. Beginning Racketball

217. Folk Dance (1) I I I *

218. Football (1) I I I *

219. Golf (1)

220. Personal Defense (1) I *

221. Women's Gymnastics (2) I *

222. Handball-Racketball (1) I I

225. Soccer-Speedball-Speed-A-Way (2) I I I *

226. Softball (1) I I I *

228. Swimming-Lifesaving (2) I I I *

230. Tennis (2) I I I *

232. Volleyball (2) I I I *

250. Beginning Track (I I I P, 170a).

260. Water Safety Instructor (2) I II American Red Cross Water Safety Instructor Certificate will be issued to those students qualifying. P, current advanced lifesaving certificate.

261. Advanced First Aid and Emergency Care (2) I I I 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 I I 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, medication, 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.

276. Designed Exercise Programs (2) I I Instruction and practice in various types of formal exercise programs. Munroe/Simko


285. Principles of Teaching Physical Activity (3) I I I General principles and practical experiences related to analysis of movement skills, correction of movement errors, and preinstructional planning applied specifically to teaching physical activity.

286. Sports Officiating (1) I I I Guiding principles and standards; rules, mechanics, and procedures for officiating sports common to secondary school interscholastic and community club programs. Consult department before enrolling.

288. Historical and Philosophical Perspectives of Sport and Physical Education (3) I II Study of the development of sport and physical education from ancient society through the 20th century; history of philosophic thought and influences on current practices.


320. Psychological Foundations for Exercise and Sport (3) I II Examines principles of motor learning and performance; psychological factors such as personality, anxiety, and motivation which influence learning and performance; and psychology of exercise.

351. Elementary School Physical Education (3) I II Purposes and practices of physical education at the elementary school level; instruction in recommended activities; teaching and evaluation techniques; class organization. P, current advanced physical education certificate and current advanced lifesaving certificate.


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.

356. Directed Study (0-3) I I I I Significant activity. Hours to be determined before enrollment.

360. Functional Kinesiology (3) I I I I 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.


371. 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, Math 117R/S.

373. Physiological Basis of Physical Education and Athletics (3) I I I I Physiological responses and adaptations to physical activity; exercise and environment; physiological emphasis fitness evaluation and application of training principles for exercise and sport. P, Chem. 103a, 104a, Ecol. 159a-159b, 160a-160b, Math 117R/S.
375. Exercise Physiology (3) II Regulation and adjustment of physiological systems during acute exercise and adaptations with chronic exercise in individuals and populations and populations and athletic injuries; emphasizes physiological mechanisms. P, Chem, 103a-103b, 104a-104b. Ecol, 159a-159b, 160a-160b, Math, 117VS, 118.

376. Exercise Physiology Laboratory (1) P, CR, 375.

377. Techniques in Prevention and Treatment of Athletic Injuries (3) II Prevention, treatment, and management of athletic injuries; emphasizes practical experience in application of preventive taping and bandaging. P, Ecol, 159a-159b, Delforge.

380. Scientific Foundations of Motor Learning (3) II 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, Psyc, 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 measurement in physical education; data analysis techniques for test evaluation, test construction, and grading; experience with tests of fitness, sport skills, and sociometric devices. May be convened with 382.

382. Governance and Fiscal Aspects of Amateur Athletics (3) I II Examination of the structure, function, and fiscal aspects of organizations which govern amateur athletics in the U.S.

385. Principles of Athletic Coaching (3) II Duties, responsibilities and ethics of the athletic coach; the coaching profession in public school settings with emphasis on administrative functions, legal liability, facilities coordination, and game and contest management. Baker

386. Administration of Interscholastic Athletics (2) I 1950-91 Role of athletics in secondary education, with emphasis on administrative philosophy, staff relations, business procedures, facilities, and the conduct of athletic events. Baker

388. Administration of Physical Education Programs (3) I III Principles and practices characteristics of physical education programs; organizational and administrative theory; organizational models and theories, curriculum development, contemporary economics, innovations and issues. Baker/Miller

390. Internship (3) I II P, 373, 374, 394d.

394. Practicum (3) I III P, 354, 360, 373, 374

b. Physical Education Teaching Techniques on the College Level (1) I II P, 285 and professional activities requirement.

d. Exercise Leader (2) [Prt./2] I II I SIR, 8L, P, 373 and 374, or 375 and 376

e. Exercise Technician (2) [Prt./2] I II I SIR, 8L, P, 373 and 374, or 375 and 376

410. Sport in Contemporary Society (3) I Study of contemporary sport from the perspectives of its personal, social, cultural, economic and educational dimensions. May be convened with 510 Miller


450. 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, 360 or 370, Ecol, 159a-159b, 160a-160b. May be convened with 560, Alwater/Enoka

491. Preceptorship (3) I II P, 320, 370, 375, 376.

b. Analysis of Data in Exercise and Sport Sciences (1) I May be convened with 156b, Alwater/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, Miller

515. Philosophy of Physical Education and Sport (3) I For a description of course topics, see 422. Also examine philosophic foundations, to explore the philosophic process, and to analyze, formulate, and apply principles as guides to action. P, 12 upper-division units of exercise and sport sciences. Miller

522. Curriculum Development in Physical Education (2) I For a description of course topics, see 422. Graduate-level requirements include a comprehensive term paper. P, 265. May be convened with 422.

525. Motor Learning and Human Performance (3) I For a description of course topics, see 410. Also examine the effects of exercise on physiological systems; emphasizes exercise in various environments. P, 159a-159b, 160a-160b. May be convened with 460, Alwater/Enoka.


556. Physical Activity in Aging and Chronic Diseases: Psychosocial Aspects (3) I Psychosocial dimensions of exercise programs designed for populations with chronic diseases as the focus of the exercise program. P, 159a-159b, 160a-160b. May be convened with 460, Alwater/Enoka.

570. Research Design in Exercise and Sport Sciences (2) I II Study of research design, methodologies, and data analysis procedures pertinent to the exercise sciences. Emphasis is on the selection of research problems and interpretation of research articles. Lohnman

577. Laboratory Research Design for Exercise and Sport Sciences (1) I Laboratory experiences in literature retrieval systems; data analysis procedures by calculator, microcomputer, and mainframe computer; critical analysis procedures of research articles, and participation in a research project. CR 570, Lohnman

579. Statistical Analysis in Exercise and Sport Sciences (3) I Analysis of research designs and data analysis procedures in the field of exercise and sport sciences with emphasis on appropriateness of selected designs and interpretation of various data analysis procedures. Statistical power, reliability, covariance and multiple regression techniques and uses of micro- and mainframe data analysis software. P, 570 and 571, Lohnman


581. Therapeutic Modalities (3) I II Advanced study of the role of hydroterapeutic and electrotherapeutic agents in the rehabilitation of athletic injuries. P, 580, Delforge

582. Anatomical Basis of Sport Injuries (3) I Comprehensive survey of bones, ligaments, muscles, nerves, and vessels of the trunk and upper and lower extremities, with emphasis on the planning and implementation of rehabilitation programs for injured athletes. 2R, 3L, P, CR 580, Hilman

583. Medical Aspects of Sports Injuries (3) I II Common surgical procedures and post-surgical immobilization techniques used in the management of sports-related injuries; implications for post-surgical therapeutic exercise programs. P, 580, 582

584. Planning of Athletic Injuries (3) I For a description of course topics, see 582. Principles in planning and implementation of rehabilitation programs for injured athletes with emphasis on application of contemporary therapeutic exercise techniques. P, 580, Delforge

585. Issues in Athletic Training and Sports Medicine (3) I II Current issues and trends in athletic training and sports medicine with emphasis on the professional preparation of
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)

236. 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.

237. Frontier 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 eastern and mid-western United States.

247. Science and Society (3) The historical impact of science on society; selected examples of the interaction of scientific research with politics, art, literature, and social thought from the 16th century to the present.

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) (Identical with Or.S. 271) The study of Japan, China, and Mongolia from ancient origins to the present. (Identical with Reli. 271)

271. The History of Christianity (3) S The history of Christianity is presented with its many shifts, shadows and differing stages, from the Apostles' Third Ecumenical Council to Vatican II (1962-65). (Identical with Reli. 271)

272. Japanese Civilization (3) II The study of the evolution of Japanese social values, aesthetic concerns, religion, and political institutions in order to understand Japan's cultural heritage and contemporary society. (Identical with Or.S. 272)

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, military technology, and leadership.

332. Vietnam and the Cold War (3) S Causes, strategies and tactics, technology, and leadership of the Vietnam War and the Democratic Republic of Vietnam. (Identical with Or.S. 332)

339. Tradition, 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 capitalism and development.

347. The Old South (3) Social and political history from Jamestown to secession. (Identical with BI.S. 347)

348. The South Since the Civil War (3) From the Civil War to the present. (Identical with BI.S. 348) "Merging"

351. Race and Class in Latin America (3) II The impact of commercial expansion, urbanization, industrialization, and ideological change on race and class relations in Latin America from the 16th to early 20th century.

368. Colonial Mexico (3) I From discovery through the War for Independence. (Identical with M.A.S. 368)

369. Mexico Since Independence (3) II Struggle for political, economic and social stability; international relations; cultural patterns. (Identical with M.A.S. 369)

370a-370b. History of the Jews (3-3) Survey of major political, socioeconomic, and cultural developments in Jewish history. 370a: Modern Jewish history. 370b: The Jew in the medieval world (to the 17th century). (Identical with Or.S. 370a-370b and Reli. 370a-370b)

372a-372b. History of the Jewish People in Ancient Times (3-3) (Identical with Or.S. 372a-372b)

374. The Holocaust (3) II 1990-91 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 Or.S. 374)

375a-375b. History of China (3-3) (Identical with Or.S. 375a-375b)


401. Ancient Mesopotamia (3) I (Identical with Reli. 401a) Archaeology of the Paleolithic and Mesolithic cultures. 401a-401b. 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 Clas. 404a-404b)

405a-405b. 17th Century Europe (3-3) Major institutions and trends in Europe from the breakup of the Roman World to the 17th century. 405a is not prerequisite to 405b. (Identical with Reli. 405a-405b) May be convened with 505a-505b.

406. Medieval England (3) II From the Norman conquest to the Hundred Years War, with emphasis on political, social, and cultural developments. (Identical with Reli. 406) May be convened with 506.


408. The Reformation (3) II The Reformation in thought and action both from the perspective of its religious origins and of the political and social conditions. Analysis of its impact on sixteenth century Europe including the spread of Protestant reformation and its companion movement, counter-reformation. (Identical with Reli. 408) May be convened with 508.

410. History of Hell in Early Europe (3) II The concept of punishment after death in Western Europe from the Bible to Dante. Includes the Hebrew, Greco-Roman, Germanic, and Christian traditions. (Identical with Reli. 410) May be convened with 510.

411. European Intellectual History to 1750 (3) I Dominant themes in European intellectual history including the spread of Protestant reformation and its companion movement, counter-reformation. (Identical with Reli. 411) May be convened with 511.

412. European Intellectual History: 1750 to 1815 (3) I The political, social, economic and cultural history of Europe in the 18th century. Reading and discussions of texts from Petrarch to Locke.

413. European Intellectual History: 1750 to 20th Century (3) II The political, social, economic and cultural history of Europe in the 19th and 20th centuries. Reading and discussions of texts from David Hume to Friedrich Nietzsche.

505a-505b. European Intellectual History: 1750 to 20th Century (3-3) May be convened with 505a-505b.

515. United States Military History (3) I European background to contemporary international relations from the Congress of Vienna through the outbreak of World War I.

516. Imperial and Early Modern Germany (3) I The political, social, economic and cultural history of Germany from the late Middle Ages to about 1900. May be convened with 516.

518. Modern Germany I The political, social, economic and cultural history of Germany from the period of the French Revolution to the present. May be convened with 518.

519. The French Enlightenment (3) I The intellectual history of France in the 18th century, with emphasis on the works of the philosophes. May be convened with 519.

520. The French Revolution and Napoleon (3) II The origins and progress of the Revolution in France. May be convened with 520.

521. History of Russia: Early Period (3) I Political, socio-economic, and cultural history of Russia in medieval and early modern times. May be convened with 521.

522. History of Russia: Modern Period (3) II Political, socio-economic, and cultural history of Russia in the modern era until the Bolshevik Revolution. May be convened with 522.

523. Intellectual History of Russia (3) II The historical significance of social, political, and intellectual history of Russia in the 19th and 20th centuries.

524. The Russian Revolutions (3) I The era of reform and revolutions in Russia from 1890 to 1921, culminating in the formation of the Soviet regime.

525. History of the Soviet Union (3) II The Bolshevik Revolution and problems of Soviet Russian history from 1917 to the present.


527. Russian-American Relations: 1783 to the Present (3) II Diplomatic, social, economic and cultural relations between Russia and the United States since 1783.

528. Antisemitism (3) II Exploration of broad range of social, cultural, political, economic and religious issues with a specific emphasis on the discovery of the Jewish race as they appeared in German Central Europe and in an often multilingual context in the period 1860-1920. (Identical with Psys. 428 and Reli. 528)

531. Colonial America (3) I The experience and evolving institutions of the North Atlantic colonists from the first landings to the end of the French and Indian War. May be convened with 531.

532. The Era of the American Revolution (3) II Origins, progress, and character of the struggle for independence; internal political, constitutional, social, and economic developments; the problems of the "Critical Period" and the making of the Constitution. May be convened with 532.

533. Jefferson and the New Nation, 1790-1825 (3) I The Federalists and the rise of the Republican party: a biographical, economic, political and social history of the early North, South and expanding West. May be convened with 533.

534. The Jacksonian Era, 1825-1850 (3) I Ii Political, social and economic developments in the United States from the adoption of the Monroe Doctrine through the Mexican War. May be convened with 534.

535. The Coming of the Civil War, U.S. 1845-1861 (3) I Political, constitutional, social and economic developments in the U.S. from the Mexican War through the Civil War. (Identical with B.S. 436) May be convened with 535.

536. Civil War and Reconstruction, U.S. 1861-1878 (3) II Political, constitutional, economic, and military developments in the U.S. during the era of rapid industrialization from the end of Reconstruction through World War I. May be convened with 536.

537. U.S. 1875-1919 The Gilded Age and Progressive Era (3) Examination of economic, social and political developments in the U.S. during the era of rapid industrialization from the end of Reconstruction through World War I. May be convened with 536.

538. U.S. 1918-1945 From World War I through World War II (3) Prosperity, Depres-
sion and the New Deal in peace and war. May be convened with 538.

440. United States: 1945 to Present (3) I II American society and the role of the United States in the world since the end of World War II, with emphasis on the impact of the Cold War on American society. May be convened with 540.

442. History of American Society and Thought: Pre-Civil War (3) I American political, social, and cultural history up to the American Civil War. May be convened with 542.

443. History of American Society and Thought Since the Civil War (3) II The transformation of American society from the end of the Civil War to the present. May be convened with 543.

446. History of Arizona (3) I II Economic, social, and political development of the state from Spanish times to the present. May be convened with 546.

447. History of American Agriculture (3) II The history of the roots, development, and influence of agricultural forces in the United States from the pre-Columbian period to the present. (Identical with A.Ec. 447) May be convened with 547.

449. History of American Foreign Relations to 1914 (3) I Examine the rise of America as a world power, including its relations with Europe, Latin America, and Asia. May be convened with 549.

450. History of American Foreign Relations Since 1914 (3) I An examination of American interactions with nations from prehistoric times to the present; themes covered include economic, cultural, and military relations and conflicts. (Identical with Or.S. 451) May be convened with 550.

452. American Ethnic History (3) II A history of the various ethnic minorities in America from Colonial times to the present, with emphasis on adjustment, acculturation and degrees of assimilation. (Identical with B.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. (Identical with W.S. 453) May be convened with 553.

454. Spanish Inquisition (3) I The Inquisition in Spanish, European, and ethnic history; its bureaucratic structure and procedures, its victims, New and Old Christians, and witches. (Identical with Or.S. 454 and Rel. 454) May be convened with 554.

457. The Mexican Revolution (3-3) Survey of political, social, and economic developments in South Asia from the mid-18th century to the present. (Identical with Or.S. 473) May be convened with 573.

471. Introduction to Indic Civilization (3) (Identical with Or.S. 471) May be convened with 571.

472. History of Medieval India (3) I Survey of medieval India from the 7th century to 1700. (Identical with Or.S. 472) May be convened with 572.

473. History of Modern India and Pakistan: From Colonialism to Independence (3) II Social, cultural, and political history of India. From earliest times to 1800. (Identical with Or.S. 474a-474b) May be convened with 573.

474a-474b. History of Japan (3-3-3) Social, cultural, and political history of Japan. From earliest times to 1800. (Identical with Or.S. 474a-474b) May be convened with 573.

474c. History of the Middle East (3) I Survey of the Middle East from 1492, Spain's role in the world and the Spanish Civil War; Spain's cultural contributions. May be convened with 566.

466. History of Brazil (3) II History of Brazil from 1500 to the present. May be convened with 566.

467. Contemporary Latin America (3) I Revolution, social change and reaction in Latin America from 1930 to the present. May be convened with 567.

468a-468b. Asia and the West (3-3) Processes of interaction between Europeans and the peoples and cultures of the Middle East, South Asia, and East Asia. (Identical with Or.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. (Identical with W.S. 469) May be convened with 569.

470. Religion and History of India (3) Development of major religious traditions of South Asia: Vedic Religion, Buddhism, Jainism, Hinduism, Sikhism, and Islam. (Identical with Or.S. 470) May be convened with 570.

471. Introduction to Indic Civilization (3) (Identical with Or.S. 471) May be convened with 571.

472. History of Medieval India (3) I Survey of medieval India from the 7th century to 1700. (Identical with Or.S. 472) May be convened with 572.

473. History of Modern India and Pakistan: From Colonialism to Independence (3) II Social, cultural, and political history of India. From earliest times to 1800. (Identical with Or.S. 474a-474b) May be convened with 573.

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474c. History of the Middle East (3) I Survey of the Middle East from 1492, Spain's role in the world and the Spanish Civil War; Spain's cultural contributions. May be convened with 566.
nitional independent reading. May be convened with 419.

520. The French Revolution and Napoleon (3) II 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) II For a description of course topics, see 422. Graduate-level requirements include a research paper. May be convened with 422.

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) II For a description of course topics, see 432. Graduate-level requirements include different, additional reading and reports thereon. May be convened with 432.

534. The Jacksonian Era, 1825-1850 (3) I For a description of course topics, see 433. Graduate-level requirements include an additional, substantial research or historiographical paper, to be decided on in consultation with the instructor. May be convened with 433.

535. The Coming of the Civil War, U.S. 1845-1861 (3) 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. 1861-1876 (3) I 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) I For a description of course topics, see 438. Graduate-level requirements include additional research or writing; see instructor for details. (Identical with Or.S. 592) May be convened with 438.

546. History of Arizona (3) II 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.

547. History of American Agriculture (3) I For a description of course topics, see 447. Graduate-level requirements include an additional research paper. (Identical with A.E.C. 547) May be convened with 447.

548. Modern India from 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 coursework. May be convened with 449.

550. History of American Foreign Relations since 1914 (3) For a description of course topics, see 450. Graduate-level requirements include an in-depth research paper and additional readings. May be convened with 450.

551. The United States and East Asia: 1840 to the Present (3) II 1990-91 For a description of course topics, see 451. Graduate-level requirements include an in-depth research paper and additional course readings. May be convened with 451.

552. American Economic History (3) II For a description of course topics, see 452. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 452.

553. Feminism: A Comparative History (3) II For a description of course topics, see 453. 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 453.

554. Intellectual History of Latin America since 1810 (3) II 1990-91 For a description of course topics, see 454. 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 454.

556. History of Spain (3) I For a description of course topics, see 456. Graduate-level requirements include a research paper on a topic chosen in consultation with the professor. May be convened with 456.

557. History of Brazil (3) II For a description of course topics, see 457. Graduate-level requirements include an in-depth research paper. May be convened with 457.

558. History of Latin America (3) For a description of course topics, see 458. Graduate-level requirements include a research paper. (Identical with Or.S. 558) May be convened with 458.

560. United States: 1945 to Present (3) II For a description of course topics, see 460. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 460.

562. History of American Society and Thought: Pre-Civil War (3) I For a description of course topics, see 462. Graduate-level requirements include an in-depth research paper. May be convened with 462.

563. History of American Society and Thought: Civil War (3) I For a description of course topics, see 463. Graduate-level requirements include an in-depth research paper. May be convened with 463.

565. History of Women in Latin America (3) II For a description of course topics, see 465. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 465.

566. History of Africa (3) For a description of course topics, see 466. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 466.

568b. Asia and the West (3-3) 1989-90 For a description of course topics, see 468b. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 468b.

568a-568b. Asia and the West (3-3) For a description of course topics, see 468a-468b. Graduate-level requirements include additional research or writing, see instructor for details. (Identical with Or.S. 568a-568b) May be convened with 468a-468b.

569. History of Women in Latin America (3) II For a description of course topics, see 469. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 469.

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 Or.S. 570) May be convened with 470.

572. History of Medieval India (3) I 1989-90 For a description of course topics, see 472. Graduate-level requirements include additional research or writing; see instructor for details. (Identical with Or.S. 572) May be convened with 472.

573. History of Modern India: 1750-Present (3) For a description of course topics, see 473. Graduate-level requirements include additional research or writing; see instructor for details. (Identical with Or.S. 573) May be convened with 473.

574a-574b-574c. History of Japan (3-3-3) For a description of course topics, see 474a-474b-474c. Graduate-level requirements include an additional research paper. (Identical with Or.S. 574a-574b-574c) May be convened with 474a-474b-474c.

576. Modern Chinese History (3) (Identical with Or.S. 576) May be convened with 476.

577. Modern Chinese History (3) (Identical with Or.S. 577) May be convened with 477a-477b.

578. Modern History of the Middle East (3) I (Identical with Or.S. 578) May be convened with 478.

579. Women in East Asia (3) I For a description of course topics, see 479. Graduate-level requirements include a research paper. (Identical with Or.S. 579) May be convened with 479.

582. Social History of China (3) (Identical with Or.S. 582) May be convened with 482.

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 in part on such sources. May be convened with 487a-487b.

588. History of Byzantium (3) I For a description of course topics, see 488. Graduate-level requirements include a research paper. (Identical with Clas. 588) May be convened with 488.

589. Women in East Asia (3) I For a description of course topics, see 489. Graduate-level requirements include an additional research paper. (Identical with Or.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. (Identical with Or.S. 590) 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 Or.S. 592) May be convened with 492.

595. Colloquium Certain colloquia in Oriental studies may be used for history graduate credit.

a. Advanced Studies in United States History (3) [Rpt.] I II
b. Advanced Studies in Latin American History (3) [Rpt.] I II
c. Advanced Studies in European History (3) [Rpt.] I II
d. Advanced Studies in the History of Women (3) [Rpt.] I II GRD (Identical with Or.S. 595)
a. Advanced Studies in Ancient History (3) [Rpt.] I II Consult department before enrolling. (Identical with Or.S. 595)

b. Confucianism: The Classical Period (3) (Identical with Or.S. 595)
c. Confucianism: The Neo-Confucian Traditions (3) (Identical with Or.S. 595)
d. Chinese History Since 1949 (3) (Identical with Or.S. 595; which is home) May be convened with 495r.

596. History of Latin America (3) For a description of course topics, see 496. Graduate-level requirements include additional research or writing; see instructor for details. (Identical with Or.S. 596) May be convened with 496.
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), Chairperson; Robert M. Harshman (Philosophy and Linguistics), William A. Longacre (Anthropology), Richard E. Michod (Ecology and Evolutionary Biology)

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)

Home Management
(See Family and Consumer Resources)

Honors Center (HONR)

Slonaker Building
(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). While honors courses are primarily reserved for honors students, select students not enrolled in the Honors Program may be admitted to a course with the instructor's permission. 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) II. Small group discussions exploring special topics. Open to all Honors students.

391H. Honors Preceptors (1-3) I II. Open to select upper-division students interested in gaining teaching or practical experience in an academic department. (Prior permission required.)

396H. Honors Proseminar (3) I II. A small, interdisciplinary class focusing on specialized topics.

396H. Honors Independent Study (1-3) I II. Open to select 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

American Indian Studies
396H. Honors Proseminar (3) (offered alternatively with Black Studies and Mexican-American Studies).

Anatomy

Independent laboratory opportunities available.

Anthropology

102. Introduction to Cultural Anthropology (3) I II
111. Exploring Physical Anthropology (3) II
396H. Honors Proseminar (3) I II

Art

118. Survey of World Art (3) I
396H. Honors Proseminar (3) (offered alternatively with Music and Drama).

Biochemistry

182. Life: The Science of Biology (4) II
Additional independent laboratory opportunities are available.

Black Studies

396H. Honors Proseminar (3) (offered alternatively with American Indian Studies and Mexican-American Studies).

Chemistry

105a-105b. Honors Fundamentals of Chemistry (4-5) I II
242a-242b. Honors Lectures in Organic Chemistry (3-3) 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

Drama

140a-140b. History of Theater and Drama in Western Civilization (3-3)
396H. Honors Proseminar (3) II

Ecology and Evolutionary Biology

182. Life: The Science of Biology (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) II
460. Economic Organization and Government Policy (3) III
461. Economics of Regulated Industry (3) II
481. Economics of Wage Determination (3) III

English

103H. Freshman Composition (3) I II
104H. Freshman Composition (3) I II
495. Colloquium
a. Honors for Juniors (3) II
b. Honors for Seniors (3) III

Fine Arts

207. Western Civilization - The Arts: The 20th Century (3) I II
307. Western Civilization - The Arts: Palaeolithic Through Renaissance (3) I II
317. Western Civilization - The Arts: Baroque Through 19th Century (3) I 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 Preceptors (1-3) I II
396H. Honors Proseminar (3) I

History

101. History of Western Civilization: Backgrounds and Formation to 1648 (3) III
106. History of the United States from 1607-1877 (3) III
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) II

Management Information Systems

396H. Honors Proseminar (3) II
### Mathematics

125b. *Calculus (3) II

**Mexican-American Studies**

396H. Honors Proseminar (3) (offered alternatively with Black Studies and American Indian Studies)

**Microbiology and Immunology**

182. *Life: The Science of Biology (4) II

396H. Honors Proseminar (I-3) II

*Additional independent laboratory opportunities available.*

**Molecular and Cellular Biology**

182. *Life: The Science of Biology (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) II

389. *Research Methods in Nursing (2) 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

396H. Honors Proseminar (3) II

### Political Science

102. *American National Government (3) I

250. *Contemporary National Politics (3) III

396H. Honors Proseminar (3) I II

### Psychology

101. *Introduction to Psychology (3) III

396H. Honors Proseminar (3) I

### Russian

101a-101b. *Elementary Russian (4-4)

201a-201b. *Intermediate Russian (4-4)

396H. Honors Proseminar (3) I

### Sociology

100. *Introduction to Sociology (3) II

396H. Honors Proseminar (3) I

### Spanish

101, 102. *First Year Spanish (4-4)

201, 202. *Third and Fourth Semester Spanish (4-4)

320. *Readings in Literary Genres (3) I

396H. Honors Proseminar (3) I

*Women's Studies

396H. Honors Proseminar (3) I

*Honors section available. Consult Schedule of Classes for information.

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.

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 grade-point average of (2) complete 30 units in university-wide, college, or departmental honors courses, (3) take at least 3 of these 30 units in the 396H Proseminar series of courses, (4) complete both semesters of 498H as part of the 30-unit honors requirement, and (5) 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 Billie Jo Inman, Director
Senior Lecturer Donna E. Swain
Lecturers Stephen M. Beall, Ann Kerwin, Mark Luprecht, Richard Poss, Richard H. Wilkinsen, Bella Zweig

The Humanities Program provides interdisciplinary courses designed to deepen consciousness of ethical and aesthetic concerns pertinent to human experience from ancient 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, 498H (Honors Thesis in Humanities), a 300- or 400-level literature course from one of the following departments: Classics, English, French and Italian, German, Russian and Slavic Languages, Spanish and Portuguese, or a 300- or 400-level course in Art History or Philosophy.

The Humanities Program participates in the Honors Program.

### Hydrology and Water Resources (HYDR/WRA)

Geology Building, Room 122

(602) 621-5082

Professors Daniel D. Evans, Acting Head, Nathan Buras, Donald R. Davis, Stanley N. Davis (Geosciences), Lucien Duckstein (Systems and Industrial Engineering), Martin M. Fogel (Watershed Management), John W. Harshbarger (Emeritus), Richard H. Hawkins (Watershed Management), Simon Ince (Civil Engineering), Austin Long (Geosciences), William B. Lord (Water Resources Research Center), Thomas Maddock III, Shlomo P. Neuman, Eugene S. Simpson (Emeritus), Ernest T. Smerdon (Civil Engineering), Sorooch Soroooshian (Engr. & Geosciences), Associate Professors Randy L. Bassett, Michael D. Bradley, Assistant Professors Roger C. Bales, 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, ground-water and surface-water hydrology, water quality, mathematical and statistical methods in hydrology (including numerical modeling), and water resource planning, management and administration.

The department offers the Bachelor of Science in Hydrology and the Master of Science in Hydrology 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.

### Hydrology (Hyd)

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
443. Quantitative Planning Methods in Water Resources Administration (3) I
Applications of quantitative methods to water resources management; benefit-cost analysis; optimization; structure and basis of planning process; principles and guidelines. P, microeconomics, Math. 125a. May be repeated 443.

444. Quantitative Design Methods in Water Resources Administration (3) II
Applications of quantitative methods to water resources management; benefit-cost analysis; optimization; operations research methods (linear, quadratic, and dynamic programming). P, FORTRAN, microeconomics, Math. 125a. May be repeated with 443.

451. Population and Resources (3) I (Identical with Geog. 461)

476. Natural Resource Economics (3), II (Identical with A.Ec. 476)

480. Forest Policy and Administration (3) II (Identical with Ws.M. 480) May be repeated with 480.

481. Environmental Policy (3) II (Identical with Pol. 481) May be repeated with 481.

501a-501b. Water Resources Policy and Administration (3) I
Water resources administration and policy; institutional and policy aspects of water resources administration; management, organizational theory, and international problems of water use and development; ground-water management and policy. 501a is prerequisite to 501b.

502. Introduction to Water Resources Policy II (For a description of course topics, see 402. Graduate-level requirements include an in-depth term paper. P, Math. 125a. (Identical with Geog. 502) May be repeated with 402.

513. Risk Estimation and Evaluation (3).

An introduction to basic concepts and issues of water resources management and administration, emphasizing water law and rights, water resource planning, institutional and organizational arrangements, and policy processes such as adjudication and rule-making. Open to majors only.

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, S.I.E. 520. (Identical with C.E. 526)

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 repeated with 443.

544. Quantitative Design Methods in Water Resources Administration (3) II
For a description of course topics, see 443. Graduate-level requirements include an in-depth research paper and/or project. P, FORTRAN, microeconomics, Math. 125a. May be repeated with 443.

556. Finite State Methods in Water Resources Management (3) II 1990-91 Finite state methods; applications to natural resource systems as arise in hydrology, ecology, and earth sciences, including the modeling of interfaces such as aquatic processes. P, Math. 254, S.I.E. 170. (Identical with S.I.E. 556)

560. Ground-Water Management (3) II
Management techniques for regional aquifer systems. Quantitative methods for both quantity and quality aspects of ground-water manage-

576. Advanced Natural Resource Economics (3) (Identical with A.Ec. 576)

577. Natural Resource Economics and Public Policy (3) II (Identical with A.Ec. 577)

580. Forest Policy and Administration (3) II (Identical with Ws.M. 580) May be repeated with 480.

581. Environmental Policy (3) II (Identical with Pol. 581) May be repeated with 481.

643. Water Resources Systems Analysis (3) II
1990-91 Applications of mathematical programming to the analysis of interactions of hydrology, engineering, economics, and socio-institutional systems in natural resource systems. P, 544 or consult department before enrolling.

695. Colloquium

b. Water Resources Administration (1-3) [Rpt./1]

696. Seminar

h. Long-Range Resource Planning (1-3) [Rpt./2]

i. International Water Resource Management (1-3) [Rpt./2]

j. Water Quality Planning and Policy (1-2) II
m. Water Storage Systems (1-3) [Rpt./1] I P, consult department before enrolling.

Industrial Engineering
(See Systems and Industrial Engineering)

Interdisciplinary Programs (DIS) (IDS)
PAS Building, Room 238
(602) 621-6616

The Office of Interdisciplinary Programs coordinates both interdisciplinary programs and courses. Such programs are described under "Office of Interdisciplinary Programs" in the General Divisions of the University section of this catalog. In most cases, interdisciplinary courses are listed under a "home" department and crosslisted in a variety of other departments. Such courses would not appear in this section. Those interdisciplinary courses for which no department acts as "home" are listed below.

596. Seminar

u. Interdisciplinary Environment-Behavior-Design (3) I (Identical with Arch. 596u, Geog. 596u, L.Ar. 596u, Psy. 596u, and Ping. 596u)

Interior Design
(See Family and Consumer Resources)

Irrigation
(See Agricultural Engineering)

Italian
(See French and Italian)

Japanese
(See Oriental Studies)

Journalism (JOUR)
Franklin Building, Room 101M
(602) 621-5040

Professors George W. Ridge, Jr., Head, Donald W. Carson, Abraham S. Chalin, Philip Mangelsdorf (Emeritus), Associate Professors Ford N. Burkhardt, William F. Greer, James W. Johnson, Jimmy D. Patten, Jacqueline E. Sharkey, Assistant Professor Virginia Escalante

Lecturers Wallace Beebe, Anne-Marie Brady, C. Brickford Lucas, S. Jeffrey Minker

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, and 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, 326, 470 and 471. Students then select elective courses in the following areas: newspapers, magazines, community journalism, public information, photojournalism. Students must make an outstanding contribution to the press in order to graduate. Credits required to 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, 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, 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 Independent, and The Pretentious Idea, a media review. In addition, students report on state government for The Arizona Daily Star, and contribute to the Arizona State Press (Phoenix). The department is a member of the Arizona Journalism Institute.

Guadalajara Exchange: Students interested in Latin American reporting are offered an 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
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) II Gathering, evaluating, and writing news. P, CR 208, Freshman level. May be convened with 396 for journalist department before enrolling. (Identical with M.Ar. 205)

206. Advanced Reporting (3) II Comprehensive and accurate news presentation, with emphasis on interview techniques and coverage of major news stories. P, 205.

208. Law of the Press (3) I 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 (2) I II Reporting and interpreting the news through pictures.

302. Photojournalism Laboratory (1) II I Open to majors only. P, CR 301.

305. Broadcast Writing (3) I I (Identical with Writing-Emphasis Course in the Academic division writing -proficiency requirement (see "Writing- Emphasis Courses" in the Academic Guidelines section of this catalog).

320. Writing (2) II I Theory and techniques of copy editing and headline writing; training on video display terminals. 1R, 3L. P, 208, 206 or CR. Department permission required.

362. Writing for Media (3) I I (Identical with M.Ar. 362)

364. Creative Advertising (3) I I I Open only to students with permission of the instructor as required. Advanced Standing as specified in the College of Business and Public Administration section of this catalog. (Identical with Mktg. 364)

366. Write and Produce TV Specials (3) I I I Open 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 Radio-Television News (3) I I (Identical with M.Ar. 381)

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596. Workshop
a. Color Photography (2) [Rpt./1] S Two-week field trip with fee. May be convened with 497a.

597. Workshop
a. Color Photography (2) [Rpt./1] S Two-week field trip with fee. May be convened with 497a.

598. Seminar
a. Latin American Studies (3) [Rpt.] I P. Spanish or Portuguese proficiency. May be convened with 495a.

599. Seminar
a. Latin American Studies (3) [Rpt.] I P. Spanish or Portuguese proficiency. May be convened with 495a.

600. Contract (5)
601. Introduction to Legal Process (3)
The Graduate Library School offers courses emphasizing planning in the acquisition, organizing, and accessing information in library settings and information centers. The focus of the course work is the study of information and its uses as a social phenomenon.

The school offers only the Master of Library Science. For admission and degree requirements, please see the Graduate Catalog.

410. Introduction to Microcomputers in Libraries (1) II S Examination of the place and function of microcomputers in the library and information environment. Emphasis on hardware and software concepts. Hands-on learning of the utility of microcomputers.

417. Media in Instruction (3) I I S (Identical with T.E. 517)

441. Children's Literature in Spanish (3) I (Identical with Span. 441) May be convened with 541.

443. Mexican-American Literature (3) II (Identical with Span. 443) May be convened with 543.


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.


506. Research Methods (3) I I Need and opportunities for research in librarianship; types of research; research methodology; study of research design; elementary statistics.

507. Library Management (3) I I Introduction to management concepts, the organizational structure of libraries, planning and administration, and the utilization of library personnel.

509. Information Sources for Agricultural Scientists (1) I I (Identical with PL S 599).

510. Introduction to Information Science (3) Methods, theories, and technologies of information science; elements of computer programming in library information systems; implementation and management of computer systems in libraries and information centers.

511. Information Storage and Retrieval (3) II Study and involvement in on-line, interactive systems.

512. Automation in Libraries (3) 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 I Introduction to quantitative methods for the design, analysis, and control of library systems.

515. Library Cooperation and Networks (3) I I Study of the background and state of the art of library cooperative systems, networks, and bibliographic utilities.

517. Preparation of Instructional Materials (3) I II (Identical with T.E. 517)

519. Cartographic Information Management (3) I II Cartographic format as an information transfer medium. History of cartography and problems of the interpretation of cartographic products. Role and place of maps in the information environment.

521. Advanced Cataloging (3) II Comparative study of Dewey Decimal Classification and Library of Congress Classification; advanced problems in descriptive cataloging, subject headings, and library classification.

522. Preparation of Bibliography (3) I II Critical examination of various styles of bibliographic description; practical application in the construction of a systematic bibliography.

530. Public Librarianship (3) I I Administration of tax-supported libraries serving the general public, including problems of governmental relations; responsibilities, financial support, buildings, personnel, collections.

540. Academic Librarianship (3) I II 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) II (Identical with Span. 543) May be convened with 443.

550. Special Librarianship (3) II Mission, organization and administration of the special library.

560. History of Books and Printing (3) I 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 movable type.

561. History of Children's Literature (3) II Survey of literature for children in England and America from earliest times to the close of the 18th century, together with study of cultural and social factors reflected in the literature. (Identical with Engl. 561).

562. Library Public Relations and Communication (3) I II Essentials for library public information activities, brochures, news releases, and public service announcements for radio and television; communication problems at public service desks.

570. Literature of Science and Technology (3) I I Creation, organization, and dissemination of scientific and technical literature; reference function and problems of bibliographic control. A scientific background is not required.

571. Information Sources in the Social Sciences and Humanities (3) II Advanced bibliographic and reference sources in the social sciences and humanities, with emphasis on the structure of knowledge in the various disciplines and evaluation of user services.

573. Government Publications (3) I II Examination of opportunities for government publications available from municipal, county, state, national and international agencies, with emphasis on selection and use of publications by the public.

575. Human Factors in Information Systems (3) Study of the human-information system interface; libraries, computers, human-information processing, psychological factors in design and operation of information systems.

576. Administration of Reference (2) I I Theory of information service, policy development, special services, and administration of reference services. Open to majors only.

580. Presentation of Children's Literature (3) II Preparation and practice of storytelling, including the reading-aloud of stories to children, presentation of picture stories, practice in reading and telling stories, and initiation of the storytelling tradition.

589. Scholarly Communication (3) II Structure and workings of scholarly communication and products in the U.S. Examines the content and methodology of scholarly communication in various disciplines. (Identical with Comm. 589). 600. Introduction to Graduate Study in Music (3) II (Identical with Mus. 600). 607. Plan for a Literature (3) I 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 the content and methodology of scholarly communication, as well as current techniques. Emphasis on current research and theory.

620. National and International Information Policy (3) Investigates the formulation and implementation of policies that govern the flow of scientific and technical information in the United States and between the United States and selected countries.


2. Special Library (2-4) [Rpt. /1] I II S, 502, 503, 504, 505, CR 507 or CR 540.

3. Public Library (2-4) [Rpt. /1] I II S, 502, 503, 504, 505, CR 507 or CR 540.


5. Community College Library (2-4) [Rpt. /1] I II S, 502, 503, 504, 505, CR 507 or CR 540.

6. Internships in Libraries (3) II (Identical with Comm. 622).

695. Colloquium (3) I I Theory of Classification (1-3) I I Issues in Library and Information Science (1-3) [Rpt. /4 units].

696. Seminar (3) I I Current Research Trends (1-4) [Rpt. /1] I I Government Information (3) [Rpt. /1] I I Issues in Library and Information Science (1-4) [Rpt. /1] I I
Linguistics (LING)

Douglas Building, Room 200E
(602) 621-6897

Professors D. Terence Langendoen, Head, Richard Demers, Robert Michael Harnish (Philosophy), Jane Hill (Anthropology), Chisato Kitagawa (Oriental Studies), Adrienne Lehrer, Susan Steele
Associate Professors Diana Archangeli, Richard T. Oehrie
Assistant Professor Michael Hammond, Oelia Zepeda (American Indian Studies)

The Department of Linguistics offers instruction in introductory, intermediate, and advanced courses in phonetics and 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 Ph.D. concentration 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, 200, 300 and one year of work in a non-Indo-European language. Remaining taken in one of the following three tracks: (1) general linguistics, (2) theoretical linguistics, (3) sociolinguistics and applied linguistics.

General linguistics: Required: (a) Semantics/Pragmatics (422 or 465) (b) Historical: (480, 490, or history of a language). (c) Phonetics (Sp.H. 260 or 367, or phonetics of a language). (d) Structure. (210 or structure of a language).


Majors are urged to continue their foreign language study and to complete 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, 200, and 300.

101. Introduction to Language (3) I II Surveys of linguistic concepts and methods: communication among animals; physiology of human speech; elementary phonetics, syntax, and language change; language and the brain; language and society.

102. Linguistics for Native American Communities (3) I Introduction to descriptive linguistics for Native Americans; practical linguistic and social issues in Native American languages; types and characteristics of oral and written language; dialects and language change; classroom applications. (Identical with A. in. S. 203a-203b)

200. Fundamentals of Linguistic Analysis (3) II The basic nature of linguistic investigation with the aim of discovering some of the regularities of language structure. P, 101.

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 language families; characteristics that spread over a geographical region; and the history of the study of the 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 Linguistic principles governing the internal structure of English words and the words in which new words are created, with a focus on spelling, sounds and morphemes.


276. The Nature of Language (3) I I (Identical with Anth. 276)


303. Gender and Communication (3) I 1990-91 (Identical with Anth. 303)

307a-307b. Elementary O'odham (Papago) Language (3-3) GRD Speaking, reading, writing, and grammar (Identical with the O'odham (Papago) language. 3R, 1L. (Identical with A. in. S. 307a-307b)

320. Language and Social Issues (3) II 1989-90 Focused 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-using being with different personal, psychological, and sociolinguistic difference, not only in our multilingual-multicultural country, but in the world as well.

376. Introduction to the Philosophy of Language (3) I 1990-91 (Identical with Phil. 376)

403. Foundations of Syntactic Theory I (3) I An introduction to fundamental issues in the theory of syntax, including phrase structure, the opacity conditions, government, control, binding, thematic relations, and theory of logical form. Intended to familiarize the student with the essentials of the Extended Standard Theory and related developments. May be convened with 503.

404. Foundations of Phonological Theory I (3) I Investigation of the principles that underlie categorization and understanding; the representation of sounds and the regular patterns of sound in natural language. Topics include the standard theory of generative phonology, distinctive feature theory, syllable theory, the core skeleton, rule formulation (linear and non-linear) and rule interactions. May be convened with 510.

411a-411b. Modern Japanese Grammar (3-3) I (Identical with Or.S. 411a-411b) May be convened with 511a-511b.

420a-420b. Linguistic Structure of Modern Chinese (language and structure) I 1990-91 (Identical with Or.S. 420a-420b) May be convened with 520a-520b.

422. Linguistic Semantics and Lexicology (3) II 1990-91 Study of word and sentence meanings, relationship between the lexicon and the grammar, idioms, metaphor, etymology, and change of meaning. P. in course in linguistics. (Identical with Phil. 422) May be convened with 522.

423a-423b. Theory of Spanish Syntax (3-3) I (Identical with Span. 423a-423b) May be convened with 523a-523b.

426. Introduction to Arabic Linguistics (3) II (Identical with Or.S. 426) May be convened with 526.

427. Applied Linguistics (3) I (Identical with Span. 427) May be convened with 527.

430. Language Variation (3) I II Study of geographical and social dialects, stylistic differences, and data on non-Monolingual and the implications of variation for writing grammars and for understanding language change, P. one course in linguistics.

445a-445b. Structure of a Non-Western Language (3-3) I I (Identical with Anth. 445a-445b) May be convened with 577.

461. Linguistics and the Study of Literature (3) II I I II (Identical with Or.S. 461) May be convened with 577.

471. Natural Language Processing (3) I I I Linguistics and the processes underlying speech production and comprehension; speech sounds, words, parsing, semantics and pragmatics. (Identical with Phil. 473 and Psych. 473) May be convened with 523a-523b.

473. Advanced English Phonetics (3) I (Identical with Anth. 473) May be convened with 511a-511b.

476. Language in Culture (3) I I (Identical with Anth. 476) May be convened with 577.

477. Discourse and Text (3) II 1989-90 (Identical with Anth. 477) May be convened with 577.

480. Historical Comparative Linguistics (3) I (Identical with Anth. 480) May be convened with 580.

485. Linguistic and Computer-assisted Approaches to Literature (3) I I I (Identical with Or.S. 485) May be convened with 580.

489. Computational Linguistics (3) I Fundamentals of formal language theory; syntactic and semantic processing; the place of world knowledge in natural language processing. P. a course in one of the following: formal languages, syntax, data structures, or compilers. (Identical with C.Sc. 486 and Psych. 486) May be convened with 580.

490. Theories for Nonmajors (3) I I I Conceptual foundations, methodology, and current theoretical frameworks. Students will carry out actual linguistic analysis. For students in fields other than linguistics, Anth. 480.

503. Foundations of Syntactic Theory I (3) I For a description of course topics, see 403. Graduate-level requirements include a greater number of problems. May be convened with 403.

504. Foundations of Syntactic Theory II (3) II Continuation of Ling. 503, with emphasis on recent linguistic research.


510. Foundations of Phonological Theory I (3) I For a description of course topics, see 410. Graduate-level requirements include a greater number of problems. May be convened with 410.

511a-511b. Modern Japanese Grammar (3-3) I (Identical with Or.S. 511a-511b) May be convened with 411a-411b.

512. Foundations of Phonological Theory II (3) II I I (Identical with Or.S. 512a-512b) May be convened with 412a-412b.
including evidence for its interaction with morphological structures and rules.

515. Phonological Phonetics (I) II Analysis of the acoustic and articulatory properties of sounds and patterns of sounds that occur in human language. Emphasis on the significance of the properties of sounds for phonological analysis in particular, distinctive feature theory. Role of psycho-linguistic studies as a source of evidence for phonological theory.

520a-520b. Linguistic Structure of Modern Chinese (3-3) (Identical with Ors. 520a-520b) May be convened with 420a-420b.

522. Linguistic Semantics and Lexicology (3) II 1990-91 For a description of course topics, see 422a. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with Phil. 522) May be convened with 422.

523a-523b. Linguistic Approaches to Literature (3) [Rpt./6 units] II 1989-90 (Identical with Ger. 523) May be convened with 423a-423b.

525. Introduction to Arabic Linguistics (3) II (Identical with Or. 525) May be convened with 425.

527. Applied Linguistics (3) I (Identical with Span. 527) May be convened with 427.

540. Language Acquisition and Reconstruction (3) I Introduction to the methods in theory, of, and problems in reconstruction of phonology, syntax, and semantics. Data will be drawn from a variety of language families, but will concentrate on American Indian languages and languages with little or no written record.

544. Syntactic Analysis (3) II 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, constituent, and subcategorization.

551. Language Acquisition (3) II (Identical with Sp. 551)

561. Linguistics and the Study of Literature (3) II 1990-91 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 Phil. 561) May be convened with 461.

564. Formal Semantics (3) I (Identical with Phil. 564)

565. Pragmatics (3) I 1989-90 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.

573. Natural Language Processing (3) I 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 Psych. 573) May be convened with 473.

576. Language in Culture (3) II (Identical with Anth. 576) May be convened with 476.

577. Discourse and Text (3) I 1989-90 (Identical with Anth. 577) May be convened with 477.

580. Historical Comparative Linguistics (3) I (Identical with Anth. 580) May be convened with 480. (See Management and Policy)

583. Sociolinguistics (3) I (Identical with Anth. 583)

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Ger. 585) May be convened with 485.

588. 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 Psych. 588) May be convened with 488.

595. Colloquium

a. Linguistics (1) [Rpt./3] I

600. Current Issues in Linguistic Research (3) [Rpt./1] Current research in linguistics, with emphasis on relationships among syntax, semantics, and phonology.

696. Sentence Theory

a. Syntax and Semantics (3) [Rpt./2] I
b. Topics in Sentence Theory (3) [Rpt./2] II
c. Compositional Semantics (3) [Rpt./2] II
d. Current Issues in Syntactic Theory (3) II [Rpt./2]
e. Linguistic Investigations and Applications (3) (I) (Identical with Comm. 680) May be convened with 586.
f. Topics in Experimental Phonology (3) [Rpt./2]

697. Workshop

a. Semantics Theory (3) I Open to majors only

Management (See Management and Policy)

Management and Policy (MAP)

Harvill Building, Room 409
(602) 621-1035

Professors Michael R. Gottfredson, Head, Don L. Bowen (Emeritus), Terence Connolly, Erwin B. Fraedrich, Peter Hirsch (Sociology), Theodore H. Koff, James P. Logan, June M. Morrison (Emeritus), Raymond A. Mulligan (Emeritus), Thomas R. Nadin (Emeritus), Arthur L. Silvers, George W. Summers (Emeritus)

Associate Professors Robert W. Buckingham, Marvin Fortman, H. Brinton Milward, Gregory B. North, Walter Powell (Sociology), David A. Tansik, Robert E. Tindall, Ronald J. Vogel

Assistant Professors Lawton R. Burns, Jolene R. Galegher, David L. Torres, Douglas Wholey

Instructor Christina Shelley

Lecturer Penelope S. Jacks

The Department of Management and Policy offers courses in management, organizational behavior, and public policy. The curriculum is designed to prepare students for a wide range of managerial and staff positions, as well as for graduate study in management, public administration, and law. The department participates in the following graduate programs:

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.

For admission and degree requirements, please see the Graduate Catalog.

The department participates in the Honors Program.

100. Introduction to Public Administration and Policy (3) II An introduction to the process of public policymaking and the major issues, problems, and options facing public sector managers. (Identical with Ping. 100)

204. Introduction to the Analysis of Data for Decision Making (3) II Informal and exploratory approaches to the analysis of empirical data in a managerial context. P, Math. 119.

300. Introduction to Planning (3) II Development of public sector planning in the U.S. during the 20th century, with emphasis on contemporary issues and solutions. (Identical with Ping. 300)

305. Management and Organizational Behavior (3) II The organizational structure of the firm, with an emphasis on management in private and public organizations in various cultures. Special sections of this course are offered for participants in the University Honors Program. (See Management and Policy)

320. Legal, Social and Political Environment of Business (3) II Introduction to the legal, social, political, and environmental aspects of business. The relationship between business and government: regulation and interest groups, the legal process.

350. Personnel Management (3) II IGRD Policies and practices in utilizing human resources effectively at all organizational levels.

351. The Crime Problem (3) II Theory and research on the nature, causes and control of crime from an interdisciplinary perspective.

352. Legal Aspects of the Criminal Justice Process (3) III Analysis of selected principles of criminal law, procedural review, and correctional processes.

357. Criminal Justice Administration (3) III Theory and practice of criminal justice organizations, police, courts and correctional institutions.

384. Social Welfare Policy (3) II Policy issues and options analyzed in the area of social welfare. Emphasis on specialized needs of vulnerable groups such as children and the socially disadvantaged.

385. Acute Health Care Policy and Administration (3) III Delivery modes for acute care, analysis of public policies relating to such care and the role of government in its administration, including inpatient care (hospitals), outpatient care (doctors, group practices, HMOs), and emergency care.

390. Program Planning and Administration for Human Services (3) III The planning and administrative process in human services programs; needs assessment, program design, implementation, evaluation, principles of management control.

395. Introduction to Administration of Services for the Aging (3) III Administration of services for the elderly, with a focus on the performance of aging-related services, as well as on the role of health care providers in the aging process.

400. Quantitative Methods for Administrators (3) III (Identical with M.S. 400)

401. Environment and Strategic Management in Organizations (3) II Administration of organizations with complex operating environments; emphasis on the role of the manager in public and private sector organizations.

405. System and Program Evaluation (3) III Methodology of evaluating the performance of programs and organizations in the context of public policy.


411. Public Administration and the Mexican-American (3) I Hispanic-American cultural and historical impact on public administration in the southwestern U.S. from 1775 to the present. Includes bilingual Spanish-Spanish speaking participation in state and local government administration of services. (Identical with M.A.S. 411)

413. Administrative Leadership (3) III Elements of leadership, as applied to selected administrative situations.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>455.*</td>
<td>Preventive Health Care Policy and Administration (3)</td>
</tr>
<tr>
<td>436.*</td>
<td>Crime and Public Policy (3)</td>
</tr>
<tr>
<td>431.*</td>
<td>The Criminal Justice System (3)</td>
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<tr>
<td>430.*</td>
<td>Personnel Policies (3)</td>
</tr>
<tr>
<td>426.*</td>
<td>Wills, Estates, and Trusts (3)</td>
</tr>
<tr>
<td>481.*</td>
<td>Finance and New Venture Development (3) I (Identical with Fin. 481)</td>
</tr>
<tr>
<td>482.*</td>
<td>Marketing Planning and Decision-Making (3) II New product development; marketing programming and strategy; bargaining technique; individual and group decision-making processes. Only open to entrepreneurship program students, P, Econ. 330, Fin. 311, Mktg. 361. (Identical with Mktg. 482)</td>
</tr>
<tr>
<td>483.*</td>
<td>Development of New Venture Plans (3) II New product development, marketing programming, and strategy; bargaining technique; individual and group decision-making processes. Only open to entrepreneurship program students. P, Econ. 330, Fin. 311, Mktg. 361. (Identical with Mktg. 483)</td>
</tr>
<tr>
<td>485.*</td>
<td>Zoning Fundamentals (3) I Survey of zoning processes; nature, structure, and function of zoning processes. P, 305 or 502. (Identical with C. 485)</td>
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<tr>
<td>500.*</td>
<td>Management Case Analysis and Presentation (3) I Written analysis of cases and other reports; development of skills in analysis, decision-making, and written oral presentation. Open only to students admitted to B.P.A. graduate programs.</td>
</tr>
<tr>
<td>501.*</td>
<td>Human Resource Management (3) 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</td>
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<tr>
<td>502.*</td>
<td>Organization Development and Change (3) II Concepts and skills relevant to professional practice. Only open to students concerned with problem diagnosis and organizational development and change. P, 305 or 502.</td>
</tr>
<tr>
<td>503.*</td>
<td>Fundamentals of Physical Planning (3) I Basic considerations in site analysis and planning, and transportation and utility systems; subdivision design and plat review. (Identical with Ping. 503)</td>
</tr>
<tr>
<td>504.*</td>
<td>Social Service Planning (3) I Survey of the strategies of planning efforts designed specifically to increase social welfare through the delivery of services using historical, comparative, and evaluative perspectives. (Identical with Ping. 504)</td>
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<tr>
<td>505.*</td>
<td>Cost-Benefit Analysis (3) II (Identical with Econ. 505)</td>
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<tr>
<td>506.*</td>
<td>Departmental Management (3) I II Analysis of management opportunities and challenges; evaluation and formulation of strategies of firms expanding internationally. (Identical with Fin. 506)</td>
</tr>
</tbody>
</table>

**537. Finance for New Ventures (3)** I (Identical with Fin. 537)

**538. Marketing, Negotiation and Decision-Making (3)** I (Identical with Ping. 538) Development of bargaining and decision-making skills through simulated negotiations and role playing. Open only to students in the entrepreneurship program. P, Econ. 500a, Fin. 511, Mktg. 500. (Identical with Mktg. 538) |

**539. Planning of New Ventures (3)** II 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)

**541. Research Methodology (3)** I Behavioral research techniques; bias, validity, reliability, and适用 Statistic tests; critiques of research articles and reports. P, 552 |

**557. Law of the Elderly (3)** 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. |

**560. Trends in Management Theory (3)** I Review of management practices from the Industrial Revolution to modern high technology. Focus on contemporary organizations and their management. Open only to students admitted to B.P.A. graduate programs. An M.B.A. integrative course. |

**563. Housing and Residential Areas (3)** I Physical, social, and economic aspects of housing development and residential areas and their relationship to other land uses and functions. (Identical with Econ. 563) |

**567. Behavioral Science Theory and Method in Management (3)** I Rpt. /12 units | Rpt. /12 units |

**568. Environmental Scanning (3)** I (Identical with Mktg. 568) |


**569. Human Resource Management (3)** 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. |

**572. Organization Theory and Behavioral Research Methods (3)** I Interrelationships of managers, employees, and organizational structures and systems. Only open to students admitted to a B.P.A. graduate program. |

**573. Human Resource Management (3)** 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. | Principles, methods, research relevant to management of an organization's human resources, with emphasis on employment psychology, training, development, compensation. P, 305 or 502. |

**574. Behavioral Science Theory and Method in Management (3)** I Rpt. /12 units | Rpt. /12 units |

**575. Behavioral Science Theory and Method in Management (3)** I Rpt. /12 units | Rpt. /12 units |

**576. Behavioral Science Theory and Method in Management (3)** I Rpt. /12 units | Rpt. /12 units |

**577. Behavioral Science Theory and Method in Management (3)** I Rpt. /12 units | Rpt. /12 units |

**578. Behavioral Science Theory and Method in Management (3)** I Rpt. /12 units | Rpt. /12 units |
methodologies which support public sector policies and administration, including the philosophical basis of these methods and a research design exercise. P. 522, 601.

609. Issues 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, Png. 609)

610a-610b. Fiscal and Budgetary Administration (3) II Examination of fiscal and budgetary cycle of public and nonprofit agencies. P. 601, Acct. 572.

610b: Cost/benefit analysis for public agencies. P. 610b 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 the 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) II Examines governmental roles, boundaries, and interdependencies among the federal, state, and local levels of government. P. 651.

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 organization are used to develop a paradigm for comparative analysis. P. 650.

655. Efficiency Analysis in Health Administration (3) I II Professional-level treatment of econometric and statistical principles as they apply to the health-care industry, and of the impacts of health policy and program alternatives; case study method used. P. Econ. 500a. (Identical with Png. 655)

662. Aging and Public Policy (3) I II Policy framework for administration of programs, plans, priorities, and legislation related to the needs of 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
   a. Criminal Justice (1-6) II
   b. Health Services Administration (1-6) II
   c. Long Term Care Administration (1-6) II
   d. Policy and Planning (1-4) I II

696. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

700. Research in Health Services Administration (3) I II (Identical with Png. 696)

701. Research in Health Services Administration (3) I II (Identical with Png. 696)

706. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

708. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

710. Research in Health Services Administration (3) I II (Identical with Png. 696)

716. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

720. Research in Health Services Administration (3) I II (Identical with Png. 696)

726. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

730. Research in Health Services Administration (3) I II (Identical with Png. 696)

736. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

740. Research in Health Services Administration (3) I II (Identical with Png. 696)

746. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

750. Research in Health Services Administration (3) I II (Identical with Png. 696)

756. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

760. Research in Health Services Administration (3) I II (Identical with Png. 696)

766. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

770. Research in Health Services Administration (3) I II (Identical with Png. 696)

776. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)

780. Research in Health Services Administration (3) I II (Identical with Png. 696)

786. Seminar
   a. Development Administration (1-3) II
   b. Program Planning and Development (1-3) II
   c. Performance Measurement and Accountability (1-3) II
   d. Health Services Administration (1-3) I II
   e. Criminal Justice Administration (1-3) I II
   f. Land-Use Regulation (3) I II (Identical with Png. 696n)
Marketing (MKTG)

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 and consumer research. 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 and the marketing process. Open only to entrepreneurship program students.

364.* Creative Advertising (3) I II Use of visual and audio techniques to plan, create, and produce effective advertising campaigns. Not acceptable for credit toward marketing major. (Identical with Jour. 364 and M.Ark. 364)

366.* Public Relations (3) I I 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 mktg. major. (Identical with Jour. 366 and M.Ark. 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. (Identical with M.Ark. 370, Mktg. 370)

440.* Marketing Research (3) H II Concepts and techniques of research for marketing decisions; problem definition, determination of information needs, sources, methods of gathering and analyzing data; presentation of findings for management. P. 361, MIS 375, Math. 123.

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, MIS 375, Math. 123.

452.* Advertising and Promotion Management (3) I II Role of advertising and special promotions in the economy and business and nonprofit organizations; concepts and strategies for programs, budgets, media selection, evaluation of effectiveness. P. 361, MIS 375, Math. 123.

454.* Management of Sales Operations (3) I II Sales policies and their relationship to the total marketing program; sales strategies and objectives; development and administration of sales organizations, control and evaluation of sales operations. P. 361, MIS 375, Math. 123. May be repeated with different topics.


456.* International Marketing Management (3) I II Marketing operations for foreign environments; cultural, political, and economic factors affecting the international marketer. P. 361.

458.* Retailing Management (3) I II Management of the retailing environment, personal selling, buying, merchandising, pricing, advertising, promotion, selling, expense control and customer service. P. 361, Acct. 200.

459.* Product Management (3) I II Product (services) strategy for achieving financial growth; evaluating opportunities; generating ideas; launching new offerings; managing the product (services) portfolio. P. 361, MIS 375, Math. 123.

470.* Marketing and Public Policy (3) I II Marketing regulations and public policy decisions; implications for marketing decision making; role of marketing research in public policy development. P. 361, Mktg. 470.

471.* Marketing Policies and Operations (3) I I An integrative, capstone course focusing on comprehensive marketing problems; development, control, and auditing of marketing organizations and operations. P. 440, 450; 3 additional units of marketing at the 400 level; Fin. 311, Mktg. 311, Mktg. 311. 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 I Assessment of market opportunity, competitive strategy, market structure analysis, forecasting techniques. Open only to entrepreneurship program students. P. 361, Econ. 330, Fin. 311. (Identical with Mktg. 480)

483.* Marketing Planning and Operational Decision-Making (3) I II Problems and projects give practical experience in developing marketing plans. Open only to students who meet the requirements for Advanced Standing in the College of Business and Public Administration section of this catalog.

500. Marketing Management (3) I II Scope, environment and nature of marketing management; customer and market analysis for product, service, price, promotion and distribution decisions. Open only to students admitted to B.P.A. graduate programs.

530. Management of Marketing Communications (3) I II Application of communications theory and research findings in advertising, sales promotion, publicity, personal selling, planning, conduct and administration of programs of information and persuasion. P. 500.

536. Introduction to Economic Growth (3) I II 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. 311, Mktg. 500. (Identical with Econ. 536)

538. Marketing, Negotiation and Decision Tactics (3) I III (Identical with Mktg. 538)

550. Consumer and Organizational Buyer Behavior (3) I II Nature of the purchase decision process for goods and services. Theories, concepts, and research findings are examined for use in management and public policy decision making. P. 500.

551. Marketing Decision Support Systems for External and Internal Environments (3) I II Application of contemporary computer-based, quantitative models and data analysis techniques to aid marketing management decision making. P. 500, M.A.P. 552.


559. Product Strategy (3) I 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) I II Marketing planning and strategies for foreign environments, cultural, political, economic factors affecting the international marketer, multinational corporation and multinational market groups. P. 500.

568. Environmental Scanning (3) I II An MBA interpretive course. How information from the economy can be used to develop a firm's competitive strategy. Multi-disciplinary, using concepts and tools from economics, marketing and management, and research training in the analysis of competition. Open only to graduate students. P. 500, Econ. 500, Fin. 511. (Identical with Econ. 566 and Mktg. 568)

672. Survey and Qualitative Marketing Research Methods (3) I II A capstone course and an introduction to formative and qualitative research for marketing management information needs; secondary data search methods; instrumentation, sampling, field work and data analysis; ethnographic, depth interview and projective methods. P. 500, M.A.P. 552.

673. Experimental Research Methods in Marketing (3) I II A capstone course and introduction to formative and qualitative research for marketing management information needs; secondary data search methods; instrumentation, sampling, field work and data analysis; ethnographic, depth interview and projective methods. P. 500, M.A.P. 552.

695. Colloquium (3) I I Research in Marketing (1) [Rpt./7] I I

696. Seminar (3) I I Perspectives and Principles for Research (1) I I

Marketing 185
Materials Science and Engineering (MSE)

Minas Building, Room 131
(602) 621-6070


Associate Professor Paul D. Calvert;
Assistant Professor Dunbar P. Birdie, Pierre A. Deymier, Brian D. Fabes, Brian J.J. Zelinski

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 engineering materials, and Doctor of Philosophy with a major in materials science and engineering.


222. Introduction to Materials Science (3) I Introduction to the scientific and engineering concepts of materials. Emphasis on the methods used in attacking engineering problems using unit equations and conversion factors. Open to freshmen and sophomore students only.


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.

256. Laboratory in Materials Science (1) I Laboratory exercises involving materials. This laboratory accompanies 255. CR, 255.

257. Materials Science of Art and Archaeological Objects (3) I 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. (Identical with Anth. 257)

258. Materials Science of Art and Archaeological Objects Laboratory (1) I Laboratory exercises involving the materials science of art and archaeological objects. (Identical with Anth. 258)


331R. Fundamentals of Materials for Engineers (3) I II Scientific principles which underlie and relate the behavior and properties of materials to their engineering applications. P, Phys. 103a, Chem. 103a or CR.

331L. Engineering Materials Laboratory (1) I II Fundamental laboratory techniques for the evaluation of properties and behavior of materials for engineering applications. 1R, 2L, P.


360L. Materials Laboratory (1) I Laboratory experiments on physical, electrical and optical properties of materials. P, 260 CR, 360R.

412. Physical Chemistry of Materials (3) I II Application of principles of thermodynamics and transport to kinetic processes in materials, including diffusion, phase transformations, and thermal expansion. Also includes the compact microstructure development. P, 240, 409.

401R. Mineral Processing (3) I Unit operations employed for the beneficiation of materials. 401L. Laboratory experiments dealing with unit operations of mineral processing. P, 401R or CR.


412. Physical Chemistry of Materials (3) I Physical and chemical topics of interest to materials science and engineering. P, 412 or Chem. 480b or CR. May be convened with 442b.

420L. Primary Processing Laboratory (1) I Lab. experiments involving application of thermodynamics and transport phenomena fundamentals to processes. P, CR, 420R.


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, and electropolishing. P, 240. May be convened with 522.


435. Corrosion (3) I II The science of corrosion reactions and their application to engineering problems. P, 331R, 412 or Chem. 480b or CR. (Identical with Ch. E. 435) May be convened with 535.


450. Materials Processing (3) I Applications of the principles of transport phenomena and materials science to solidification and semiconductor processing. Application of solids behavior to deformation processing. P, 409 or 331R. May be convened with 550.

450L. Materials Processing Laboratory (1) I Laboratory experiments in solidification and mechanical forming processes. P, CR. 450R. May be convened with 550L.

452. Nondestructive Evaluation of Materials (3) I II Introduction to the nondestructive testing and evaluation of the various classes of engineering materials. Methods include eddy current, penetrant, electromagnetic, radiographic, ultrasonic, electronic, eddy current, acoustic emission, and thermal. P, 331R or CR. May be convened with 552.

461. Biological and Synthetic Materials (3) I Structural materials in biology include fibers (tendon and silk), rubber (elastin), composites (bone) and ceramics (teeth and shells). Their properties are compared with synthetics. P, Chem. 103a. May be convened with 561.

470. Technology of Polymers and Ceramics (3) I Processing and properties of glasses and ceramics in a wide range of technological applications. Discussion of patent literature. P, Chem. 480b or CR. May be convened with 570.

479. Culture and Materials Technology (3) I (Identical with Anth. 479) May be convened with 579.

480. Experimental Methods for Microstructural Analysis (3) I II An introduction, through a combination of lectures and laboratory experiences, to basic techniques for nonstructural characterization of materials. 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. The role of forecasting in business and government will be discussed. P, Math. 125b or equivalent.

486. Technology and Society (3) I The evolution of our technological civilization will be discussed with emphasis on possible future changes. Emphasis will be on technological change and on the changing roles of the scientist and engineer.

488. Scanning Electron Microscopy (3) I Theoretical and practical aspects of electron-
A minor in mathematics includes 20 units, including 124 or 125a, 125b, 215, 223, and at least 6 upper-division units. The teaching major for prospective secondary school teachers: 32 units. The upper division core courses include 305, 330, 362, and 433. Six additional units of 400-level courses are to be selected in consultation with the student's advisor.

The teaching minor: A minimum of 24 units, including 124 or 125a, 125b, 215, 275, 305, 330, and at least two electives from the following: 362 or 404, 410, 430, 446, 461.

The elementary education major area of specialization: 301, and a minimum of 14 units of upper-division courses selected from 119 or 145, either 123 or 124 or 125a, 125b, 160, and 305.

The engineering mathematics major: Requires completion of 36 units, including 124 or 125a, 125b, 215, 275, 305, 330, and at least two electives from the following: 362 or 404, 410, 430, 446, 461.

The elementary education major area of specialization: 301, and a minimum of 14 units of upper-division courses selected from 119 or 145, either 123 or 124 or 125a, 125b, 160, and 305.

The engineering mathematics major: Requires completion of 36 units, including 124 or 125a, 125b, 215, 275, 305, 330, and at least two electives from the following: 362 or 404, 410, 430, 446, 461.

The elementary education major area of specialization: 301, and a minimum of 14 units of upper-division courses selected from 119 or 145, either 123 or 124 or 125a, 125b, 160, and 305.
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 503.

404. History of Mathematics (3) I The development of the mathematical sciences 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. 215. May be convened with 625.

405. Mathematics in the Secondary School (3) II Not applicable to B.A. or B.S. degrees for math majors. (Identical with T.I.E. 405)

410.** Elements of Complex Numbers (3) I Geometric, analytic, and algebraic topics in the complex plane; topics will not be considered a prerequisite to 422.

415. Introduction to Abstract Algebra (3) I Introduction to groups, rings, and fields. P. 423. May be convened with 515.

416. Applications of Algebra (3) I Various applications of algebra, e.g., to coding theory, combinatorial designs, cryostallography, etc. P. 415. May be convened with 516.

421. Fourier Series and Orthogonal Functions (3) I Fourier series, orthogonal functions, Legendre polynomials and Bessel functions. P. 254 or 255. May be convened with 625.

422a-422b.** Advanced Analysis for Engineers (3-3) Laplace transforms, Fourier series, partial differential equations, vector analysis, integral theorems, matrices, complex variables. Credit limited to 422a or 422b, but not both. P. 254 or 255. 422a is not prerequisite to 422b. Both 422a and 422b are offered each semester. May be convened with 524.

423. Intermediate Analysis (3) I 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).

424.** Elements of Complex Variables (3) I Complex numbers, functions of complex variables, differential and integral calculus, residue calculus, and calculus of residues. P. 223. May be convened with 524.

425. Advanced Calculus I (3) Continuity and Riemann integration in one or two dimensions, improper integrals, uniform convergence, differentiation in n-space, inverse function theorem. P. 223 and 423. May be convened with 525.

426. Advanced Calculus II (3) 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) II 1990-91 Topics to be selected from projective geometry, algebraic geometry, metric geometry or combinatorial topology. P. 215. May be convened with 525.

431. Calculus of Variations (3) I 1989-90 Euler equations and basic necessary conditions for extrema, sufficiency conditions, introduction to optimal control, direct methods. P. 254 or 255. May be convened with 531.

434. Introduction to Topology (3) I Properties of metric and topological spaces and their maps, topics selected from geometric and algebraic topology, including the fundamental group. P. 423.

436. Infinite Dimensional Differential Geometry (3) I Differential geometry of surfaces; nonintrinisitic geometry: fundamental forms, Gaussian and mean curvatures, intrinsic geometry. Theorema egregius, Gauss-Bonnet theorem. P. 254 or 255.

443. 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.S.C. 443) May be convened with 543.

447. Combinatorial Mathematics (3) I 1990-91 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.

455.** Elementary Partial Differential Equations (3) I Theory of characteristics for first order partial differential equations; second order elliptic, parabolic and hyperbolic equations. P. 254 or 255. May be convened with 555.


466. Theory of Statistics (3) I Probability spaces, random variables, standard distributions, point and interval estimation, parametric and nonparametric methods. Math majors will not receive grad. credit. P. 123 or 248. (Identical with Stat. 466) May be convened with 566.

473. Theory of Computation (3) II (Identical with C.S.C. 473) May be convened with 567.

475a-475b. Mathematical Principles of Computer Languages (3-3) 475a: Analysis of errors in numerical computations, solution of systems of linear equations, application of these concepts to matrix inversion, eigenvalues, roots of nonlinear equations, interpolation and approximation. P. 254 or 255; and a knowledge of a scientific computer programming language (e.g., FORTRAN IV). 475b: Numerical integration, solution of systems of ordinary differential equations, initial value and boundary value problems. (Identical with C.S.C. 475a-475b).

479. Game Theory and Mathematical Programming (3) I 1989-90 Linear inequalities, game theory, decision processes, optimal control, duality theories, simplex method. P. 410 or 413 or 415. (Identical with C.S.C. 479) May be convened with 579.

511a-511b. Modern Algebra (3-3) Groups, rings, modules, algebras, Galois theory. P. 415 and 416; or 413 and 415.

513. Linear Algebra (3) I For a description of course topics, see 415. 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 415.

514b. Algebraic Number Theory (3-3) 1989-90 Dedekind domains, complete fields, class groups and class numbers, Dirichlet unit theorem, algebraic function fields. P. 51b.

516. Applications of Algebra (3) I Advanced topics in groups, rings, fields, algebras; content varies. P. 516.

519. Topics in Number Theory and Combinatorics (3-3) I Advanced topics in algebraic number theory, analytic number theory, and combinatorics, with emphasis on problem solving. P. 516.

521. Fourier Series and Orthogonal Functions (3) I For a description of course topics, see 421. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 255. 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 255. May be convened with 422a-422b.


524. Elements of Complex Variables (3) I For a description of course topics, see 424. Graduate-level requirements include more extensive problem sets or advanced projects. P, 223 or 424. May be convened with 424.  

525. Advanced Calculus I (3) I For a description of course topics, see 425. Graduate-level requirements include more extensive problem sets or advanced projects. P, 223 or 423. 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, 225 or 426. May be convened with 426.

527a-527b. Principles of Analysis (3) I II For a description of course topics, see 427a-427b. Graduate-level requirements include more extensive problem sets or advanced projects. P, 225 or 425. May be convened with 425.

529. Topics in Modern Analysis (3) [Rpt.] I II Advanced topics in measure and integration, complex analysis in one and several complex variables, probability, functional analysis, operator theory, control and game theory. P, 426.  

530. Second Course in Geometry (3) I II 1990-91 For a description of course topics, see 430. Graduate-level requirements include more extensive problem sets or advanced projects. P, 225 or 226. May be convened with 430.

531. Calculus of Variations (3) I 1989-90 For a description of course topics, see 431. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 255. May be convened with 431.

534a-534b. Topology (3-3) I II Point set topology, homotopy, homology, Applications, such as manifolds, duality, fixed point theorems, solutions to differential equations. P, 415, 425.

536a-536b. Calculus of Tensors and Exterior Differential Forms (3-3) 1990-91 Affine tensors, tensor analysis on differentiable manifolds, calculus of exterior differential forms; calculus of variations, Riemannian geometry, applications to field theories. P, 427.


538. Topics in Geometry and Topology (3) [Rpt.] I II Advanced topics in point set and algebraic topology, algebraic geometry, differential geometry. P, 427.

539. Algebraic Coding Theory (3) I II 1989-90 Construction and properties of error correcting codes; encoding and decoding procedures and information theory; various codes. P, 415. (Identical with E.C.E. 539.)

543. Theory of Graphs and Networks (3) I 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 CS 543.) May be convened with 443.

546. Theory of Numbers (3) I 1990-91 For a description of course topics, see 446. Graduate-level requirements include more extensive problem sets or advanced projects. P, 225 or 255. May be convened with 446.

547. Combinatorial Mathematics (3) II 1990-91 For a description of course topics, see 447. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215 or 245. May be convened with 447.


553a-553b. Partial Differential Equations (3-3) 1990-91 Theory and examples of linear equations, characteristics, well-posed problems, regularity, variational principles, asymptotics, Topics in nonlinear equations, such as shock waves, diffusion waves, and estimates in Sobolev spaces. P, 525b or 565b.  

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 255. May be convened with 454.

555. Elementary Partial Differential Equations (3) I II For a description of course topics, see 455. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 255. May be convened with 455.

556. Applied Partial Differential Equations (3) I II For a description of course topics, see 456. Graduate-level requirements include more extensive problem sets or advanced projects. P, 455a or 455b. May be convened with 456.

557a-557b. Dynamical Systems and Chaos (3-3) 1989-90 Qualitative theory of dynamical systems, phase space analysis, bifurcation, period doubling, universal scaling, onset of chaos, chaotic and strange attractors, applications to physics, biology, ecology, fluid mechanics and topology. P, 422a-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.)


566. Theory of Statistics (3) I II For a description of course topics, see 466. Graduate-level requirements include more extensive problem sets or advanced projects. P, 465. (Identical with Stat 566b.) May be convened with 466.

567a-567b. Statistical Inference (3-3) 1989-90 A decision theoretic approach to estimation and hypothesis testing, sequential methods, large sample theory. P, 425 and 464 or 563a. (Identical with Stat. 567a-567b.)

568. Applied Stochastic Processes (3) III For a description of course topics, see 468. Graduate-level requirements include more extensive problem sets or advanced projects. P, 464. (Identical with Stat. 568b.) May be convened with 468.

573. Theory of Computation (3) III For a description of course topics, see 473. Graduate-level requirements include more extensive problem sets or advanced projects. P, 464 or 465. (Identical with Stat. 573a and 573b.)

574a-574b. Numerical Analysis (3) I II Error analysis of numerical computations; non-linear equations, eigenvalues interpolation and approximation, numerical integration, initial and boundary value problems for differential equations, optimization. P, 474a or 475b.

577. Topics in Applied Mathematics (3) [Rpt.] 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.


584. Operational Mathematics (3) I For a description of course topics, see 484. Graduate-level requirements include more extensive problem sets or advanced projects. P, 484. May be convened with 484.

585. Mathematical Modelling (3) I For a description of course topics, see 485. Graduate-level requirements include more advanced projects. P, 421 or 475b. SIE 320a. May be convened with 485.

586. Case Studies in Applied Mathematics (1-3) C For a description of course topics, see 488. Graduate-level requirements include more extensive problem sets or advanced projects. P, 487 and 424, or 425b. May be convened with 484.


588. Topics in Mathematical Physics (3) [Rpt.] I II Advanced topics in field theories, mathematical theory of quantum mechanics, mathematical theory of statistical mechanics; content varies.

589. Nonlinear Wave Motion (3) I 1990-91 Nonlinear partial differential equations describing conservative phenomena, plasmas, lasers, shockwaves, modulated wave trains, parametric resonance, solitons and exactly solvable equations. P, 422b or 456 or 455.

591. Mathematical Software (3) [Rpt.] I II P, 254 or 255, knowledge of "C" programming. May be convened with 496.

a. Topics in Mathematical Software (3) [Rpt.] I P, 254 or 255, knowledge of "C" programming. May be convened with 496.

b. Mathematical Software (3) [Rpt.] I P, 254 or 255, knowledge of "C" programming. May be convened with 496.
Mechanical Engineering (See Aerospace and Mechanical Engineering)

Media Arts (MAR)

Modern Languages Building, Room 205
(602) 621-7352

Professors: Caren J. Deming, Head, J. Michael Gillies

Associate Professors: Harry Atwood (Emeritus), Peter Lehman (Adjunct, Drama), Wesley B. Marshall

Assistant Professors: H. Bruce Fowler, Mary Beth Haralovich, Denise J. Kervin, Robert J. Sabal, A. Christine Strayer

Lecturer: F. D. Nott

The department provides instructional programs designed to prepare students to assume creative and leadership roles in the electronic, filmic, and graphic media arts. Course work focuses upon history, theory, criticism, production, and management of the media arts. The department's course offerings lead to the Bachelor of Fine Arts and Bachelor of Fine Arts in Media Arts degrees. The facilities of the Division of Media Services, including KUAT-TV/AM/FM, and film production facilities are utilized for many laboratory classes. Advanced students have opportunities to obtain preprofessional experience through the department's internship program.

The Bachelor of Arts in Media Arts is for students planning careers in broadcast journalism 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, 209, 210, 307, or 308.

Requirements: In the major, the student must complete 28 credit hours of media arts courses, including 100, 101, 105, 200, 214, 362, 376, and 18 emphasis units selected under advisement.

At least 12 units must be upper-division courses. No more than 6 units of internship and independent study (see the work in 399) may be counted toward the major; and no more than 6 units of production and practicum course work (231, 214, 215, 241, 250, 302, 311, 314, 315, 316, 413, 414, 415A, 415B, 473, 494, 497) may be counted toward the major. No more than 48 units in media arts may be counted toward the degree. At least 18 units in the major must be completed in residence. It is recommended that students develop typing ability toward the degree. At least 18 units in the major must be upper-division. Basic production facilities and equipment are provided by the department. Students are responsible for the cost of film/TV stock, processing, and other necessary supplies.

The department participates in the Honors Program.

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.

101. Introduction to Media Arts (3) I II Survey of radio, television, film. Examination of the media, their history, aesthetics, technology and relationship to society and culture.

105. Beginning Film Technique (3) I II Silent motion picture production techniques. Individual 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 theories which make a distinction between film, and audio images: light, color, area, depth, movement, and sound in message design and structure.

205. Reporting the News (3) I I I (Identical with Jour. 205)

207. Western Civilization and the Arts: Baroque Through Nineteenth Century (3) I I I (Identical with F.A. 317)

307. Western Civilization and the Arts: Palaeolithic through Renaissance (3) I I I (Identical with F.A. 307)


322. Major American Broadcast Genres (3) I I I 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.

325. History of American Broadcasting (3) I I I Examination of the American broadcast industry, technical innovation, the rise of stations and networks, financial base, programming, regulation, and changes in audience.


364. Creative Advertising (3) I 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. (Identical with Mktg. 364.)
361. 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 368)

371. Film/Video Production Financing (3) I II Strategies for production financing for independent film/video projects and ways to position projects in the marketplace. Students will develop a prospectus for their own project. P. 214 or 215. (Identical with Dram. 371)

376. Audience Measurement (3) I 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.

380. Writing for News and Documentary (3) I Advanced work in the writing of news and public affairs programs for radio, television, cable, and closed-circuit use, with emphasis on the public affairs program and documentary. P. 280, 362.

381. Reporting for Radio-Television News (3) I Advanced procedures and techniques utilized in news gathering, production of newscasts, event coverage, newsroom organization. Performance practice is emphasized in laboratory exercises. 2R, 3L, P. 205, 280 or 362. (Identical with Jour. 381)

382. Producing Public Affairs and Documentary Programs (3) I II Advanced work in the production of public affairs and documentary programs; idea formulation, budgeting, writing, researching, emphasis on organization of production team and practical production considerations. 2R, 3L. Open to majors only. P. 314, 380, or 381.


413. Advanced Audio Production (3) I II Advanced audio production, mixing theory, sound processing for various types of production. 2R, 3L. P. 101, 200, 213.

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 team project, 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 such as television, film, and advertisements. P. 200, 320. (Identical with W.S. 423) May be convened with 523.

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. 328.

474a-474b. Film Theory and Criticism (3-3) (Identical with Dram. 474a-474b)

475. Screen Acting Techniques (3) I II (Identical with Dram. 475)

476. Broadcast and Cable Programming (3) I Investigation of principles, techniques, and current issues in programming for radio and television stations (commercial and public) and cable systems. P. 101. May be convened with 576.

497. Workshop a. Community Audio-Video Production (1-5) [Rpt./8 units] I II P. 314 or 414 (depending on production assignment) and acceptance of portfolio by Portfolio Committee. b. Video for Law Enforcement (1)

523. Representation of Gender in the Media (3) I For a description of course topics, see 423. Graduate-level requirements include an in-depth research paper on an issue related to contemporary media programming. P. 101. May be convened with 476.

Medical Technology (See Health-Related Professions)

Medicine (MED/ANES/FCM/IMED/NEUR/OBG/OPI/PATH/PSY/PSY/RAD/RONC/SURG)

Arizona Health Sciences Center, Room 2208 (602) 626-7383

Interdepartmental (MED)

495. Colloquium y. Introduction to the Neurosciences I (2) 1989-90 P. Consult department before enrolling. (Identical with Anat. 495y, Phcl. 495y, and Psio. 495y) May be convened with 495z.

z. Introduction to the Neurosciences II (2) 1989-90 P. 495z or consult department before enrolling. (Identical with Neurol. 495z, Phcl. 495z, Psio. 495z, and Psy. 495z) May be convened with 595z.

595. Colloquium y. Introduction to the Neurosciences I (2) 1989-90 P. Consult department before enrolling. (Identical with Anat. 595y, Phcl. 595y, and Psio. 595y) May be convened with 495z.

z. Introduction to the Neurosciences II (2) 1989-90 P. 595z or consult department before enrolling. (Identical with Neurol. 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 600 levels. See 896 below for a complete listing.

801. Preparation for Clinical Medicine I (1-2) II No grade is given until the full 12 units are completed.

802. Human Behavior and Development (6) II

830. Supplementary Registration (1-9)

850. Seminar a. Introduction to Forensic Pathology (1-3) II b. Physical and Biological Basis of Nuclear Medicine (2) c. Introduction to Computers in Medicine (2) d. Clinical Epidemiology (2) e. Research in Medical Ethics (2) f. Medical Jurisprudence (2) g. Research Methods for Clinical and Forensic Medicine (2) h. Pathophysiology of Respiratory Diseases (2)

*Available as both 396 and 896

Anatomy

See Anatomy elsewhere in this catalog.

Anesthesiology (ANES)

Professors: Burnell R. Brown, Jr., Head, I. Glenn Sipes.

Associate Professors: Randall C. Cork, A. Jay Nebl, Stuart R. Hamburger, Charles W. Otto.

Assistant Professors: Joseph A. Gallo, Jr., William S. Gegg (Clinical), Karen M. Knierim (Clinical), Lawrence B. Weiss.

800. Research (1-6) [Rpt./1]

810. Clerkship a. Anesthesiology (1-8)


891. Preceptorship a. Anesthesiology and Subspecialties (1-18) c. General Anesthesiology (4-6)

Biochemistry

See Biochemistry elsewhere in this catalog.

Cancer Biology

See Cancer Biology elsewhere in this catalog.

Family and Community Medicine (FCM)


Associate Professors: Peter M. Attarian, Frank A. Hale (Research), David H. Levinson, Ronald E. Pust, Cheryl K. Ritenbaugh (Research), Assistant Professors: George H. Adams (Research), Kay A. Bauman (Clinical), Donan H. Cordes, Pat L. Gordon (Research), Barbara R. Hartmann (Research), Evan W. Kligman, Craig L. McClure, J. Kristin Olston-Garewal (Clinical), Robert C. Rhode (Clinical), Arthur B. Sanders, Janet H. Sent (Research), Lee Sennott-Miller (Research), Louise H. Warrack (Research), Barry D. Weiss.


487. Poverty and Health (3) II (Identical with Nurs. 487) May be convened with 487.


515. Subspecialty h. Cancer Epidemiology and Prevention (3) I P. none; statistics helpful. (Identical with R.Onc. 515h)

587. Poverty and Health (3) II (Identical with Nurs. 587) May be convened with 487.

588. Clinical Anthropology (3) I II (Identical with Nurs. 588)

595. Colloquium d. Special Topics in Cell Biology (2) [Rpt./6 units] II Open to students in biological sciences only. (Identical with Anat. 595d, M.C.B. 595d, R.Onc. 595d)

596. Seminar a. International Health (3) Open to health majors only.

b. Occupational Disease (1) II Open to medical or industrial hygiene students only; consult department before enrolling.

c. Prevention and Control of Disease (1) II (Identical with Nurs. 596d)

n. Community and International Nutrition (1-3) II (Identical with N.F.S. 596n)

s. AIDS, Cancer, Nutrition Immunity (1) II w. Diet and Prevention of Disease (2)

z. Psychosocial Epidemiology (2)
Note: Some seminars are numbered at both the 500 and the 800 levels. See 896 below for a complete listing.

800. Research (2-16) [Rpt./2]
803. Clinical Clerkship (6-9)

811. Subinternship
a. Family Medicine (3-6) II S

815. Subspecialty
b. The Dying Patient (1-6) [Rpt./1]
d. Problems in Community Oriented Primary Care (6-12)
e. Personal Change in Lifestyle Related Behavior (3-6) Consult department before enrolling.
g. Community-Based Care of the Older Patient (3-12) [Rpt./12 units] Field trips. Consult department before enrolling.
h. Cancer Epidemiology and Prevention (3)

891. Preceptorship
a. Primary Care (6-12)
b. Family Medicine (3-12) P. 4th year medical student. Consult department before enrolling.
c. Epidemiology at CDC (3) II P, open to majors in medicine, public health, and nursing. Consult department before enrolling.
d. Rural Care (4-12)
e. Primary Care Health Care (3-6) Consult department before enrolling.
f. Clinical Preceptorship in International Health (6-12)
g. AHEC/Border Health (4-12) Consult department before enrolling.

896. Seminar
a. "International Health (3) S Open to health majors only.
b. "Epidemiologic Methods (3) II

c. Approaches to Managing Behavior Problems of Children and Adolescents (2)
d. Holistic Health (2) II Open to majors only. Consult department before enrolling.
e. Principles and Practice of Home Health (2) II Consult department before enrolling.
f. The Doctor-Patient Relationship (2)

g. Crisis and Conflict: Health Services in Latin America-Brazil (2)
h. "Nutrition in Disease (1-2) [Rpt./1] P. Bioc. 801, Psio. 601/801.


m. "Prepater of Community-Oriented Medicine in Rural Areas (2) II

n. "Community and International Nutrition (1) III

p. "Primary Care Health Care (1) [Rpt.] II

q. "Occupational and Environmental Health (3) S Consult department before enrolling.
r. "Basic Principles of Epidemiology (3) [Rpt./1]
s. "AIDS, Cancer, Nutrition Immunity (1) II
t. "Tropical Disease Problems (2)
u. "Current Issues in Health Services (2)
w. "Diet and Prevention of Disease (2)
x. "Psychosocial Epidemiology (2)

Available as both 596 and 896

Internal Medicine (MED)


Lecturers Benjamin Burbank, James Corrigan (Pediatrics), David Flieger, Gerald Goldstein, Milan Novak, Gail E. Riggs

596. Seminar
a. Pathophysiology and Immunology of the Clinical Manifestations of Coccidioidomycosis (2)

800. Research (3-30) [Rpt./30 units]
803. Clinical Clerkship (12)

810. Clerkship
a. Ambulatory Care (4-6) [Rpt./12 units] II S P, completion of third year medical school.
b. Ambulatory Diagnosis and Therapeutics (2)

811. Subinternship
a. Internal Medicine (6-12)
b. Intensive Care (4) P, successful completion of third year medical school.
c. Coronary Care Unit (4)
d. Medical Intensive Care Unit (4)
e. General Medicine (4)

815. Subspecialty
a. Clinical Cardiology Elective (4-8)
b. Clinical Dermatology (3) c. Endocrinology (4-12) d. Clinical Gastroenterology (4-8) e. Hematology-Oncology (6) f. Infectious Diseases (4-12) g. Pulmonary Diseases (4) h. Pulmonary Laboratory and Consultation Services (2) i. Nephrology (3-7) j. Nephrology Practice (3) P, 803. k. Neurology Practice (3) P, 803.

891. Preceptorship
a. Neurology (1-18) [Rpt./2]

895. Colloquium
a. Introduction to the Neurosciences I (2) 1989-90 P, Consult department before enrolling. (Identical with Med. 495y, which is home) May be convened with 595z.
b. Introduction to the Neurosciences II (2) 1989-90 P, 595y or consult department before enrolling. (Identical with Med. 595z, which is home) May be convened with 595z.

800. Research (112) [Rpt./1] (See College of Medicine Electives Manual)
803. Clinical Clerkship (3-6)

810. Clerkship
a. Neurology (3-6)

815. Subspecialty
c. Cerebrovascular Disease (3) P, 803.

891. Preceptorship
a. Obstetrics and Gynecology (OBG) I

9. Obstetrics and Gynecology (OBG)

Professors Lewis Shenker, Acting Head, John R. Davis (Pathology), John V. Kelly (Clinical), John D. Mollison, Tawffik Rizkallah (Clinical), Louis Weinstein (Research)

Associate Professors Diane S. Fordney (Psychiatry), Kathryn L. Reed, William C. Scott (Clinical), Earl A. Surwil (Clinical)

Assistant Professors Steven Calvih, David Chaffin (Clinical), Joel Childers (Clinical), Stephen Green (Clinical), David S. Gross (Research), Allan Hartsough, Oliver Jones (Clinical), Herbert E. Pollock (Clinical), Bruce Silva, Eric Thompson

Lecturers Caroline F. Anderson (Clinical), Jessica Byron (Clinical)

800. Research (1-18) [Rpt./1] pms
803. Clinical Clerkship (6-9)

810. Clerkship
a. Preparation for Practice (1-18)

815. Subspecialty
b. Clinical Infertility (4-6) II S

891. Preceptorship
a. Obstetrics and Gynecology (1-18)
b. Gynecology-Endocrinology (6)

Ophthalmology (OPH)

Professor Barton L. Hodes, Head, Albert M. Potts (Clinical)

Associate Professor Andrezj W. Fryczkowski (Research)

Assistant Professors Richard W. Allinson, Enrique L. Labadie, Kalarickal Oommen, Steven Rapesak

Lecturer Robert H. Hamilton

800. Research (6-10) II
815. Subspeciality
a. Ophthalmology (3-6)

Neurology (NEUR)

Professors Alan B. Rubens, Head, Peggy Ferry (Pediatrics), William A. Sibley

Associate Professor Colin R. Barnford

Assistant Professors William Feinberg, Enrique L. Labadie, Kalarickal Oommen, Steven Rapesak

Lecturer Robert H. Hamilton
891. Preceptorship

Pathology (PATH)


Associate Professors James M. Byers III, Anna R. Graham, Thomas M. Grogon, Mary Jane Hicks, Allen M. Jones (Clinical), Douglas H. McKeVilne, Claire M. Payne (Research), Ronald B. Schiffman, Karen K. Steinbronn (Clinical)

Assistant Professors Maria L. Aguirre (Clinical), Jerry L. Bangert (Clinical), Thomas E. Henry (Clinical), Bruce O. Parks (Clinical), Kenneth B. Simons, Catherine M. Spier

489. Introduction to Forensic Science: Pathology, Anthropology, Toxicology and Law (2) II Opportunity for the criminal investigator and attorney with a background in forensic pathology to better understand the results of trauma, toxic substances and environmental catastrophes. Taught off campus only.

801. General and Systemic Pathology (10) I II

810. Clerkship
a. Anatomic Pathology (1-18)
   b. Clinical Pathology (1-18)
   c. Special Topics (1-18) [Rpt.]

891. Preceptorship
a. Pediatrics (1-18) [Rpt./2]

Pediatrics (PED)


Associate Professors Suzanne B. Cassidy (Clinical), Michael W. Cohen (Clinical), M. Eleanor Grimm (Clinical), Gail Harrison, H. Eugene Hoyne (Clinical), John J. Hutter, Michael S. Radetzky (Clinical), Mary E. Rimsza (Clinical) Michael J. Schumacher, Elsa Sell, John E. Udel, Jr.

Assistant Professors Alan D. Bedrick, Robert A. Berg (Clinical), Clifford DeBenedetti (Clinical), Richard L. Donnerstein, Carlos A. Flores, Daniela Lax, Thomas R. Lloyd, William N. Marshall (Clinical), Paul S. Metzler (Research), Wayne J. Morgan, Paul F. Pollack, Michael Raddish (Clinical), William A. Scott, Eve Shapiro (Clinical), Ziad M. Shehab, Robert Van derVoort (Clinical), Rickey L. Williams

Instructors Donna M. Capin (Clinical), Roni Grad (Research), Karen O. Kennedy (Clinical)

Lecturers Jeryl K. Dansky (Clinical), Victor A. Elsberry, Fran Farrell, Maureen J. Hutter, Catherine J. Locke (Clinical)

800. Research (1-18) (See College of Medicine Electives Manual)

803. Clinical Clerkship (6-9)

810. Clerkship
   b. Pediatric Care in a Cross-Cultural Setting (6)
   c. Inpatient Pediatrics (6)

811. Subinternship
a. Ambulatory Pediatrics (1-18)
   b. Behavioral and Developmental Pediatrics (1-18)

815. Subspecialty
a. Advanced Neonatology (6)
   b. Pediatric Infectious Diseases (6)
   d. Cardiac Ultrasound Echo and Doppler (4-6)
   e. Pediatric Cardiology (6)
   f. Pediatric Nephrology (6)
   g. Pediatric Hematology/Oncology (6)
   h. Poison Center (4-6) P, 803.
   i. Clinical Allergy (1-6) (Identical with Med. 851), which is home.
   j. Pediatric Endocrinology (1-4)
   m. Child With Complex Chronic Illness (4) P, full third year medical school curriculum including pediatrics.

891. Preceptorship
a. Pediatrics (1-18)
   b. Preparation for Practice (1-18)

Pharmacology

See Pharmacology elsewhere in this catalog. Pharmacology courses are listed under Pharmacology and Toxicology.

Physiology

See Physiology elsewhere in this catalog.

Psychiatry (PSY)

Professors John C. Racy, Acting Head, Allan Beigel, Larry E. Beutler (Psychology), Richard R. Bootzin (Psychology), Henry W. Brosin, Alfred W. Kasznia (Psychology), Mary F. Koss, Alan I. Levenson, Alayne Yates

Associate Professors Harold S. Arkowitz (Psychology), Diane S. Fordney (Obstetrics and Gynecology), David Nelson (Psychology and Toxicology), Catherine M. Shisslak (Psychology), Henry I. Yamamura (Psychology)

Assistant Professors Peter J. Attarian (Family and Community Medicine), Shirley N. Fahey, Milton Frank

495. Colloquium
a. Introduction to the Neurosciences I (2) 1989-90 P, 495y or consult department before enrolling. (Identical with Micr. 495)

595. Colloquium
z. Introduction to the Neurosciences II (2) 1989-90 P, 595y or consult department before enrolling. (Identical with Med. 495z, which is home)

594. Colloquium
z. Introduction to the Neurosciences II (2) 1989-90 P, 594y or consult department before enrolling. (Identical with Med. 594z, which is home)

800. Research (1-12) (See College of Medicine Electives Manual)

803. Clinical Clerkship (6-9) [Rpt./1]

810. Clerkship
a. Clinical and Community Psychiatry (1-18)
   b. Child Psychiatry (1-18)

815. Subspecialty
   f. Forensic Psychiatry (3-6) II JS P, 803.

891. Preceptorship

Radiation Oncology (RONC)

Professors J. Robert Cassady, Head, Thomas C. Cetas, Eugene W. Gerner, Timothy Bowden, Robert B. Roemer

Associate Professors Jeffrey M. Trent, Daniel L. Magee

Assistant Professors Anne E. Cress, Joichi Duffy (Research), Helen Gensler (Research), Anna Hill (Research), Kullen H. Hynynen, Bruce Lulu, Wendell R. Lutz, David S. Shim, Bashar Darred S. Stea, Helen F. Sykes (Clinical), Jeffrey Williamson (Clinical)

501. 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; radiobiology and chemical (especially radiomimetic drugs) carcinogenesis. P, introductory biology and chemistry.

515. Subspecialty
a. Cancer Epidemiology and Prevention (3) P, none; statistics helpful. (Identical with F.C.M. 515h, which is home)


555. Cancer Biology (3) II 1990-91 (Identical with Micr. 555)

595. Colloquium
d. Special Topics in Cell Biology (2) [Rpt./6 units] II (Identical with C.Bio. 595d, which is home)

596. Seminar
h. Control of Proliferation in Animal Cells (2-12) I P, consult department before enrolling. (Identical with Micr. 596)

815. Subspecialty
a. Introductory Radiation Oncology (1-16)

815. Environmental Carcinogenesis (3) II 1990-91 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, consult department before enrolling. (Identical with Micr. 851)

891. Seminar
h. Control of Proliferation in Animal Cells (2-12) I (Identical with Micr. 891)

Radiology (RADI)

Professors M. Paul Capp, Head, George R. Barrett (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. Pett (Surgery), Arthur J. Present (Emeritus), Joachim F. Seeger, William L. Wolfe, Jr. (Optical Sciences), James M. Woolfenden

Associate Professors Robert A. Bjelland, Raymond F. Carmody, Robert E. Henry, Lawrence W. Keefe (Clinical), Gerald D. Pond, Hans Roenigk (Research), James R. Standen (Clinical), Bryan R. Westerman

Assistant Professors H. Bradford Barber (Research), Arthur F. Gmitro, Pamela J. Lund (Clinical), George W. Seelye (Research, Optical Sciences), Thomas R. Stejskal (Clinical), Cathy S. Timy (Clinical), Evan C. Unger, Walter H. Williams

Instructors Rebecca Hunt (Clinical), Jason L. Hermon (Clinical)

Lecturers Harry R. Claypool (Anatomy), Jack N. Hall

Research Specialist Kevin M. McNeill

800. Research (1-6) [Rpt./1]

815. Subspecialty
a. Diagnostic Radiology (4)

891. Subspecialty

Surgery (SURG)

Professors Leonard F. Peffer, Acting Head, Victor M. Bernhard, L. Philip Carter, Milo Chvapil, Jack G. Copeland, George W.
Drach, Eric P. (Internal Medicine), Theodore J. Glattke (Speech and Hearing Sciences), A. Norman Guthkelch, Douglas Lindley, Donald D. Madon (Speech and Hearing Sciences), Harvey W. Meislin, Michael L. Pitt (Radiology), Charles W. Putnam, Gutlshen K. Sethi, Donald P. Speer, Robert T.F. Spetzler, Thomas J. Starke, Charles M. Tipton (Exercise and Sport Sciences), Hugo V. Villar, Robert G. Volz, Charles L. Witte, Marlyns H. Witte, Charles F. Zukoski

Associate Professor Johnathan Beck (French and Italian), Richard C. Jensen (Classics), Peter Medine (English)

Assistant Professor Albrecht Glassman (German)

The Graduate Committee on Medieval Studies does not offer any major at this time. Programs constituting appropriate minors are available for doctoral students with majors in other disciplines. For further information concerning the minor, please see the Graduate Catalog.

Metallurgical Engineering

(Meet Science and Engineering)

Mexican American Studies (MAS)

Douglass Building, Room 315
(602) 621-7551

Mexican American Studies and Research Center

Professors Macario Saldate IV (Educational Foundations and Administration), Director, Jose D. Garcia (Physics), Anon A. Gyrsko (Spanish and Portuguese), Miguel A. Mejia (Spanish and Portuguese), Michael C. Meyer (History), James Officer (Anthropology), Elia. S. Rivero (Spanish and Portuguese), Cecilia Robinson (Emeritus, English), Renato I. Rosoldo (Emeritus), Charles M. Tatum (Spanish and Portuguese), Carlos Velez (Anthropology), Thomas Weaver (Anthropology)

Associate Professor Celestino Fernandez (Sociology), John A. Garcia (Political Science), Juan R. Garcia (History), Roseanne Gonzalez (English), William Velez (Mathematics)

Assistant Professors Frances Aparicio (Spanish and Portuguese), Roberto Fernandez (Sociology), Ana Perchez (Spanish and Portuguese), Joaquin Ruiz (Geosciences), Kathleen C. Schwartzman (Sociology), David Torres (Management and Policy)

Lecturers Raquel R. Goldsmith (Adjunct), Adalberto M. Guerrero (Spanish and Portuguese)

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, 477b, 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 9 units chosen from 161, 233, 332, and 443, 477b, or 485.

160. Minority Relations and Urban Society (3) (Identical with Hist. 160)
161. The Chicanos in American Society (3) (I) (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.

213. Oral Communication in Spanish (4) (I) (Identical with Span. 393)
233. History of the Mexican American (3) (I) (Identical with Hist. 233)
303a-303b. Comprehensive Spanish for the Major (3-3) (I) (Identical with Span. 303a-303b)
319. Mexican American Culture (3) (I) (Identical with Anth. 319)
322. Foundations of Bilingual Education (3) (I) (Identical with L.R.C. 322)
330. Minority Groups and American Politics (3) (I) (Identical with Pol. 330)
332. Politics of the Mexican American Community (3) (I) (Identical with Pol. 332)
368. Colonial Mexico (3) (I) (Identical with Hist. 368)
369. Mexican Since Independence (3) (I) (Identical with Hist. 369)
373. Intermediate Grammar for the Bilingual (3) (I) (Identical with Span. 373)
444. Mexican-American Poetry (3) (I) (Identical with Span. 444)
445. Mexican-American Literature (3) (I) (Identical with Span. 445)
446. Mexican-American Narrative (3) (I) (Identical with Span. 446)
447. Contemporary Mexican Literature (3) (I) (Identical with Span. 447)
448. Government and Politics of Mexico (3) (I) (Identical with Pol. 448)
499. Introduction to the Mexican-American Film (3) (I) (Identical with Span. 449)
453. Mesoamerican Archaeology (3) (I) (Identical with Anth. 453)
460. History of the Hispanic Borderlands (3) (I) (Identical with Hist. 460)
467. Race and Ethnic Relations (3) (I) (Identical with Soc. 467)
473. Spanish for the Bilingual Classroom Teacher (3) (I) (Identical with Span. 473)
485. Mexican/Chicana Women's History (3) (I) (Identical with Hist. 485)
487. Women and Their Share of Capitalism (3) (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).

495. Colloquium (3) (I) (Identical with Hist. 495c, which is home)
569. Seminar (3) (I) (Identical with Hist. 569m, which is home)
569. Colloquium (3) (I) (Identical with Hist. 569n, which is home)

*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) (I) (Identical with Anth. 423)
432. Pre-Columbian Culture and Myths (3) (I) (Identical with Span. 432)
454. Cultural and Literary Origins of Hispanic Southwest (3) (I) 1989-90 (Identical with Span. 434)
441. Children's Literature in Spanish (3) (I) (Identical with Span. 441)
433. Mexican-American Poetry (3) (I) 1990-91 (Identical with Span. 442)
434. Mexican-American Literature (3) (I) (Identical with Span. 443)
444. Mexican-American Narrative (3) (I) 1990-91 (Identical with Span. 444)
445. Mexican-American Theatre (3) (I) 1989-90 (Identical with Span. 445)
446. Contemporary Mexican Literature (3) (I) (Identical with Span. 447)
447. Government and Politics of Mexico (3) (I) (Identical with Pol. 448)
449. Introduction to the Mexican-American Film (3) (I) (Identical with Span. 449)
453. Mesoamerican Archaeology (3) (I) (Identical with Anth. 453)
460. History of the Hispanic Borderlands (3) (I) (Identical with Hist. 460)
467. Race and Ethnic Relations (3) (I) (Identical with Soc. 467)
473. Spanish for the Bilingual Classroom Teacher (3) (I) (Identical with Span. 473)
485. Mexican/Chicana Women's History (3) (I) (Identical with Hist. 485)
487. Women and Their Share of Capitalism (3) (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).

495. Colloquium (3) (I) (Identical with Hist. 495c, which is home)
569. Seminar (3) (I) (Identical with Hist. 569m, which is home)
569. Colloquium (3) (I) (Identical with Hist. 569n, which is home)
181. Life: The Science of Biology I (4) (Identical with MCB 181)

182. Life: The Science of Biology II (4) (Identical with MCB 182)

205. Introduction to Microbiology (5) I (Identical with MCB 205) Introduction to general, applied, and pathogenic microbiology and immunology. 4R, 4L.

317R. General Microbiology and Microbial Physiology (3) 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) II Instrumentation and technology in general microbiology and microbial physiology. P, 317R or CR.

357. Communicable Diseases (3) I II The nature and prevention of communicable diseases. Open to nonmajors only.

403R. Biology of Animal Parasites (3) I (Identical with VSC. 403R) May be convened with 503R.

403L. Parasitology Laboratory (1) I (Identical with VSC. 403L) May be convened with 503L.

410a-410b. Advanced Cell Biology (3-3) (Identical with MCB. 410a-410b).


419L. General Immunology Laboratory (2) I Laboratory technique in immunology. P, 419R or CR. (Identical with VSC. 419L).

420R. Pathogenic Bacteriology (3) II I II1990-91 (Identical with VSC. 420R) May be convened with 520R.

420L. Pathogenic Bacteriology Laboratory (2) II I II1990-91 (Identical with VSC. 420L) May be convened with 520L.


427R. General Mycology (3) I I1989-90 (Identical with VSC. 427R) May be convened with 527R.

427L. General Mycology Laboratory (2) I I1989-90 (Identical with VSC. 427L) May be convened with 527L.

428L. Advanced Microbial Genetics (3) II I1990-91 (Identical with MCB. 428L) May be convened with 528L.

428R. Advanced Microbial Genetics Laboratory (2) II I1990-91 (Identical with MCB. 428R) May be convened with 528R.


430. Introduction to Biophysics (2) I I (Identical with Phys. 430) May be convened with 530.

431R. Soil Microbiology (3) I (Identical with S.W. 431R) May be convened with 531R.


451. Diagnosis and Control of Plant Diseases (4) I I (Identical with Pt.P. 451).

470R. Food Microbiology and Sanitation (3) II I1990-91 (Identical with N.F.S. 470).

471. Food Microbiology and Sanitation Laboratory (2) I I1990-91 (Identical with N.F.S. 471).

473. Recombinant DNA Techniques (3) II I1990-91 (Identical with M.C.B. 473) May be convened with 573.

495. Colloquium a. Senior (1) [Rpt./1] I II1989-90 Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).


503R. Biology of Animal Parasites (3) I (Identical with VSC. 503R) May be convened with 403L.

503L. Parasitology Laboratory (1) I (Identical with VSC. 503L) May be convened with 403L.


520R. Pathogenic Bacteriology (3) II I1989-90 (Identical with VSC. 520R) May be convened with 420R.

520L. Pathogenic Bacteriology Laboratory (2) II I1989-90 (Identical with VSC. 520L) May be convened with 420L.

523R. General Pathology (3) II I1990-91 (Identical with VSC. 523R) May be convened with 423R.

523L. General Pathology Laboratory (1) I I1990-91 (Identical with VSC. 523L) May be convened with 423L.

525. Environmental Microbiology (3) I For a description of course topics, see 425. Graduate-level requirements include an in-depth research paper on a selected topic in environmental microbiology. P, 205, CR, Chem. 241b, 243b. May be convened with 425.

527R. General Mycology (3) I For a description of course topics, see 427. Graduate-level requirements include a paper on the current use of a fungus for industry. The paper is to be written in a style for the informed public (i.,e., Scientific American). P. 205. May be convened with 427R.

527L. General Mycology Laboratory (2) I For a description of course topics, see 427L. Graduate-level requirements include the preparation of materials not already on hand to be photographed for future teaching or testing in this course. P. 527R or CR. May be convened with 427L.

528R. Advanced Microbial Genetics (3) II I1990-91 (Identical with M.C.B. 528R) May be convened with 428R.

528L. Advanced Microbial Genetics Laboratory (2) II I1990-91 (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) I (Identical with Phys. 531).

535. Soil Microbiology (3) I (Identical with S.W. 535) May be convened with 435.

538. Ecology of Infectious Disease (3) I I1990-91 For a description of course topics, see 438. Graduate-level requirements include an in-depth research paper on a selected topic in general or medical microbiology. P, 205, Chem. 241b, 243b. May be convened with 438.

181. Life: The Science of Biology I (4) (Identical with MCB 181)

182. Life: The Science of Biology II (4) (Identical with MCB 182)
of seapower, with emphasis on mission, organization, and warfare components of the Navy and Marine Corps naval and customs, military justice, leadership, and nomenclature.

102. Naval Ship Systems I: Engineering (3) II Ship characteristics and types including ship design, hydrodynamic forces, stability, compartmentalization, propulsion, electrical and auxiliary systems, interior communications, ship control, and emergency control; basic concepts of the theory and design of steam, gas, and nuclear propulsion.

200a-200b. Naval Laboratory II (1-1) II Various topics such as drill and ceremonies, physical fitness, cruise preparation, sail training, safety awareness, personal finances, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.

201. Naval Ship Systems: Weapons (3) II Theory and employment of weapons systems, the protection of ships, gunnery, and naval architecture; the use of charts, visual and electronic aids, the theory and operation of magnetic and gyro compasses, and celestial navigation.

202. Navigation and Naval Operations I (3) II 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.

203. Naval Ship Systems: Engineering (3) II Various topics such as drill and ceremonies, physical fitness, cruise preparation, sail 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) II 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 internal rules of the road, relative-motion analysis, formation tactics, and ship employment. Introduction to naval operations and ship handling. P.N.S. 301.

310. Evolution of Warfare (3) II The development of warfare, focusing on the theorists, strategists, tacticians, and technological developments. Students acquire an understanding of strategy and the impact of precedent on military actions.

400a-400b. Naval Laboratory IV (1-1) II Various topics such as drill and ceremonies, physical fitness, cruise 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) II Organizational behavior and management in the context of the naval organization. A survey of management functions of planning, organizing, leading, and controlling, and an 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 warfare, with emphasis on present day amphibious operations, including the rapid deployment force concept.

Military Aerospace Studies (MLA)

South Hall, Room 104

(602) 621-3521

Professor Charles W. Hastings, Head

Assistant Professors Janet L. Dougherty, Jeffery K. Little, Kenneth I. Nonaka, 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 and civil aviation. 1R. 1L 101a is not prerequisite to 101b.

201a-201b. Second Year GMC, Air Force Today (2-2) Survey of the role of aviation in 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.

300a-300b. Third Year P.O.C., Leadership and Management (3-3) Theory and application of leadership and management, with emphasis on human relations, motivation, communication, organizational behavior, and management processes. 3R. 1L 300a-300b. 3L.

301a-301b. Fourth Year P.O.C., 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 301a-301b.

*General Military Course

**Professional Officer Course

Mining and Geological Engineering

(GEN/MN/E/M/E)

Mines Building, Room 229

(602) 621-2147

Professors Ian W. Farmer, Acting Head, Jay C. Dotson, Emeritus, DeVerle P. Harris, Y.C. Kim, Richard Newcomb, William C. Peters, Emeritus, Michael Rieber

Associate Professor, and J.K. Daemen, Charles E. Glass, Pirnadahe Kulatilake, Ben K. Sternberg

Assistant Professors Satya Harpalani

Geological Engineering (GEN)

Geological engineering involves the application of engineering principles to the design and specification of earth systems and the exploration and development of natural resources.

The department offers the Bachelor of Science in Geology Engineering, Master of Science and Doctor of Philosophy degrees in geological engineering.

Upper-division degree requirements are listed in the College of Engineering and Mines section of this catalog.

324. Introduction to Geological Engineering (3) I Introduction to current geological engineering technology applied to engineering site investigations and to the interaction of man and the environment.

330. Introduction to Remote Sensing (3) (Identical with Geos. 330)


407. Photogeology (3) II Use of aeral photographs in geologic mapping. 1R. 6L. P. Geos. 221. May be convened with 507. Glass, Writing-Emphasis Course. P. satisfaction of the upper-division writing-probability requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

415. Rock Excavation (3) I (Identical with Geos. 415) May be convened with 515.

416. Field Studies (3) II Seismic, magnetic, electrical, and gravity exploration techniques. Field trips. Special fee may be required. P. Geos. 416. May be convened with 516. Sternberg.


426. Principles of Health and Safety for Engineers (2) I (Identical with Geos. 426) May be convened with 526.

427. Geomechanics (4) I (Identical with Geos. 427) May be convened with 527.

444. Mining Geology (2) I 1989-90 Collection and use of geologic data in the production of minerals; includes surface and underground mapping. P. Geos. 444. May be convened with 544.

448. Geophysical Exploration: Potential Field Methods (4) I (Identical with Geos. 448) May be convened with 548.


561. Accident Prevention (2) I (Identical with Geos. 561) May be convened with 561.

570. 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. P. introductory courses in computer programming, math, and earth science. May be convened with 570. Sternberg.

576. Fundamentals of Industrial Hygiene (3) I (Identical with O.S.H. 486) May be convened with 586.

587. Design of Exploration Programs (3) II 1989-90 Geologic and economic principles applied to the design of mineral exploration programs and the evaluation and development of prospects. P. Geos. 587. (Identical with Geos. 587) May be convened with 587.


546. Applied Multispectral Imagery (3) II Application of image processing to mineral exploration, engineering geology, groundwater...
587. Design of Exploration Programs (3) II 1989-90 For a description of course topics, see 487. Graduate-level requirements include a research report. P. 443. (Identical with Geo. 587) May be convened with 587. Geotechnical Engineering (3) I 1989-90 For a description of course topics, see 487. Graduate-level requirements include an in-depth analysis of a problem. P. 443. (Identical with Geo. 587) May be convened with 587.

590. Economics of the Metal Industries (3) I Reserves, resources, and major deposits, production technologies, market structure, industrial organization, market structure, economics of production, pricing, and marketing practices for nonmetallic mineral development. P. A.Ec. 504.

591. Economics of Petroleum and Natural Gas (3) Reserves and resources of petroleum and natural gas; production technology, market structure, industrial organization, pricing, competitive behavior, consumption trends, and policy issues. P. A.Ec. 504.


593. Advanced Principles of Mineral Economics (3-II) Selected readings in the economics of mineral resources and production, exploration and exploitation, environmental protection, national mineral policy, world mineral development, and international trade. P. Econ. 361.


596. Seminar II Research (1-3) [Rpt.] I II (Identical with M. 696a and M. 696b)

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 exploration and mining ventures.

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-I) I 1989-90 For a description of course topics, see 500. Graduate-level requirements include a research project. May be convened with 500. Farmer.

550. Economics of the Nonmetals (3) Al 1989-90 For a description of course topics, see 500. Graduate-level requirements include a research project. May be convened with 500. Farmer.

560. Economics of Petroleum and Natural Gas (3) Reserves and resources of petroleum and natural gas; production technology, market structure, industrial organization, pricing, competitive behavior, consumption trends, and policy issues. P. A.Ec. 504.


Majors are strongly advised to include Chem. 480a-480b in their program.

The minor: The department has a structured plan for graduates to design an Honors program. The department participates in the Honors Program.

181. Life: The Science of Biology I (4) I Introduction to the cell and its properties, basic genetics of the eukaryotic system, recombinant DNA technology with illustrations from plants, animals and humans. (Identical with Bic. 181, Ecol. 181, Micr. 181)

182. Life: The Science of Biology II (4) II (Identical with Ecol. 182)

320. Genetics (4) I (Identical with Ecol. 320)

404. Contemporary Biology in Human Affairs (3) Advances in medical research will be reviewed and their ethical, social and legal implications discussed. P. one course in bioc. or biology; botany not acceptable.

410A-410B. Cell Biology (3, 3) Regulation at the cellular and molecular levels; gene expression, nature, function, and integration of organelles and ultrastructural components. P. Chem. 241b or 480a. (Identical with Micr. 410a-410b)


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, Micr. 328, Ecol. 320 or 321. (Identical with Ecol. Gene. and Micr. 428R) May be convened with 528R.

443. Insect Neurobiology (3) II (Identical with Ento. 443) May be convened with 543.


460. Plant Physiology (4) I Introduction to water relations, photosynthesis, respiration, growth and development of higher plants. 3R, 3L. P. Chem. 241a, 243a. (Identical with Ecol. 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.

462. Neurobiology Laboratory (1) I Techniques in neurobiology. CR 461.

463a-463b. Human Physiology Laboratory (1-1) (Identical with Ecol. 463a-463b)

464a-464b. Human Physiology (3-3) (Identical with Ecol. 464a-464b)

465. Neuroethology (2) II Selected topics in current neuroethological research on vertebrate and invertebrate nervous systems. P. 463, or consult department before enrolling. P. CR 465. May be convened with 565.

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.

473. Recombinant DNA Techniques (3) II Relevant techniques for the isolation, purification and cloning of DNA from eukaryotic sources by recombinant methods. P. CR 469.

477. Modern lab. techniques for genetic and molecular analysis, and sequence analysis. 1R, 6L. Con-
The School of Music, a division of the Faculty of Fine Arts, offers courses work leading to the following degrees: Bachelor of Music with majors in jazz studies, music education, performance, and theory and composition; Bachelor of Arts in Music; Master of Music; Doctor of Musical Arts; and Doctor of Philosophy. The School of Music is granted only to students who have been enrolled in 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 majors) should audition for placement in class or group piano instruction. These courses should be taken concurrently with 120a-120b and 220a-220b. Students desiring the B.A. in Music or the B.M. with a major other than performance must meet the requirements for registration in 181 in their major performance area. B.M. students majoring in performance must meet the requirements for registration in 185 in their major performance area. Admission to the 185 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 experience resulting in sufficient advancement that the student shows promise of being 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 (200, 400, 500 unless excused by the Director of the School of Music. (Accompanying or coached ensembles may fulfill this requirement for keyboard majors of the degree requirements.)

Special Regulations: Credit for private or group instruction 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 to attain credit for major classes and recitals as arranged by the instructor. Students may, at the discretion of their major advisor 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 be billed 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. Students scheduling on a legal holiday will not be rescheduled.

Programs: The curricula for the B.M. include a common core of studies which is intended to coordinate all aspects of musical training in a program of comprehensive musicianship.

The teaching minor for secondary education: 25 units, including 110a-110b, 120a-120b, 130a-130b, 130b-140b, 338m, 347, 371 or 372, 2 units of conducted ensemble, 4 units of 181 or above.

Bachelor of Music

Common First Year Curriculum: All B.M. majors will complete the following core of courses during the freshman year (minimum entrance level: 185. Graduation requirement: 7 units of 485): *ensemble: one semester of conducted, four semesters of accompanying, two semesters of coached, one semester of 110a-110b, 120a-120b, 130a-130b, 130b-140b, 420a-420b, 421, 433a-433b, and a semester of four credits. Additional general academic electives. Minimum total units: 130.

The Major in Performance includes the following five areas of specialization:

Keyboard Instrument-major instrument, 31 units (minimum entrance level: 185. Graduation requirement: 7 units of 485); *ensemble: one semester of conducted, four semesters of accompanying, two semesters of coached, one semester of 110a-110b, 120a-120b, 130a-130b, 130b-140b, 420a-420b, 421, 433a-433b, and a semester of four credits. Additional general academic electives. Minimum total units: 130.

Guitar-major instrument, 31 units (minimum entrance level: 185. Graduation requirement: 7 units of 485); *ensemble: eight semesters of conducted, six semesters of coached, Mus. 410a-410b, 432a-432b, 434, 5 units of music electives; a senior recital; additional general academic electives. Minimum total units: 130.

Voice-major instrument, 31 units (minimum entrance level: 185. Graduation requirement: 7 units of 485); *ensemble: eight semesters of conducted, four semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; academic elective. Minimum total units: 128.

Voice—voice, 31 units (minimum entrance level: 185. Graduation requirement: 7 units of 485); *ensemble: eight semesters of conducted, four semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; academic elective. Minimum total units: 128.

Additional general academic electives. Minimum total units: 130.

Additional general academic electives. Minimum total units: 130.

Bachelor of Arts in Music

This degree program is designed for students who have completed the General Education Program and for those whose interest in music is essentially vocational.

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: 181 Graduation requirement: 6 units of 185; *ensemble: six semesters of conducted, two semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; additional general academic electives. Minimum total units: 130.

Bachelor of Music Education

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: 181 Graduation requirement: 6 units of 185; *ensemble: seven semesters of conducted, two semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; academic elective. Minimum total units: 130.

Bachelor of Arts in Music Education

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: 181 Graduation requirement: 6 units of 185; *ensemble: six semesters of conducted, two semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; academic elective. Minimum total units: 130.

Bachelor of Music in Education

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: 181 Graduation requirement: 6 units of 185; *ensemble: six semesters of conducted, two semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; academic elective. Minimum total units: 130.

Bachelor of Arts in Music Education

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: 181 Graduation requirement: 6 units of 185; *ensemble: six semesters of conducted, two semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; academic elective. Minimum total units: 130.

Bachelor of Music in Education

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: 181 Graduation requirement: 6 units of 185; *ensemble: six semesters of conducted, two semesters of coached, Mus. 410a-410b, 420a-420b, 432a-432b, 434, 5 units of music electives; academic elective. Minimum total units: 130.
100. Basic Musicianship (3) I II CDT Introduc- tion to the rudiments of musical notation, harmony, rhythm, and melody.


102a-102b. Piano for General College Students (1) 102a: Introduction to basic guitar playing techniques for the general college student, with emphasis on literature and study of playing of current interest to students. 102b: Development of guitar skills including sight-reading, accompanying, tone production and other classical techniques. 102a and 102b are taken both.

103. Class Voice for General College Students (1) [Rpt.] Practical training in singing, with emphasis on basic skills of breathing, tone and diction; repertory to include folk, current, and classical music with foreign language emphasis.

107. Survey of Music I (3) I I Introductory course which concentrates on developing perceptual skills through a study of many types of music. Emphasis is on Western art music of the 18th, 19th and 20th centuries, as well as popular and ethnic music.

108. Survey of Music II (3) I I Continuation of 107, with emphasis on Western art music, particularly that of the Medieval through the Baroque era, and the music of other cultures. 108 is not prerequisite to 109.

110a-110b. Piano Class I (1-1) CDT Introduction to basic keyboard music- ship and technique through activities involving playing by ear, improvising, harmonizing, transposing, and performance by ear, majors and minors only. P, CR, 120a-120b.

111. Voice Class (1) [Rpt.] Beginning instruction: introduction and development of basic skills, breathing, diction, tone, rhythm, sight- singing, repertory songs in English; practical training in singing without specialization. Open to music majors and minors only.

120a-120b. Skills and Structure I (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.

130a-130b. Introduction to Music Literature (2-2) CDT Survey of music literature, with emphasis placed on materials and procedures for teaching these instruments in the public schools. Open to music majors and minors only. P, CR, 120a-120b.

153. Percussion Instruments Class (1) CDT Class instruction in all percussion instruments, including materials and procedures for teaching these instruments in the schools.

175. Theatre Dance (1) I I S (Identical with Dnc. 175 which is home)

207. Western Civilization and the Arts: The Twentieth Century (3) I I (Identical with F.A. 207, which is home.)

209. Percussion for Dance Students (2) I 1990-91 Rhythmic principles of dance majors through study and performance of percussion instruments. Open to dance majors only. (Identical with Dnc. 209)

210b-210b. Piano Class II (1-1) CDT Continuation of 110b, with additional sight-reading, score-reading, and accompanying. Open to majors and minors only. P, 120a-120b.

211a-211b. Diction for Singers (2-2) I (2) Training in diction for singers in English, French, German, Italian, Spanish and Ecclesiastical Latin.

220a-220b. Music Fundamentals Through Experience (3-3) CDT Continuation of 120a-120b, dealing with music from the late medieval period through early 20th-century art music in chronological order. P, 3L. 120b.

250. Introduction to Music Education (3) Observation and practical field experience in public schools; video-taped class presentations. Field trips. Open to majors only.

302. Recording Studio Production (3) I II Recording studio procedures including recording, editing, and reproduction. P, with permission of the School of Music. (Identical with MAr. 302)

307. Western Civilization and the Arts: Palatine, Hohenzollern, Renaissance (3) I I (Identical with F.A. 307, which is home)

310a-310b. Functional Piano for Music Education Majors (1-1) 310a: Development of functioning chain and post-post of actual 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.

317. Western Civilization and the Arts: Baroque through Nineteenth Century (3) I I CDT Detailed study of the history of music in Western civilization from its origins to modern times; its relationship to general cultural development. P, 220b. 317 is a writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

321a-321b. Jazz Improvisation (2-2) CDT Overview of the art of improvising jazz. Audition required. P, 201e. 321b: Continuation and refinement of the techniques studied in 321a.

330a-330b. History of Western Music (3-3) CDT Detailed study of the history of music in Western civilization from its origins to modern times; its relationship to general cultural development. CDT. P, 320a or 320b. P, 330b. 330b is a writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

331. Jazz History (3) I CDT Development of jazz in the United States.

338m. The Teaching of Secondary School Music (3) II Carries credit in ed. only. (Identical with 338m)

350a-350b. Woodwind Techniques and Materials (1-1) I Class instruction of flute, clarinet, oboe, bassoon, and materials and procedures for teaching these instruments in the public schools. Open to majors only.

358a-358b. String Bass Techniques and Materials (1-1) II Class instruction on trumpet, trombone, horn and other low brass, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

359. String Instrument Techniques and Materials (1-3) I Class instruction on violin, viola, cello and bass, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

360. Music Fundamentals Through Experience (3-3) I I CDT Basic skills and imagination learned through playing, singing, improvising, and composition. P, 201b or 201c.

361. Music Learning and Perception in the Preprimary Child (2) I A study of processes by which children achieve musical growth. Examination of means, settings and materials through which children acquire music in the preprimary child. P, CR.

370. Introduction to Conducting (2) I Conducting choral as well as instrumental ensembles; includes basic beat patterns, time signature, clefs, and introduction to score study. P, 220b.

371. Intermediate Instrumental Conducting (2) I Conducting techniques for instrumental ensembles of varying sizes; instrumental rehearsal techniques, score reading, and score study. P, 370.

396H. Honors Seminar (3) I II 410a-410b. Pedagogy (2-2) Study of methods and repertory suitable for studio teaching. Open to music majors in the major performance area only. May be convened with 510a-510b.

420a-420b. Counterpoint (3-3) Practical study of counterpoint through Fux (420a) and 19th (in 420b) centuries. P, 220b. May be convened with 520a-520b.

421. Orchestra (3) I CDT Instruments of the orchestra together with practical study of the art of symphonic scoring, original work and transcriptions. P, 220b.

422. Jazz Arranging (2) I I Class instruction and practice in writing arrangements for small jazz combos, rock groups, stage bands, and pop-vocal combinations; detailed study of jazz instrumental practices and problems. Open to majors only or as consultant department prior to enrollment in the major performance area. May be convened with 524.

424. History and Literature of Guitar (3) I 1989-90 In-depth study of the evolution of the guitar, lute, and vihuela, including repertoire, stylistic idioms, and canons. Open to majors only. May be convened with 524.

425. Undergraduate Recitals (1) I I S Public performance. P, CR 485. For theory and composition only. CDT.

426a-426b. Piano Literature (3-3) CDT Historical and stylistic study of keyboard literature, instruments and performance practices. CDT. 426a: Baroque through the early Romantic periods. P, 285-P. 426a is not prerequisite to 426b. May be convened with 526a-526b.

431a-431b. History of the Opera (3-3) I I 1989-90 Detailed study of the course of opera from its inception by the Florentine Camerata through Berg, Menotti, Stravinsky, Ginastera, Penderecki, Britten and others. Open to majors only.

434. Music in World Cultures (3) I I CDT Overview of nonwestern musics in selected world cultures. CDT.

441a-441b. Introduction to Electronic Music (3-3) [Rpt./1] Survey of the historical, theoretical and technical aspects of electronic music as applied to the composition of music in the contemporary idiom, including actual lab. applications.

450. Teaching Music in the Elementary School (3) I I CDT Role of the music specialist in the elementary school; materials, activities, and observation of demonstration teaching as they relate to a comprehensive music curriculum and qualitative musical experiences for children in grades K-6.

451. Production and Techniques for Special Ensembles and Musicals (3) I CDT Objective structures, materials and activities. CDT.

455. Music and German Literature (3) I I 1990-91 (Identical with Ger. 455) May be convened with 555.

510a-510b. Pedagogy (2-2) For a description of course topics, materials and activities. CDT.

518. Band Arranging (2) I I 1989-90 CDT Detailed study of basic instrumentation; major works of music for concert band. P, CR.

520a-520b. Counterpoint (3-3) For a description of course topics, see 420a-420b. Graduate-level requirements include an addi-
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 analytical procedures will be investigated. Open to majors only.

522a-522b. Art Song Repertory (2-2) 1990-91 Class performance of representative selections from the styles of all periods, with problems of interpretation, style, and ensemble. Registration restricted to majors only. Open to majors only.

524. History and Literature of Guitar (3) II 1989-90 For a description of course topics, see 424. Graduate-level requirements include a major research project.

525. History and Literature of the Wind Band (3) A research-oriented study of wind band history and literature from the Renaissance to the present. Open to majors only.

526a-526b. Piano Literature (3-3) For a description of course topics, see 426a-426b. Graduate-level requirements include a major research project or a special class presentation. P. 265. (P. 265a-265b is equivalent to 526b.) May be convened with 426a-426b.

530. Music in the Renaissance (3) II 1989-90 Vocal and instrumental genres from Dufay through Palestrina. Open to majors only.

531. Music in the Baroque (3) I 1989-90 CDT 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 1990-91 CDT The Viennese classical tradition from its origins to Beethoven. Open to majors only.

533. Music of the Twentieth Century (3) II 1990-91 CDT 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 CDT For a description of course topics, see 434. Graduate-level requirements include a major research project in ethnomusicology.

535. Music in the Middle Ages (3) II 1990-91 Sacred and secular monody and polyphony from Gregorian chant through Dunstable. P. 300a-330b.


537. Survey of Early Music (3) I S Intensive survey of music history from Gregorian chant to the late Baroque. Open to majors only.

550. Advanced Studies in General Music Teaching (3) I S Development of musical concepts through creative experiences; survey of research into music learning in children; alternative systems. Dalcroze, Orff, Kodaly, MCCP. P. 361 or 451.

551. Behavioral Research in Music (3) I S 1990-91 Research methodologies as they apply to musical behavior; emphasis on applying the results of existing studies to practice and on conducting original research.

555. Music and German Literature (3) I 1990-91 (identical with Ger. 555) May be convened with 455.

560. Aesthetics of Music (3) I Exploration of the problems of musical meanings, including a panaromic examination of what philosophers, anthropologists, and others of critical intelligence have contributed to comprehensive theory.

570. Advanced Conducting (3) [Rpt.] I 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) II Bibliographical materials; research techniques, and problems directed toward postgraduate study in music. Required of all doctoral candidates in music. (Identical with LS 600)

620a-620b. History of Speculative Theory (3-3) 1989-90 Survey of speculative theory in music, classical Greeks to present.

621a-621b. Analysis of the 18th and 19th Centuries (3-3) I Intensive analysis of works written 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 1990-91 Study of the philosophies, procedures, techniques, and materials used in teaching theory at the college level.


630. The Music of Bach (3) II 1990-91

631. The Music of Mozart (3) II 1989-90

632. Music in the Classical Period (3) I 1989-90 CDT The Viennese classical tradition from its origins to Beethoven. Open to majors only.

633. Music of the Twentieth Century (3) II 1990-91 CDT Contemporary idioms in music; study of genres, styles, and techniques from post-Romanticism to the present. Open to majors only.

634. Music in World Cultures (3) II CDT For a description of course topics, see 434. Graduate-level requirements include a major research project in ethnomusicology.

635. Choral Literature and Techniques (3) [Rpt./2] 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. Graduating 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) I 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.

651. Curriculum Development in Music (3) II 1990-91 Principles and techniques of curriculum construction applied to the field of music.

652. Management Techniques in Music (3) II Contemporary practices in planning, organizing, and evaluating learning experiences in music for college and university students. Open to majors only.

696. Seminar (3) I (Rpt./4 units) I II Music Education (1-4) I II Musicology (1-4) I II Music Theory (1-4) I II 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.
Music Fees

All students registering for private or group instruction are charged special fees according to the following schedule. Regular and scholarship students will be assigned to private or group instruction each semester only after a Music Committee has been convened. Rental instruments, practice rooms and lockers are issued upon presentation of this statement.

Group lesson or one-half hour private lesson: $41.

One-hour private lesson: $60.

A music major registering for more than one weekly lesson will pay a maximum fee of $60.

Rentals

Instruments are rented as available for use in regularly scheduled music activities according to the following fee 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 who have successfully completed a graduate 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.

Harp: $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 unused rental charges of $5 or less.

Natural Resource Recreation

(See Renewable Natural Resources)

Neuroscience (NRSC)

Gould-Simpson Building, Room 611
(602) 621-6628

Committee on Neuroscience (Graduate)

Professors John G. Hildebrand, Chairperson (Arizona Research Laboratories, Division of Neurobiology), A. Terry Bahill (Systems and Industrial Engineering), Bryant Benson (Anatomy, Richard Bootzin (Psychology), Thomas F. Burke (Pharmacology), Merrill F. Garrett (Psychology), Theodore Glattke (Speech and Hearing Sciences), Raphael P. Gruner (Physiology), Mac E. Hadley (Anatomy, Molecular & Cellular Biology), Thomas J. Hixon (Speech and Hearing Sciences), Victor J. Hruby (Chemistry), Sigmund Hsiao (Psychology), Robert Lansing (Psychology), Lynn Nadel (Psychology), L. Claire Parsons (Nursing), William R. Roeske (Internal Medicine), Alan R. Rubens (Neurology), Joachim F. Schacher (Psychology), Daniel L. Schacter (Psychology), Linda Swisher (Speech and Hearing Sciences), Edward French (Pharmacology), Ziaul Hasan (Physiology), Alfred W. Kasznia (Psychology), Elizabeth L. Kreulen (Pharmacology), Hugh E. Laird (Pharmacology and Toxicology), David L. Nelson (Pharmacology and Toxicology), Daniel L. Schacher (Psychology), Linda Swisher (Speech and Hearing Sciences), and Mac E. Hadley (Anatomy, Molecular & Cellular Biology), Janis M. Burt (Physiology), William M. Feinberg (Neurology), Lauren A. Fisher (Pharmacology), Richard B. Levine (Arizona Research Laboratories, Division of Neurobiology), Frank Porreca (Pharmacology), Steven Z. Rapcsak (Neurology), Douglas R. Seals (Exercise and Sport Sciences), Paul A. St. John (Anatomy), Thomas R. Tobin (Arizona Research Laboratories, Division of Neurobiology), Leslie P. Tolbert (Arizona Research Laboratories, Division of Neurobiology). The interdepartmental Committee on Neuroscience offers a graduate program leading to the Doctor of Philosophy degree with a major in neurobiology 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 colleges 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, neuropeptides, neuropharmacology, 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 credited with 543.
453. Insect Neurobiology (3) II (Identical with Ento. 543) May be credited with 443.
582. Topics in Neural Development (2) II 1989-90 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 enrolling. (Identical with Anat. 582, M.C.B. 582 and Pso. 582)
583. Topics in Neural Plasticity (2) I 1990-91 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 enrolling. (Identical with Anat. 582, M.C.B. 582 and Pso. 582)
584. Cellular Neurobiology (2) II 1989-90 (Identical with Anat. 584)
588. Principles of Cellular and Molecular Neurobiology (4) II Detailed introduction to the organization, physiology, and function of neural systems, emphasizing sensory systems, motor control, integration, and plasticity. P. 588, consult program office before enrolling. (Identical with Anat. 589 and Pso. 589)

Conducting

585-O (1-4), 685-O, 785-O (1-4)

String Instruments

String Bass

180-N, 181-N, 182-N (1-2)
580-N (1-2), 585-N (1-4), 685-N, 785-N (1-4)

Violin

180-K, 181-K, 182-K (1-2)
580-K (1-2), 585-K (1-4), 685-K, 785-K (1-4)

Cello

180-M, 181-M, 182-M (1-2)
580-M (1-2), 585-M (1-4), 685-M, 785-M (1-4)

Harpsichord

181-H, 182-H (1-2)

Wind Instruments

Baritone

180-E, 181-E, 182-E (1-2)
185-E, 285-E, 385-E, 485-E (1-4)
580-E (1-2), 585-E (1-4), 685-E (1-4)

Bassoon

180-B, 181-B, 182-B (1-2)
185-B, 285-B, 385-B, 485-B (1-4)
580-B (1-2), 585-B (1-4), 685-B, 785-B (1-4)

Clarinet

180-C, 181-C, 182-C (1-2)
185-C, 285-C, 385-C, 485-C (1-4)
580-C (1-2), 585-C (1-4), 685-C, 785-C (1-4)

Flute

180-F, 181-F, 182-F (1-2)
185-F, 285-F, 385-F, 485-F (1-4)
580-F (1-2), 585-F (1-4), 685-F, 785-F (1-4)

Horn

180-D, 181-D, 182-D (1-2)
185-D, 285-D, 385-D, 485-D (1-4)
580-D (1-2), 585-D (1-4), 685-D, 785-D (1-4)

Oboe

180-A, 181-A, 182-A (1-2)
580-A (1-2), 585-A (1-4), 685-A, 785-A (1-4)

Saxophone

180-S, 181-S, 182-S (1-2)
185-S, 285-S, 385-S, 485-S (1-4)
580-S (1-2), 585-S (1-4), 685-S, 785-S (1-4)

Trombone

180-R, 181-R, 182-R (1-2)
580-R (1-2), 585-R (1-4), 685-R, 785-R (1-4)

Trumpet

180-T, 181-T, 182-T (1-2)
185-T, 285-T, 385-T, 485-T (1-4)
580-T (1-2), 585-T (1-4), 685-T, 785-T (1-4)

Tuba

180-Y, 181-Y, 182-Y (1-2)
580-Y (1-2), 585-Y (1-4), 685-Y (1-4)

Percussion Instruments

Percussion

180-Z, 181-Z, 182-Z (1-2)
580-Z (1-2), 585-Z (1-4), 685-Z, 785-Z (1-4)
Nuclear and Energy Engineering (NEE)

Engineering Building, Room 200
(602) 621-2551

Professors Robert L. Seale, Head; Barry D. Ganapati, David L. Hetrick, Richard L. Morse, George W. Nelson, Roy G. Post (Emeritus), Morton E. Wacks

Associate Professors W. Morris Farr, Rocco A. Fazzolari, William Filippon

Assistant Professor Leland M. Montierth

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.

12.0. Technology and Society: An Historical Perspective
3 I Significant developments in human history emphasizing the role of technology as an agent for social change; particular attention to the effect of technological change on society.


221. Radiation Detection and Isotopes Laboratory (2) I Introduction to the principles and practices of radiation measurement, experimental techniques and data reduction methods. P, 231.

231. Basic Nuclear Processes (3) I Nuclear structure and stability, radioactive decay and interactions of radiation with matter, emphasis on probability, momentum, and energy balance, and process rate definition. P, Chem. 103b, 104b, Math. 125b.

343. Elements of Nuclear Reactor Theory (4) I Neutron diffusion and slowing down theory, applied to bare and reflected reactors; the effects of core homogeneity on neutron behavior. P, 231.

345. Introduction to Nuclear Reactor Engineering (3) I Analysis and design of nuclear power reactors, with emphasis on central station systems. P, 343.


369. Electrodeposition (3) I Status of Nuclear Energy (1) I

410. Energy System Design (3) I Modern techniques in synthesis and analysis are reviewed and applied to contemporary energy problems; economic evaluation, system modeling, optimization, and decision analysis. P, 348, A.M.E. 240 or E.C.E. 240.

415. Environmental Analysis of Energy Conversion (3) I Engineering analysis, assessment, and resolution of energy-environment interfacing, with emphasis on power plant siting, emissions, thermal effects, and waste management. May be convened with 515.

416. Radiation Health Physics and Safety (3) I Study of health physics practices and safety responsibilities as applied to radiation hazards and waste management. May be convened with 516.

417. Nuclear Energy and Power Systems (3) I Fundamentals of nuclear energy and radiation; engineering applications; the basic concepts of nuclear reactors and power systems. Designed for nonmajors. May be convened with 517.

420. Nuclear Engineering Laboratory (3) I I Experimental techniques for determining various parameters in nuclear systems; experiments involving the critical and subcritical reactors. P, 343. Writing-Emphasis Course for nuclear engineering students. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Course" in the Academic Guidelines section of this catalog). May be convened with 520.

425. Nuclear Reactor Operations (2) I Application of principles of reactor theory to the operation of a nuclear reactor. Reactor instrumentation, control systems, and operating procedures, including safety; review of federal regulations governing reactor operation and operator licensing. P, 540 or 343.


433. Radiation Effects (3) I I Radiation effects on solids and radiation chemistry of gases and liquids, with emphasis on effects encountered in nuclear reactor, detector, and dosimeter systems. P, 343. CR, M.S.E. 331R. May be convened with 533.

437. Introduction to Radioactive Waste Management (3) I I Influence of public policy and waste physical form on the design criteria for waste management systems. May be convened with 537.

441. Contemporary Nuclear Power Systems (3) I I Analysis of present nuclear power plants, with emphasis on design decisions as they affect core design, component selection, and system performance. May be convened with 541.

447. Direct Energy Conversion (3) I I Engineering requirements for achieving direct conversion of energy to electrical power; the engineering of thermoelectric and thermionic converters, fuel cells, magneto-hydrodynamic, and photoelectric systems. P, Math. 254; A.M.E. 240; or Phys. 212, 211. (Identical with A.M.E. 447 and E.C.E. 447) May be convened with 547.

450. Introductory Nuclear Physics (3) I I Designed for nonmajors. May be convened with 550.

451. Air Conditioning Engineering (3) I I Designed for nonmajors. May be convened with 551.


456. Engineering System Simulation (3) I I Dynamic modeling and simulation of engineering systems, including energy conversion systems, nuclear and chemical reactors, and control systems, using digital continuous time simulation languages. P, A.M.E. 240 or Ch. E. 306a; Math. 254. May be convened with 556.

459. HVAC System Design (3) I I Analysis and design of air conditioning systems for commercial and industrial buildings, including equipment and component selection. Energy efficiency and energy consumption analysis will be emphasized. P, 453. (Identical with A.M.E. 459) May be convened with 559.

465. Current Problems in Energy and Power (1-4) [Rpt./6 units] I A multidisciplinary course directed by guest lecturers who are practicing professionals. May be convened with 465.

466. Power Plant Electrical Design (3) I I Designed for nonmajors. May be convened with 566.

467. Solar Energy Engineering (3) I I Designed for nonmajors. May be convened with 567.

468. Photovoltaic Systems Engineering (3) I I Designed for nonmajors. May be convened with 568.

469. Energy Laboratory (3) I I Designed for nonmajors. May be convened with 569.

470. Energy Analysis (3) I I Designed for nonmajors. May be convened with 570.

475. Environmental Analysis of Energy Conversion (3) I I Designed for nonmajors. May be convened with 575.


478. Energy Systems Design (3) I I Designed for nonmajors. May be convened with 578.

515. Environmental Analysis of Energy Conversion (3) I I Designed for nonmajors. May be convened with 515.

516. Environmental Analysis of Energy Conversion (3) I I Designed for nonmajors. May be convened with 516.

517. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 517.

520. Nuclear Energy Engineering Laboratory (3) I I Designed for nonmajors. May be convened with 520.

522. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 522.

523. Nuclear Fuel Cycles (3) I I Designed for nonmajors. May be convened with 523.

525. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 525.

526. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 526.

527. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 527.

528. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 528.

529. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 529.

530. Nuclear Engineering Laboratory (3) I I Designed for nonmajors. May be convened with 530.

531. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 531.

532. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 532.

533. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 533.

534. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 534.

535. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 535.

536. Nuclear Energy and Power (3) I I Designed for nonmajors. May be convened with 536.

537. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 537.

538. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 538.

539. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 539.

540. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 540.

541. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 541.

542. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 542.

543. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 543.

544. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 544.

545. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 545.

546. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 546.

547. Nuclear Energy Engineering (3) I I Designed for nonmajors. May be convened with 547.
Graduate-level requirements include an in-depth research paper. P, Math. 254; A.M.E. 240; or Phys. 121. (Identical with A.M.E. 547 and E.C.E. 547) May be convened with 447.

550. Introduction to Nuclear Physics (3) II (Identical with Phys. 550) May be convened with 450.

554. Dynamics of Nuclear Systems (3) I For a description of energy topics, see 454. Graduate-level requirements include an in-depth research paper. P, 343 or 540. May be convened with 454.

555. Engineering System Simulation (3) II For a description of course topics, see 456. Graduate-level requirements include an in-depth research paper. May be convened with 456.

559. HVAC System Design (3) II For a description of course topics, see 468. Graduate-level requirements include an in-depth research paper. (Identical with A.M.E. 559) May be convened with 459.

563. Energy from Biomass (3) II (Identical with A.En. 563)

565. Solar Energy Engineering (3) I For a description of course topics, see 467. Graduate-level requirements include an in-depth research paper. (Identical with E.C.E. 565) May be convened with 468.

566. Photovoltaic Systems Engineering (3) I For a description of course topics, see 468. Graduate-level requirements include an in-depth design and/or systems analysis project. (Identical with E.C.E. 566) May be convened with 468.

569. Industrial Energy Utilization and Management (3) I II Analysis of effective energy utilization in industrial operations; availability analysis, combustion, heat recovery, process energy, building systems, cogeneration, electrical loads, lighting and machinery. (Identical with E.C.E. 569) May be convened with 469.

570. Energy Engineering Management (3) I II For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper. May be convened with 470.


583a-583b. Plasma Physics and Thermodynamics (3-3) 583a. II Fundamentals of the theory of fully ionized plasmas, including wave phenomena and stability of plasma fluids; introduction to plasma kinetic theory. 583b. I I II Advanced study in the physics of ionized plasmas; relaxation times and transport coefficients from Fokker-Planck theory; advanced subjects. P, 483b. (Identical with Phys. 583a-583b)

596. Seminar (1) I II Advanced Nuclear Power Activities (1) I I Designed to develop skill in the analysis of safety problems; nuclear power plant design; system operation; the reactor core; accident analysis; critical reactor theory. P, 537.

599. Seminar (3) I I Advanced experimental studies using the nuclear reactor and radiation detection systems. 2R, 3L. P, 420, 540.

630. Fuel Cycles for Nuclear Reactors (3) II I For a description of energy topics, see 430. The processes and requirements for fuel element design and the limitations of fuel element performance to reactor design; economic factors in fuel cycles. P, 540.

637. Technology of Radioactive Waste Storage and Disposal (3) I II Detailed technology of radioactive waste streams; their processing and treatment; the treatment and disposal methods and storage and disposal alternatives for high-level and low-level waste. P, 537.

642. Reactor Theory II (3) I I Fundamental theory of reactors, including subcritical, critical, and supercritical states; blackness theory, perturbation theory, and applications; temperature coefficient, changes in reactivity due to fission product accumulation, fuel consumption, and corrosion. P, 540.


667. Advanced Solar Engineering (3) I II Research and development studies related to theory and systems design; solar cells, photovoltaics, solar for electric power, solar for heat, and solar for process heat; analysis, design, and economics. Course includes invited lectures, literature research, and an original invited paper. P, 567. (Identical with Ch.E. 667 and E.C.E. 667)


685. Inertial Confinement Controlled Fusion (3) I I Advanced topics in inertial confinement fusion, including implosion theory and transport phenomena, stability of spherical implosions, lasers and charged particle trajectories, and reactor designs. P, 483b, Phys. 470b. (Identical with E.C.E. 685)

687. Magnetic Confinement Controlled Fusion (3) II II Theory and design of magnetic fusion systems; instabilities, transport and reactor design considerations associated with linear and magnetic fusion systems; Tokamaks and mirror machines. P, 483b; Phys. 470b. (Identical with E.C.E. 685)

Nursing (NURS)

Nursing Building, Room 103 (602) 626-6161

Professors L. Claire Parsons, Dean, Agnes M. Aamodt (Emerita), Jan R. Atwood, Eleanor E. Bawens, Pearl P. Coulter (Emerita), Ada Sue Fettke, Rose Gerber, Margaretta A. Kay, Beverly A. McCord, Merle Mishel, Arlene M. Putt (Emerita), Gladys E. Sorenson (Emerita)

Associate Professors Evelyn M. DeWalt, Sandra Fettke, Rose Gerber, Margaretta A. Kay, Beverly A. McCord, Merle Mishel, Arlene M. Putt (Emerita), Betty J. McCracken, Lillian Lynch (Emerita), Caryn D. Mauro, Margaret jar, Mary J. Welty (Emerita), Mary O. Wolanin (Emerita)

Instructors Donna Zazworsky (Adjunct), Kaye Ronsman, Dana Smyth, E. Jean Snider, Instructors Donna Zazworsky

The degrees offered are the Bachelor of Science in Nursing, Master of Science in Nursing Specialist, and Doctor of Philosophy with a specialization in Nursing. For undergraduate admission and degree requirements, please see the College of Nursing section of this catalog. For graduate admission and degree requirements, please see the Graduate Catalog.

Starting with the nursing major courses in the sophomore year, all nursing students are required to provide their own cars for transportation to clinical agencies where they are assigned for patient-care experience. Students wear an official College of Nursing uniform for clinical courses. During these semesters the student must be enrolled for all required courses.

The College participates in the Honors Program.

251. Perspectives of Nursing and Health Care (3) I II Orientation to nursing as a profession including an overview of the health care delivery system within the context of societal responsibility. Open only to majors. Open to nonmajors; consult with department before enrolling.

253. Nursing Process and Health Assessment (3) I II Development of analytical skills to use in the assessment of health. Open only to majors. Open to nonmajors; consult with department before enrolling.

280. Professional Nursing Role (3) I I Socialization into professional nursing practice; life span development and family care; health assessment of clients across life span. Open to registered nurse students only. P, admission to the College of Nursing.

340. Nursing Skills in Assessment (3) I I Designed to develop skill in interviewing and physical assessment for development of patient care plans. Basic preparation in health assessment. Open to majors only. Open to nonmajors; not open to majors.

341. Women and Health (3) I I Exploration of body processes and body experiences of women throughout the life cycle, through examination of research, traditional and feminist writings; health care consumerism. Not open to majors. (Identical with W.S. 341)

342. Emergency Care of the School Age Child (2) S SPR Emergency care for school age children and explanation of the nurse's role. P, R.N. (Offered alternate summers.)

350. Pathophysiology (3) I I Provides a conceptual integrative approach to selected pathophysiological phenomena and human responses to illness. Nonmajors who wish to enroll should consult the department. P, Chem. 101a-101b, 102a-102b, 103a-103b, 159a-159b, 160a-160b, and 161.

355. Nursing Skills for Care Provider (6) I II Provide student with basic nursing skills for the care provider. Includes selected psychosocial and psychomotor skills used to assist individuals in meeting their health care needs. 2R, 12L. P, 263, 279, CR, 350, 375.

359. Introduction to the Nursing Profession and Research (3) Orientation to and socialization into professional nursing, including utilization of intellectual skills to define and
to evaluate existing research. Open to majors only.


382. Psychiatric Mental Health Nursing (6) I Concepts, principles and techniques of nurse-client relations with individuals and groups in psychiatric-mental health settings. Open to majors only. P, 353, 363, 375 or CR.


389. Research Methods in Nursing (3) I Implementation of the research process, evidenced through design of a research proposal. Open to majors only.

389H. Honors Seminar (3) I


482. Legal Implications in Nursing (3) I Overview of the nurse's relationship with law, as a practicing nurse, and as an individual; exploration of roles from student to expanded practice, including rights, responsibilities, and legislative process. Advanced degree credit available for non-Ph.D. majors only. Writing-Emphasis Course.

483. Perspectives of Cancer Care for Health Professionals (3) S Current methods of care for individuals with cancer and for their families. Open to majors only. P, 475. CR, 486, 487.

484. The Health Professions and the Social Sciences (3) I Concepts, principles, and theories from anthropology, psychology, and sociology for health care. Advanced degree credit available for non-Ph.D. majors only. Writing-Emphasis Course.

485. Nurse in Clinical Selective (2) I Directed nursing practice in an area of clinical interest. Open to majors only. 6L, P, 472, 475. CR, 472, 485, 488.


487. Poverty and Health (3) I Concepts, principles and techniques applied to the health care of the poor and the impact these needs have on the family. Open to majors only. P, 353, 363, Pcol. 472. CR, 375, 379.


495. Colloquium a. Bilingual Health Communication (3) I (Identical with Anth. 495a, which is home.) May be convened with S595.

496. Principles of Physiology in Health Care (4) S Selected physiologic functions and adaptive changes which occur in health and illness. Cellularphysiology, the immune system, neurophysiology, cardiovascular physiology, renal, and endocrine physiology. P, undergraduate physiology.

567. Poverty and Health (3) I For a description of core topics, see 487. Graduate-level requirements include an in-depth research paper on an aspect of poverty. Advanced degree credit available for non-Ph.D. majors only. P, 353, 363, Pcol. 587. CR, 587.

589. Health of the Older Adult (3) I Current research in the aging process including physical and mental alterations; emphasis on physiological changes related to the actual practice of patient care, with emphasis on culture content of groups living in the greater Southwest. P, nine units of behavioral science. (Identical with Anth. 587 and F.C.M. 587) May be convened with 487.

590. Cultural Anthropology (3) I Application of anthropological theory to the clinical practice of patient care, with emphasis on culture content of groups living in the greater Southwest. P, nine units of behavioral science. (Identical with Anth. 587 and F.C.M. 587) May be convened with 487.

595. Colloquium a. Bilingual Health Communication (3) I (Identical with Anth. 495a which is home.) May be convened with 495a.

600A-600B. Nursing Theory and Practice (3-3) I II Maintenance, therapeutic and preventive methods of caring for patients with selected health problems. Open to majors only.

603. Cross-Cultural Nursing (5) a. Bilingual Health Communication (3) I (Identical with Anth. 495a, which is home.) May be convened with 495a.

604. Developmental Concepts in Nursing (3) I II Examination of concepts of development related to the lifespan and their relationship to nursing phenomena. Open to majors only.

605. Issues in Family Relations (3) I II Examination of issues in providing care to families using theory and research from nursing and related fields. Open to majors only.

606. Social, Psychological Problems in Nursing (3) I Focus on concepts of stress and psychiatric-mental health problems and outcomes. Nursing research on addictions, depression, abuse and violence will be explored. Open to majors only.

621. Educational Process (3) I Theoretical and practical application of teaching-learning process in classroom and clinical settings. Open to majors only.

622. Nurse Educator Role (3) I II Theoretical and practical application of principles 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.
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, 630.


705. Testing Nursing Theory (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. 

706. Middle Range Theory (3) | S Introduction to ways of knowing, focus on middle range theories in nursing and related sciences. Emphasis on critique, elaboration and theory testing in practice. 2R, 3L. P, 705.


724a-724b-724c. Professional Role Development (1-1-1) | W Assist student socialization into the role of nurse scientist. Ethics of research, development of research proposals, and scholarly work through publication and presentation, balancing roles of scholar, educator and clinician. Open to majors only. P, admission to Ph.D. program.

771. Qualitative Methods in Clinical Nursing Research (3) | S Application of selected qualitative research methods from the social sciences to clinical nursing. P, 630.

775. Study of Social Influences (3) | S In-depth examination of social forces affecting the health care system.

779. Quantitative Nursing Research (3) | S Provides knowledge necessary to deal with clinical nursing research numerical data sets. Emphasis on confirmatory and exploratory data, analysis issues. Residual analysis is stressed. 2R, 3L. Open to majors only. P, 705.

811a-811b. Instrument Construction (3-3) | S Deductive and inductive processes for constructing/testing instruments to measure nursing care interventions/patient outcomes. 811a: Instrumentation for behavior and objective phenomena. 811b: Instrumentation for subjective phenomena. Includes instrumentation strategies and developing/evaluating measures. 2R, 3L. Open to majors and minors only. P, 705, 710, graduate level statistics. 811a is not prerequisite to 781b. (781a and 781b offered alternately summers.)
tional principles in the selection of normal and therapeutic diets; designed for students in the health sciences, dietetics, and other related fields. P. 595a.

340. Introduction to Diet Therapy (3) I Food composition, principles of interviewing and counseling, cultural aspects of diets, energy requirements, grading of proteins, and principles of diet therapy. P. 201; Chem. 103b, 104b; Ecol. 159b.

358. Institution Food Management (3) II Quantity food preparation and service, factors affecting food service, menu planning, standards, institutional accounting, inventory; menu planning for institutions, management of time and labor and use of labor equipment, equipment selection and maintenance. 2R, 2L, 3L.


364H. Honors Seminar (3) I Sunce


411. Consumer Fraud in Nutrition (3S) Consumer issues, methods and its effects on nutritional status, general health, and family economic means. Methods of combating nutrition misinformation. P. 101 or 201, Econ. 201a or 201b. (Identical with Micr. 101a or 101b.)

441. Therapeutic Nutrition (4) II Therapeutic principles of nutrition acquisition and utilization, including modification of the diet, for selected disease and/or deficiency states; factors of importance in client/patient care, rehabilitation and education. P. 408. May be convened with 541.

443. Community Nutrition (2) II Nutritional status assessment in the community setting; review of ongoing community programs in government and private agencies; analysis of requirements and role of community nutritionist; nutrition projects and grant writing. Field trips. Sheehan

447. Perspectives in Geriatrics Laboratory (1) I (Identical with Ph.Pr. 447) May be convened with 547.

450. Food Service Organization and Management (3) I Organization and management of food service systems; responsibilities of management for leadership, sanitation, maintenance, and care of food service plant and its equipment. P. 330. Writing-Emphasis Course* for food service management major.

459. Sensory Evaluation of Food (3) I 1989-90 Fundamentals of taste, odor, color, and tactile sensation relative to food; design and methodology of small-panel and consumer-panel testing. 2R, 3L. May be convened with 559a.

460. General Biochemistry (5) I (Identical with Bic. 460)

463. Food Analysis (3) III 1990-91 Laboratory procedures for chemical and physicochemical analysis of food products. TR BL, P. 360 (Identical with An.S. 463) May be convened with 563.


468a-468b. Food Processing (3-3) I 1989-90 Refrigeration, freezing, dehydration, heating, fermentation and pickling, irradiation and addition of chemicals, as they apply to food preservation and food technology. P. 360; Chem. 241b, 462a. Writing Emphasis Course* for food technology specialization within the food science major. May be convened with 568a-568b.

470. Food Microbiology and Sanitation (3) III 1990-91 Microbiology in processing and handling of foods; relation of microorganisms, insects, and rodents to design and function of processing and handling equipment. P. Micr. 120 or 217. (Identical with Micr. 470) May be convened with 471.

471. Food Microbiology and Sanitation Laboratory (2) II 1990-91 Laboratory procedures for assessment of sanitary quality of foods. P. 470 or CR. (Identical with Micr. 471) May be convened with 571.

520. Advanced Nutritional Science (3) I Advanced study of the biochemistry and physiology of nutrients with emphasis on present knowledge and current research topics in nutritional sciences. P. Bic. 460 or 462a.

530. Problems in the Biochemistry of Aging (2) I 1989-90 Current topics in the biochemistry of mammalian aging; examination of the metabolic, hormonal, immunologic and neural aspects of aging. P. 408. writing-Emphasis Course* (in the academic guidelines section of this catalog).

540. Advanced Dietetics (3) I Nutrition and methodology in patient care as applied by the advanced-level practitioner. Open to majors in nutritional sciences only.

541. Therapeutic Nutrition (4) II I For a description of topics see 441. Graduate-level requirements include an in-depth research paper on a current topic. P. 408. May be convened with 547.

542. Perspectives in Geriatrics Laboratory (1) I (Identical with Ph.Pr. 542) May be convened with 447.

548. Nutrition in Sport and Exercise (3) II I (Identical with Ex.S.S. 548)

555. Nutrition Science (3) I 1989-90 Chemical composition, principles of interviewing and utilization, including modification of the diet, for selected disease and/or deficiency states; factors of importance in client/patient care, rehabilitation and education. P. 408. May be convened with 541.

559. Advanced Food Science (3) I Food safety evaluation, microbiology of pathogens and beneficial organisms, chemistry, engineering, processing, analytical chemistry, laws, regulations. P. Chem. 241b, 360a, 462a, 460a; Micr. 120 or 217, Phys. 102a or 102b; Math. 117S/R.

559. Sensory Evaluation of Food (3) II 1989-90 For a description of topics see 459. Graduate-level requirements include an in-depth research paper on a current topic. May be convened with 549.

560. Advanced Food Chemistry (3) I 1989-90 Chemical and physical properties of food constituents, additives, and food properties. P. 360, one year of biochemistry.

563. Food Analysis (3) II 1990-91 For a description of topics see 463. Graduate-level requirements include an in-depth research paper on a current topic. P. 360. (Identical with An.S. 563) May be convened with 565.

565. Food Engineering (3) II 1990-91 (Identical with A.En. 565) May be convened with 465.

568a-568b. Food Processing (3-3) I 1989-90 For a description of course topics, see 468a-468b. Graduate-level requirements include an in-depth research paper on a current topic. P. 470 or CR. P. Micr. 120 or 217. May be convened with 470.

570. Food Microbiology and Sanitation (3) II 1990-91 For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper on a current topic. P. 470 or CR. (Identical with Micr. 470)

571. Food Microbiology and Sanitation Laboratory (2) II 1990-91 For a description of course topics, see 471. Graduate-level requirements include an in-depth research paper on a current topic. P. 470 or CR. May be convened with 471.

580. Composition and Structure of Meat (2) I 1990-91 (Identical with An.S. 580)

594. Practicum

595. Colloquium

596. Seminar


602. Metabolic Integration (3) II 1990-91 Food intake, transport, protein and amino acid utilization in higher animals. P. 408.

609. Nutritional Biochemistry Techniques (3) I Biochemical methods for evaluating metabolic functions of nutrients. 1R, 6L. P. 408. Chem. 340, 911 or 323 or 326. (Identical with An.S. 609) Reid

615. Chemistry and Metabolism of Lipids (3) II 1989-90 Chemistry and structure of lipids and their metabolism; designed for students in the advanced-level practitioner. Open to majors in nutritional sciences only.

622. Mineral Metabolism (3) I 1989-90 Chemistry, metabolism and biological function of minerals; designed for students in the advanced-level practitioner. May be convened with 621.

628. Steroid and Lipoprotein Chemistry and Metabolism (3) II 1989-90 Chemistry and metabolism of mammalian steroids and lipoproteins; designed for students in the advanced-level practitioner. May be convened with 627.

630. Developmental Nutrition (3) II 1990-91 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.

640. Field Methods in Human Nutrition (3) II 1989-90 Case-oriented approach to nutritional assessment, diagnosis, prescription, plan and prognosis; application of dietary, clinical and biochemical methods to nutrition problems in nutritional sciences only.

653. Chemistry of Food Carbohydrates (2) I 1989-90 The chemical and physical properties of carbohydrates important to their presence in food. P. Bic. 460, 462a. Berry

663. Chemistry of Food Proteins (3) I 1989-90 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. Bic. 462a preferred. Bic. 460 acceptable. (Identical with Bic. 665) Goll

672. Food Safety (2) II 1989-90 Significance and control of foodborne hazards associated with pathogenic microorganisms, microbial toxins, industrial chemicals, and other environmental contaminants. P. Chem. 241b. (Identical with Micr. 672) Gerba

693. Internship

696. Seminar

a. Dietetic Internship, ADA Accredited (1-6) [Rpt./2] I II Field trips. Begins Mid-August and continues for 15 weeks. Consents dept. before enrolling. Open to majors only. P. Course work equivalent to American Dietetic Association Plan IV.

698. Seminar

b. Nutrition (1) [Rpt./6 units] I I (Identical with Nu.Sc. 698)

c. Food Science (1) [Rpt./6 units] I I
Nutritional Sciences (NUSC)  
Shantz Building, Room 309  
(602) 621-5630

Committee on Nutritional Sciences (Graduate)

Professors Donald J. McNamara (Nutrition and Food Science), Chairperson; David S. Alberts (Internal Medicine), James W. Berry (Nutrition and Food Science), James Blanchard (Pharmacology), William H. Brown (Animal Sciences), Herbert E. Carter (Emeritus, Biochemistry), Milos Chavapil (Surgery), David L. Earnest (Internal Medicine), Charles Gerba (Microbiology and Immunology), Gary G. Harrigan (Family and Community Medicine, Pediatrics, Nutrition and Food Science), J. Tal Huber (Animal Sciences), Wayburn S. Jeter (Exercise and Sports Science), Mary Ann Kight (Nutrition and Food Science), Olka Koldovsky (Pediatrics), K.Y. Lei (Nutrition and Food Science), Frank M. Whiting (Biochemistry), Ann M. Wills (Nutrition and Food Science), and Food Science), Louise  

The committee offers graduate work in the areas of nutrition, including nutritional biochemistry, human nutrition, clinical and community nutrition, and animal nutrition.

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 (Identical with N.F.S. 696b, which is home)

Occupational Safety and Health  
(See Health-Related Professions)

Operations Management  
(See Management Information Systems)

Optical Engineering  
(See Electrical and Computer Engineering)

Optical Sciences (OPTI)

Optical Sciences Center, Room 401  
(602) 621-4111

Committee on Optical Sciences (Graduate)


The committee offers graduate work in the areas of optical sciences, including optics, light, light sources, detectors, systems of light, and other properties of light, properties of materials, pattern recognition, quantum optics, 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 Circuitry 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 College of Electrical and Computer Engineering of the College of Engineering and Mines. (See the College of Engineering and Mines section of this catalog for specific admission and requirements related to this program.)


434. Electric and Optical Properties of Semiconducting Materials (3) I Identical with E.C.E. 434 may be convened with 534.

440a-440b. Atomic and Molecular Spectroscopy (3) I Electromagnetic Foundations of Optics (3) I General introduction to quantum mechanics, deterministic behavior of non-classical systems, quantum optics, measurement theory, and measurement process.

440a-440b. Atomic and Molecular Spectroscopy (3) I Electromagnetic Foundations of Optics (3) I General introduction to quantum mechanics, deterministic behavior of non-classical systems, quantum optics, measurement theory, and measurement process.

470a-470b. Optical Consulting (3) I Optical Instrumentation, Systems, and Measurements (3) I Identical with E.C.E. 470a-470b may be convened with 687.

470a-470b. Optical Consulting (3) I Optical Instrumentation, Systems, and Measurements (3) I Identical with E.C.E. 470a-470b may be convened with 687.

487. Fiber Optics (3) I Rapidly rotating fiber, characterization, fiber preform and fiber drawing, fiber diameters, fiber properties, fiber fabrication, testing.

502. Introduction to Fourier Optics (3) I Harmonic analysis, harmonic systems, harmonic response, Fourier transform, interference function, diffraction, image formation, holography, optical data processing, Math. 220.

503. First-Order Optical Design (3) I Rays and waves, Fermat's principle, Snell's law, dispersion, systems of plane mirrors, Gaussian images, paraxial imagery, paraxial design methods, Delano diagram, introduction to aberrations.

503. First-Order Optical Design (3) I Rays and waves, Fermat's principle, Snell's law, dispersion, systems of plane mirrors, Gaussian images, paraxial imagery, paraxial design methods, Delano diagram, introduction to aberrations.

505. Interference and Interferometry (3) I Wave equations, energy flow, polarization, inter-
496. Seminar
   a. Special Topics in Asian Studies (3) [Rpt.]

497. Workshop
   b. Techniques of Foreign Language Teaching
      (1) (Identical with Ger. 497b)

503b. Introduction to Comparative Literature and
      Historical Theory (3) (Identical with
      CPLT 503b)

527a. The Prehistory of East Asia (3) (Identical with Anth. 527a)
      May be convened with 426.

551. The United States and East Asia: 1840 to
     the Present (3) II 1980-91 (Identical with Hist.
     492) May be convened with 592.

492. History of Sufism (3)

464. International Relations of East Asia (3)

451. The United States and East Asia: 1840
     to 1990 (Identical with Hist. 451)
     May be convened with 551.

565. Marxism in East Asia (3) (Identical with Anth.
     565) 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. 565)
     May be convened with 463.

564. 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 463.

495. Colloquium
   i. Confucianism: The Classical Period (3)
     (Identical with Hist. 495i, which is home.)
     May be convened with 462.

   j. Confucianism: The Neo-Confucian Tradit-
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. P. 403b or 409b. May be convened with 553.

454. Spanish Inquisition (3) I 1990-91 (Identical with hist. 454). May be convened with Ling. 426. Graduate-level requirements include the submission of a research paper. May be convened with 459.

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 Rel. 455).

456. Colloquium


2. Seminar

w. Sex Roles in the Bible (3) II May be convened with 596.


509a-509b. Biblical Hebrew (3 to 4-3 to 4) 1990-91 CDT For a description of course topics, see 409a-409b. Graduate-level requirements include extra extensive readings. May be convened with 409a-409b.

530. Prophecy in Ancient Israel (3) II For a description of course topics, see 430. Graduate-level requirements include additional readings. May be convened with 430.

533. Advanced Hebrew (3) [Rpt.] For a description of course topics, see 433. Graduate-level requirements include additional readings. May be convened with 433.

539a-539b. Egyptian Arabic (3-3) Introduction to the Cairene dialect. Phonology, common greetings, basic vocabulary and grammar. P and reading in 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.

443. Islamic Thought (3) II 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 443.

444. Arabic Literature in English (3) II 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 444.

445. Persian Literature in English (3) II 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 445.

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 of research on population, resources and socioeconomic development, with emphasis on determinants and consequence of population growth and migration in contemporary Middle East. (Identical with A.Ec. 467 and Pol. 467) May be convened with 547.

468. Geography of the Middle East (3) I II 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 468.

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. (Identical with Hist. 477a-477b) May be convened with 577a-577b. 477a is an 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.

480a-480b. History of Iran and Central Asia (3-3) 480a: History of Iran from 226 B.C. to 1222. 480b: History of Central Asia and the 19th century Iran. (Identical with Hist. 480a-480b)

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.

495. Colloquium

1. Modern Arabic Prose (3) [Rpt./1] Two years of Arabic. May be convened with 595.

2. Seminar

w. Classical Arabic Prose (3) May be convened with 595.

3. Courses "Writing-Emphasis Courses. P satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).
and the great prose masters of the Han-Quing. Variable content. P. 500b.

550. Studies in Modern Chinese (3) [Rpt.] I S

549. Reading in Modern Chinese Texts, with emphasis on oral and written comprehension and expression. P. 410b.

554. Readings in Modern Chinese Literature (3) [Rpt.] II Readings in Chinese literature since 1900. Variable content drawn from short stories, novel, drama, and poetry. P. 410b.


560. Modern Chinese Foreign Relations (3) II (Identical with Pol. 560) May be convened with 460.

571. Chinese Historical Texts (3) [Rpt.] II 1990-91 Readings in historical traditional texts of various types. P. 500b.

576. Modern Chinese History (3) For a description of course topics, see 476. Graduate-level requirements include an intensive bibliographic review essay on a specialized historical problem. (Identical with Hist. 576) May be convened with 476.

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. China (3) [Rpt.] I

i. Confucianism: The Classical Period (3) (Identical with Hist. 595a; which is home.) May be convened with 495.

ii. Confucianism: The Neo-Confucian Tradition (3) (identical with Hist. 595b; which is home.) May be convened with 495.

iii. Revolution in Chinese History (3) II (Identical with Hist. 595c) May be convened with 495.

596. Seminar

f. Classical Chinese Literature (3) [Rpt.] I

g. Modern Chinese Literature (3) [Rpt.] II

h. Premodern Chinese History and Politics (3) [Rpt.] II

i. Modern Chinese History and Politics (3) [Rpt.] I

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

572. History of Medieval India (3) I 1899-90 (Identical with Hist. 572) May be convened with 472.

573. History of Modern India and Pakistan: 1750-Present (3) II 1990-91 (Identical with Hist. 573) May be convened with 473.

580. Religious History of India (3) (Identical with Hist. 580) May be convened with 470.

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 Anth. 586) May be convened with 486.

595. Colloquium

b. Tunisia (3) [Rpt.] II May be convened with 495b.

596. Seminar

r. Modern History of India and Pakistan: 1947-present. May be convened with Anth. 595b.

597. Seminar

a. History of the Jews (3) [Rpt.] II

b. Jewish History in the Holy Land (3) [Rpt.] I

c. Jewish History in the Diaspora (3) [Rpt.] I

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

India-Pakistan

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 445.

452. Hindu Mythology and Literature (3) [Rpt.] I Introduces major literary works with ancient Sanskrit myths. Selections from the Vedas, Puranas, and other classics in English translation. May be convened with 552.

470. Religious History of India (3) (Identical with Hist. 470) May be convened with 570.

471. Introduction to Indic Civilizations (3) I Social and political institutions, arts and philosophy of traditional society from prehistoric times to c. 1000 A.D., with emphasis on Hindu religion and its interrelations with the social order. (Identical with Anth. 471 and Hist. 471) (Identical with Hist. 471) Writing-Emphasis Course* for India-Pakistan specialization.

472. History of Medieval India (3) I 1989-90 (Identical with Hist. 472) May be convened with 572.


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.

487. Political Systems of India and Pakistan (3) II Survey of post-independence political developments in India and Pakistan. (Identical with Pol. 487) May be convened with 587.

497a-474b. Japanese Literature in English (3-3) Survey of Japanese literature, reading in English translation. 474b: Selected topics in Japanese literature, content varies. 474a-474b-474c. History of Japan (3-3-3) (Identical with Hist. 474a-474b-474c) May be convened with 574a-574b-574c.

495. Colloquium

b. Japan (3) [Rpt.] II May be convened with 595b.

496. Seminar


502. Literary Japanese (3) Introduction to the various types of literature used from the 8th century to modern times, including Sino-Japanese, documentary, epistolary and purely literary compositions.

511a-411b. Modern Japanese Grammar (3-3) For a description of course topics, see 411a-411b. Graduate-level requirements include a special project consisting of reports on aspects of Japanese grammatical idiom. May be convened with 412a-412b.

572a-574a-574b. History of Japan (3-3-3) (Identical with Hist. 572a-574a-574b) May be convened with 474a-474b-474c.

595. Colloquium

b. Japan (3) [Rpt.] II May be convened with 495b.

596. Seminar

r. Japanese History (3) [Rpt.] I

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

Judaic Studies

103a-103b. Elementary Modern Hebrew (5-5) CDT Introduction to basic oral skills, reading and writing in class and language lab.; leads to an understanding of Biblical and modern Hebrew.


370a-370b. History of the Jews (3-3) (Identical with Hist. 370a-370b)

372a-372b. History and Religion of Israel in Antiquity (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 Second Temple, with emphasis on the formation of rabbinic Judaism. (Identical with Hist. 372a-372b and Reli. 372a-372b)

374. The Holocaust (3) I 1990-91 (Identical with Hist. 374)

382. Archaeology and the Bible (3) I Discussion of the Book of Genesis: the role of the Bible in the origins of the Jewish people, history of the Hebrew Bible, and the relationship between the two. May be convened with 382.

401. Ancient Mesopotamia (3) I (Identical with Anth. 401) May be convened with 501. Writing-Emphasis Course* for Judaic studies specialization.

403a-403b. Intermediate Modern Hebrew (5-5) CDT Intermediate grammar, reading, conversation, and extensive presentation of the syntax and vocabulary of modern Hebrew. Reading leading to a firm foundation in the language. P. 103b.


428. Anthropology of Law (3) II 1990-91 CDT Study of Biblical Hebrew grammar and literature. May be convened with 509a-509b.

430. Prophecy in Ancient Israel (3) I Nature and origins of Biblical prophecy and its ancient Near-Eastern analogues, including intensive
557. Prehistoric Mesopotamia (3) (Identical with Anth. 557) May be convened with 457.

558a-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.

595. Colloquium

a. Middle East (3) [Rpt./1] I

c. Modern Arabic (3) [Rpt./1] P, two years of Arabic. May be convened with 495n.

d. Classical Arabic (3) [Rpt./P] P, two years of Arabic. May be convened with 495o.

e. Readings in Classical Arabic Poetry (3) S P, three years of Arabic for non-native speakers of Arabic. May be convened with 495z.

596. Seminar

a. Middle East: Topics in History and Civilization (3) [Rpt./1] II
b. Near Eastern Archaeology (3) [Rpt./1] II (Identical with Anth. 596c)

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

597. Modern History of the Middle East (3-3) For a description of course topics, see 478. Graduate-level requirements include an extra paper and exams. (Identical with Hist. 577a-577b) May be convened with 477a-477b.

598. Modern History of the Middle East (3) I For a description of course topics, see 478. Graduate-level requirements include an extra paper and exams. (Identical with Hist. 578b) May be convened with 478.

Numerous topics of current interest are treated in a weekly seminar. P: History 216, department permission.

598a. Egyptian, Syro-Palestinian, and Near Eastern Archaeology (3-3) For a description of course topics, see 484a-484b. Graduate-level requirements include a full-length research paper. P: consult department before enrolling. May be convened with 484a-484b.

598b. Middle Eastern Archaeology (3-3) For a description of course topics, see 484a-484b. Graduate-level requirements include a full-length research paper. P: consult department before enrolling. May be convened with 484a-484b.

598c. Near Eastern Archaeology (3-3) For a description of course topics, see 484a-484b. Graduate-level requirements include an extra paper and exams. (Identical with Anth. 596c) May be convened with 484a-484b.

601. Advanced Physical Pharmacy (3) II 1990-91 Applications of physical pharmacy to pharmacy. P, physical pharmacy course.


630a-630b. Advanced Organic Medicinals (3-3) 1990-91 Rational drug design, receptor site theories, mechanism of drug action, and metabolic pathways of medicinal agents, chemical and enzymatic synthesis of important pharmaceuticals. P, 437b, Pcol. 471b.


815. Pharmacy Subspeciality

I. Research (3-10) I, II S 15-30L. P, or CR, 10 units of 810. (Identical with Ph.Pr. 815I, which is home.

Pharmacy (PHCL)

College of Medicine, Room 5103
(602) 626-6400

(Department, College of Medicine)

Professors Thomas F. Burks II, Head, David S. Alberts (Internal Medicine), H. Vasken Aposhian (Molecular and Cellular Biology), Klaus Brendel, Rubin Bressler (Internal Medicine), Burrell R. Brown, Jr. (Anesthesiology), Brian H. Hixton, David G. Johnson (Internal Medicine), Eugene Markin (Internal Medicine, Physiology), John D. Palmer (Assistant Professor, Internal Medicine, Cardiovascular Disease), William R. Roeske (Internal Medicine, Surgery), William R. Roeske (Internal Medicine), Mark Sipes (Anesthesiology, Pharmacology and Toxicology), Henry I. Yamamura (Biochemistry, Associate Professor, Psychiatry)

Associate Professors Dean E. Carter (Pharmacology and Toxicology), Kenneth A. Conrad (Internal Medicine, Cardiology), James R. Davis (Anesthesiology, Surgery), Edward French, A. Jay Gandolfi (Anesthesiology), Marilyn J. Halonen, David L. Kreulen, Thomas J. Lindell (Molecular and Cellular Biology), Frank Porreca, Thomas L. Smith (Research)

Assistant Professors Timothy C. Fagan (Internal Medicine), Ronald J. Lukas (Research)

Instructor Alan D. Barreuthar
Pharmacology is a broad discipline involving the investigation of the actions of drugs and chemicals 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. This program is designed to prepare students for professional practice in a wide range of both private and public sector organizations, including government, industry, and universities. The broad scope of interests in pharmacology ranges from determining the mechanisms by which chemicals produce adverse biological effects to identification and quantification of hazards resulting from occupational and environmental exposure to chemicals. For admission and degree requirements, please see the Graduate Catalog.

Toxicology is the science concerned with the harmful effects of chemicals (including drugs) on living systems. The program prepares students for careers in hospital laboratories, police crime laboratories, manufacturing companies, industrial hygiene laboratories, and toxicology laboratories in industry, government, and universities. For admission and degree requirements, please see the Graduate Catalog.

Pharmacology and Toxicology (PCOL/TOX)

Pharmacy Building, Room 236
(602) 626-2823

Department of Pharmacy


Pharmacology and Toxicology

Toxicology is the science concerned with the harmful effects of chemicals (including drugs) on living systems. The program prepares students for careers in hospital laboratories, police crime laboratories, manufacturing companies, industrial hygiene laboratories, and toxicology laboratories in industry, government, and universities. 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, including government, industry, and universities. For admission and degree requirements, please see the Graduate Catalog.

Pharmacology (PCOL)

401. Human Gross Anatomy (3) II (Identical with Anat. 401)


472. Applied Pharmacology (3) I II Pharmacodynamics, pharmaco toxicity, 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 for the pharmacy doctorate programs. Ecol. 159b May be convened with 572.

474. Clinical Toxicology (2) I II Prevention, characterization of diseases 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.

561a-561b. Introduction to Pharmacological and Toxicological Literature (1) (Identical with Phcl. 561a-561b)

571a-571b. Fundamentals of Pharmacology (4-4) For a description of course topics see 471a-471b. Graduate-level requirements include an in-depth research paper on a current topic. CR: 3. L, P. (401, Bioc. 460, Psio. 480, 481, CR. Ph. Pr. 475a-475b and Ph.Sc. 437a-437b. (Identical with Tox. 571a-571b) May be convened with 471a-471b.

572. Applied Pharmacology (3) I II For a description of course topics see 472. Graduate-level requirements include a term paper on nursing pharmacology. CR: 3. L, P. (472 or 471b, Ph. Sc. 407. (Identical with Tox. 572) May be convened with 472.

574. Clinical Toxicology (2) For a description of course topics see 474. Graduate-level requirements include an in-depth research paper and a term paper on a current topic in toxicology and/or a formal presentation on a current topic to the class. P. 472 or 471b, Ph. Sc. 407. (Identical with Tox. 574) May be convened with 474.
596. Seminar  
a. Advanced Graduate Research (1-3)  
[Rpt/3] I I (Identical with Phcl. 596a, which is home)  

562a -562b. Biochemistry (4 -3) (Identical with Bio. 562a -562b) May be convened with 562a -562b. 

554. Industrial Toxicology and Chemical Exposures (2 -4)  

550. Drug Disposition and Metabolism (2)  

423R. Human Physiology Laboratory (1) II  

554a -554b. Human Physiology Laboratory (1) (Identical with Ecol. 554a -554b) May be convened with 554a -554b.  

556. Statistics for the Medical Sciences (4) I  
(Identical with Stat. 556)  

571a-571b. Fundamentals of Pharmacology (4 -4) (Identical with Pcol. 571a-571b) May be convened with 571a-571b.  

574. Clinical Toxicology (2) I (Identical with Pcll. 574) May be convened with 574.  

576. Seminar  
a. Advanced Toxicology (1-2) [Rpt/3] I I 
 b. Current Concepts in Toxicology (1-2)  

601. Analytical Instrumentation and Techniques (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 wherever appropriate. Lecture may be taken as separate from the laboratory exercises and course design project. 3R, 1L.  


602a-602b. Seminar  
a. Advanced Toxicology (1-2) [Rpt/3] I I  
 b. Current Concepts in Toxicology (1-2)  

610. Topics in Advanced Toxicology (1-3) I I Current developments in toxicology including:  
chemical carcinogenesis, mutagenesis and teratogenesis; behavioral toxicity; inhalation toxicology; toxicokinetics; metabolism and environmental toxicology.  

653. Neuropharmacology (3-4) II (Identical with Pcol. 653)  

The Department of Pharmacology in the College of Medicine and the Department of Pharmaceutical and Toxicological Science cooperate, through the Committee on Pharmacology and Toxicology, in offering programs leading to the Master of Science degree with a major in pharmacology and the Doctor of Philosophy degree with a major in pharmacology and toxicology. 

For course descriptions, please see entries in this catalog for Pharmacology (Department, College of Medicine) and Pharmacology and Toxicology (Department, College of Pharmacy). 

For information on graduate programs and admission requirements, please see the Graduate Catalog.

Pharmacy Practice (PHPR)  

Pharmacy Building, Room 318  
(602) 626-5730  

Professors J. Lyle Bootman, Head, Donald C. Brodie (Adjunct), William F. McGrath, Gary F. Meade, Assistant Professors Alan D. Barreuther, William F. Fritz (Adjunct), Marie E. Gardner, James R. Guddy (Adjunct), G. Richard Hall (Adjunct), Richard Hammel (Adjunct), William N. Jones (Adjunct), Michael D. Katz, Richard W. Krueger (Adjunct), Lon N. Larson, Robert J. Lipsy, Joseph A. McElroy (Adjunct), Robert A. Mead, Michael Noel (Adjunct), Paul E. Nolan, James Paxinos (Adjunct), Patricia M. Plezia, Joseph P. Rindone (Adjunct), Carol J. Rollins (Adjunct), Michael J. Smith (Adjunct), Carl E. Trinch (Adjunct) 

Instructors Victor A. Elsberry, James Martin (Adjunct), J.C. Poe (Adjunct) 

Lecturers Jack R. Arndt (Adjunct)  

The Department of Pharmacy Practice offers courses leading to the Doctor of Pharmacy degree through the 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 regarding undergraduate admission and degree requirements, please consult the College of Pharmacy section of this catalog; for graduate admission and degree requirements, please see the Graduate Catalog. 

A student must be enrolled in the College of Pharmacy before taking any pharmacy practice course, except as approved by the department. The department participates in the Honors Program.

300. Pharmaceutical Calculations (2) I (Identical with Ph.Sc. 300)  

301. Introduction to Medications and Their Use for the Consumer (3) III Therapeutic uses of medications, emphasizing non-prescription products and commonly prescribed 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 Devices II  

343. Pharmacy Laws (2) I Legal concepts covering professionalism, negligence, liability, legal processes and semantics; pertinent federal, state and local statutes and regulations.
511. Pharmacy Management (3) I II History, organization and administration of pharmacist services within the institutional environment.

512. Advanced Pharmacy Management (3) I II Application of management principles to pharmacy operations. Techniques include managing clinical pharmacy practice, marketing, administrative, and financial aspects of pharmacy practice. Field trips. Open to majors only.

516. Perspectives in Geriatrics Laboratory (1) I II CR, 448. (Identical with Gero. 547 and N.F.S. 547) May be convened with 447.

517. Perspectives in Geriatrics (2) I II For a description of course topics, see 448. Graduate-level research component include 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.

518. Clinical Pharmacotherapy of Mental Disorders (2) I II For a description of course topics, see 448. Graduate-level research component include in-depth research paper on a single topic to psychopharmacology. May be convened with 469.

596. Seminar (1) I
a. Pharmacy Administration (1) [Rpt.] I I
b. Pharmacy Administration Research (1) [Rpt.] I I

611a-611b. Pharmacy and Its Environment (3-3) 1989-90 Cultural, social, behavioral, and organizational foundations of pharmacy, including the development of the present state of pharmacy practice. Includes examination of the role of the pharmacist in healthcare delivery systems. Open to majors only. P, CR, 448. (Identical with Gero. 547 and N.F.S. 447) May be convened with 448.


621. Pharmaceutical Marketing (3) I II Socioeconomic factors in the development, production, and distribution of drugs.

694. Practicum (1) I II
a. Clinical Clerkship (1-15) [Rpt.15] I I
b. Administrative Clerkship (1-15) [Rpt.] I I

695. Colloquium (1) I I
a. Research in Gerontology (1) I I (Identical with Gero. 695a)

800. Pharmacy Practice Project (1) I II Individualized plan of research not part of the dissertation or thesis. Open only to students enrolled in Doctor of Pharmacy program.

803. Pharmacy Clinical Clerkship (1) I I
a. Community Pharmacy Practice (5) [Rpt./10 units] I I S P. 461, 875.
b. Institutional Pharmacy Practice (5) [Rpt./10 units] I I S P. 461, 875.
c. Ambulatory Pharmacy Practice (5) [Rpt./10 units] I I S P. 461, 875.
d. Drug Information Practice (5) [Rpt./10 units] I I S P. 461, 875.
e. Adult Care Pharmacy Practice (5) [Rpt./10 units] I I S P. 461, 875.

Note: 803a-are six-week courses.

810. Pharmacy Clerkship (1) I II
a. Internal Medicine (1) I I S P. 803b.
b. Surgery (3-10) I I S P. 803a.
d. Geriatrics/Physiology (3-10) I I S P. 803a.
e. Outpatient Practice (3-10) I I S P. 803a.
f. Emergency Services (3-10) I I S P. 803a.
g. Acute Care (3-10) I I S P. 803a.
h. Institutional Pharmacokinetics (3-10) I I S P. 803a.
i. Psychopharmacology/Neurology (3-10) I I S P. 803a.

Note: 810-are six-week courses.

815. Pharmacy Subspecialty (1) I I
a. Hematology/Oncology (3-10) I I S P. 10 units of 810 or CR.
b. Cardiology (3-10) I I S P. 10 units of 810 or CR.
c. Pulmonary (3-10) I I S P. 10 units of 810 or CR.
d. Endocrine (3-10) I I S P. 10 units of 810 or CR.
e. GI/Renal (3-10) I I S P. 10 units of 810 or CR.
f. Gyn/Neonatal (3-10) I I S P. 10 units of 810 or CR.
g. Infectious Disease (3-10) I I S P. 10 units of 810 or CR.
h. Immunology/Immunology (3-10) I I S P. 10 units of 810 or CR.
i. Dermatology (3-10) I I S P. 10 units of 810 or CR.
j. Poison Information/Toxicology (3-10) I I S P. 10 units of 810 or CR.
k. Administrative (3-10) I I S 15-30L. P. 10 units of 810 or CR.
l. Research (3-10) I I S 15-30L. P. 10 units of 810 or CR. (Identical with Ph.Sc. 815) and Pcol. 815)

Note: 815a-are six-week courses.

896. Seminar (1) I II
a. Pharmacy Practice (1) I II
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 I Selected basic philosophical areas and problems: knowledge, belief and truth; the world and God; nature of persons, action and free will; the good life: the ideal community; philosophical perspectives on life in general; and the role of philosophy in society.

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 II 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 Classical, medieval and modern moral and political thought; theories of good, natural rights, political obligation, relation of individual and state, class conflict.

122. Philosophical Foundations of Western Civilization: Freedom, Power, and God (3) I II Classical, medieval and modern metaphysical questions. What is the nature of reality? What is God? What is the good life?

123. Philosophical Foundations of Western Civilization: Science and Inquiry (3) I II Classical, medieval, and modern approaches to science; critical knowledge; philosophical problems raised by discovery and change.

145. Science, Technology and Human Values (3) I I Nature of science, technology, pseudoscience, and their relation to philosophy and culture; impact of science and technology on society and its values and religion.

202. Symbolic Logic and Quantification Theory (3) I I Symbolic logic and quantification theory; semantic concepts; deductive techniques and translation into symbolic notation. (Identical with Math. 202)

201. Philosophy of Religion (3) I Nature of religion; existence and nature of God; religion and meaning, values and knowledge. (Identical with Rel. 233)

236. Philosophy in Literature (3) I Philosophical analysis of selected literary works.

245. Existent Problems (3) II 1989-90 Exploration of central problems of the human condition, such as freedom, the human self, social order, justice, deontological duties, blameworthiness, and responsibility.

260. Ancient Philosophy (3) I Survey of Greek, philosophy, including the pre-Socratic philosophers through Plato and Aristotle to post-Aristotelian philosophers. (Identical with Clas. 260)

262. Modern Philosophy (3) I Survey of major 17th and 18th century British and European philosophers, including Descartes, Spinoza, Leibniz, Locke, Berkeley, Hume, and Kant.

263. From Hegel to Nietzsche: Man and Civilization: Justice and Virtue (3) I II 1990-91 (Identical with Clas. 263) Emphasis on philosophical perspectives, with particular attention to contemporary philosophical thought. May be convened with 560.

264. Knowledge and Cognition (3) I I Social and interpersonal processes affecting the acquisition and diffusion of knowledge. Emphasis on philosophical perspectives, with particular attention to contemporary philosophical thought. May be convened with 561.

265. Philosophy of Mind (3) Topics include the nature of mental states, the relation between mind and brain. May be convened with 562.

266. Philosophy of Psychology (3) Topics include the nature of mental states, the relation between mind and brain. May be convened with 563.

267. Philosophy of Language (3) Topics include the nature of mental states, the relation between mind and brain. May be convened with 564.

268. Philosophy of the Biological Sciences (3) Topics include the nature of mental states, the relation between mind and brain. May be convened with 565.

269. Ethics (3) Classical and contemporary theories of art; the esthetic experience, form and content, meaning, problems in interpreting the ethical theologian of art. May be convened with 533.

343. Social and Political Philosophy (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.

344. Social and Political Philosophy (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.

345. Games and Decisions (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.

346. Ethics and the News Media (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.

347. Ethics and the News Media (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.

348. The Ethics of Law (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.

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356. The Ethics of Law (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.

357. The Ethics of Law (3) I I Philosophical analysis of social and political theories; including the theory of justice, social contract, Marxism. May be convened with 534.
473. Natural Language Processing (3) II 1990-91 (Identical with Ling. 473) May be con-
vened with 573.
496. Seminar a. Special Topics in Cognitive Science (3) II (Identical with Psy. 496a, which is home
503. Foundations of Mathematics (3) II 1990-91 (Identical with Math. 503) May be con-
vened with 403.
512. Readings in Greek Philosophy (3) [Rpt.] (Identical with Grk. 512) May be con-
vened with 412.
513. Advanced Symbolic Logic (3) For a description of course topics, see 413. Gradu-
ate-level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 413.
514. Philosophical Logic (3) For a description of course topics, see 414. Graduate-level
requirements include an in-depth research project on a central theme or topic of the course. May be convened with 414.
516. Philosophy of Mathematics (3) For a description of course topics, see 416. Graduate-
level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 416.
519. Induction and Probability (3) For a description of course topics, see 419. Graduate-
level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 419.
521. Philosophy of the Biological Sciences (3) For a description of course topics, see 421. Graduate-
level requirements include an in-depth research project on a central theme or topic of the course. (Identical with Ecol. 521) May be convened with 421.
522. Aesthetics (3) [Rpt. /2] One of the three principal branches of modern mathematical
logic—recursion theory, model theory, or set theory—will be examined in depth.
523. Philosophy of the Physical Sciences (3) For a description of course topics, see 423. Graduate-
level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 423.
524. Basic Building Blocks of Physics (3) For a description of course topics, see 424. Graduate-
level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 424.
530a-530b. Ethical Theory (3-3) For a description of course topics, see 430a-430b. Graduate-
level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 430a-430b.
531. Aesthetics (3) For a description of course topics, see 431. Graduate-level requirements
include an in-depth research project on a central theme or topic of the course. May be convened with 431.
532a-532c. Ethics and the News Media (3-3) II (Identical with Jour. 539) May be convened with 439.
540. Metaphysics (3) [Rpt.1] For a description of course topics, see 440. Graduate-level
requirements include an in-depth 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 in-depth 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 in-depth 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 in-depth 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 in-depth research paper on a central theme or topic of the course. May be convened with 450.
553. Minds and Machines (3) For a description of course topics, see 453. Graduate-level
requirements include an in-depth research paper on a central theme or topic of the course. May be convened with 453.
554. Formal Semantics (3) For a description of course topics, see 454. Graduate-level
requirements include an in-depth research paper on a central theme or topic of the course. May be convened with 454.
555. Philosophy of Language (3) For a description of course topics, see 455. Graduate-level
requirements include an in-depth research paper on a central theme or topic of the course. May be convened with 455.
556. Fege and the Rise of Analytic Philosoph-
2 Field of Psychology
ics (3) For a description of course topics, see 456. Graduate-level requirements include an in-
depth research project on a central theme or topic of the course. May be convened with 456.
571a-571b. Rationalism and Empiricism (3-3) For a description of course topics, see 471a-471b. Graduate-level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 471a-471b.
572. Natural Language Processing (3) II 1990-91 (Identical with Ling. 573) May be con-
vened with 472.

Physical Education (See Exercise and Sport Science under Health-Related Professions)

The department offers the degrees of Bachelor of Science, Master of Science and Doctor of Philosophy with a major in physics. A Bachelor of Science in Education and Master of Education are available with a teaching major in physics. For graduate admission and degree requirements, consult the Graduate Catalog. The Bachelor of Science in Engineering Physics is offered through the College of Engineering and Mines. Students should consult the appropriate departmental sections in which research is being conducted.

The major in physics: 36 units, in addition to the general education requirements for the Bachelor of Science described in the section of this catalog. Required courses are 111a-111b, 112a-112b, 410, 415a, 420, 425, 435, and 480a-480b. Under special circumstances, 102a-102b, 180a-180b and 330 or 110, 116, 121, and 330 may be substituted for 111a-111b and 112a-112b. The following courses are strongly recommended: 412, 415b, 436, 475a-475b, 481a-481b. Chem. 103a-103b, 104a-104b and 105a-105b. Math. 254 is recommended as a prerequisite for upper-division physics.

The major in engineering physics: Refer to the College of Engineering and Mines section of this catalog. An engineering physics major who intends to do graduate work in physics should discuss his or her plans with the advisor.

The teaching minor: 18 units, including 110, 116, 121, 330 or 111a-111b and 112a-112b, 433, 480a-480b. Courses in related fields, such as astronomy, may be chosen in consultation with the departmental advisor.

The department participates in the Honors Program.
222 Departments and Courses of Instruction

102a-102b.* Introductory Physics (3-3) CDT Designed for liberal arts and life science majors with no calculus background. Survey of the basic fields of physics, with emphasis on applications to everyday life, physical 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 102a or 102b.

103a-103b.* Introductory Physics with Calculus (3-3) CDT Fundamental principles of mechanics, heat, and thermodynamics, electricity, optical, atomic, and nuclear phenomena. P. CR. Math. 125b. Both 103a and 103b are offered each semester. Those wishing to take this course as a lecture-laboratory course should register concurrently for 103a or 103b.

105. Elements of Physics (3) I II CDT Designed for nursing majors. Physical measurement, sound, light, thermal energy, waves, analog circuits, nuclear physics, background knowledge for chemistry. 3R. P. CR. Math. 117h.

106. Physics for Architects (3) I II CDT Introduction to physics, with special emphasis on topics and concepts of interest to architects.

107. The Physics of Music (4) I II CDT Sound production, propagation, wave phenomena, acoustics, musical instruments, harmony and scales, hall acoustics, electronic production and recording. 3R. P. CR. Math. 117h.

109. Physics in the Modern World (4) I II Basic concepts and the societal impact of physics, with emphasis on modern developments. Topics include mechanics, waves, quantum mechanics, atomic and nuclear physics, and astrophysics. 3R. P. CR. Open to nonmajors only. P. High school algebra.

110. * Introductory Mechanics (4) I II CDT Vector concepts, mechanics, dynamics of particles and rigid bodies, conservation laws of energy, momentum, and angular momentum. 4R. P. Math. 125a, CR. 125b.


112a-112b. *Introduction to Electricity, Magnetism, Optics and Quantum Theory (4-4) I II Laws of electric and magnetic fields, dc and ac circuits, Maxwell's equations, physical and geometrical optics, and quantum theory. 4R. P. CR. Math. 223 for 112a.

116. * Introductory Electricity and Magnetism (4) I II CDT Field concepts, electrostatics, magnetostatics, currents, electromagnetic phenomena, and wave electromagnetic waves. 4R. P. CR. Math. 125a.

121. * Introductory Optics, Acoustics and Heat (2-3) I II CDT Introduction to heat and thermodynamics; treatment of optics and acoustics from viewpoint of scalar wave theory. 3R. P. CR. Math. 125a.

180a-180b. Introductory Laboratory (1-1) Quantitative experiments in physics, both illustrative and exploratory. Designed to accompany 102a–102b and/or 103a-103b. Sections are established corresponding to each course. P. CR. Math. 102a-102b or 103a-103b. Both 180a and 180b are offered each semester.


402. Medical Physics (3) I II 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. CR. Math. 223.


412. Theoretical Mechanics II (3) II CDT Continuation of 410; mechanics of the continuum; introduction to variational principles; Lagrange's equations, with emphasis on problems of statistical mechanics. P. Math. 223.


420. Optics (3) I II CDT Electromagnetic waves; rays, interference, diffraction, scattering; applications to imaging systems, Fourier methods, holography, and crystal optics. P. Math. 225.

425. Thermodynamics (3) I CDT Basic laws of thermal equilibrium; heat engines; ideal and non-ideal gases; phase transitions; introduction to irreversible processes and statistical mechanics. P. Math. 225.

430. Introduction to Biophysics (2) I CDT Concepts and experimental techniques of molecular biology; physical properties of biological macromolecules, atoms and chemical reactions, optical techniques, macromolecular changes, molecular mechanisms, or regulation. P. Math. 102b. Math. 103b. (Identical with Micr. 430) May be convened with 530.

433. Physics Demonstrations (1-3) II I CDT Introduction to teaching materials and laboratory demonstrations covering principles of classic and modern physics; with emphasis on inexpensive techniques and direct experience. Advanced degree credit available for nonmajors in two semesters of physics. May be convened with 533.

435. Introductory Quantum Theory and Atomic Spectra (3) I CDT Introduction to quantum mechanics; solution of the Schroedinger equation for harmonic oscillator; atomic structure; spectra of one and many electron systems, Zeeman-Paschen-Bach effects; hyperfine structure. P. 330 or 410b. Math. 225.

440a-440b. Atomic and Molecular Spectroscopy (3) I II CDT Laboratory experiments with microscopes and polarized scattered light to study the electronic, optical properties of small particles and surfaces; optical, electronic, lasers, remote sensing. P. 110, 116, 121, or consult department before enrolling. May be convened with 440a.

450. Introductory Nuclear Physics (3) II CDT Basic concepts of nuclear physics: the structure and stability of nuclei; nuclear forces; stable systems; nuclear reactions; decay of unstable systems; nuclear radiation characteristics. P. 330 or 112b. Math. 254. (Identical with N.E.E. 450) May be convened with 550.

480a-480b. Methods of Experimental Physics I (1 to 3–1 to 3) Continuation of 480a-480b, with emphasis on individual work. 3R. P. CR. Both 480a and 480b are offered each semester, but students are encouraged not to enroll simultaneously.

481a-481b. Methods of Experimental Physics II (1 to 3–1 to 3) Continuation of 480a-480b, with emphasis on individual work. 3R. P. CR. 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 solutions can be obtained numerically and on the use of the standard computer packages. Sample physics topics include chaos and nonlinear mechanics, quantum mechanics, turbulence theory and eigenvalues, particle trajectories, and structure. P. 100, 125a, 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 term project 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 I CDT (Identical with Opt. 504).


513. Topics in Advanced Mechanics (2-4) II CDT Modern topics in classical mechanics, including canonical perturbation theory, invariant mappings, noninteger system stochastic behavior and applications to semiclassical quantum mechanics. 3R. P. CR. Math. 225.


525. Advanced Thermodynamics and Kinetics (3) I CDT 1989-90 First and second laws of thermodynamics and their applications.
Boltzmann transport equation; H-theorem; mean free path methods applied to viscosity, thermal conductivity, and diffusion. P. 425.


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 Mircr. 530) May be convened with 430.

531. Biophysical Theory (2) II Physical concepts and computations important in the structure and function of molecules, limits to structure, symmetry, oligomer and virus structure, organiselle structure and function. (Identical with Mircr. 531)

532. Physics Demonstrations (1-3) III 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 (2) III 1990-91 Details of atomic structure; interactions of atoms with electromagnetic fields, electrons and ions; techniques for calculating unper- turbated energy levels, transition probabilities, and atomic interaction cross sections. P. 511, 515b, 570b.

536. Applications of Introductory Quantum Theory (2) I 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. 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 412b. (Identical with Opti. 540a-540b) May be convened with 440a-440b.

543. Laser Physics (3) I (Identical with Opti. 543)

545. Experimental Physics 545a-545b-545c are three five-week lecture courses; none is prerequisite to any other.

a. Experimental Spectroscopy (1) III 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) III 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) III 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. Introduction to 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. 511, 515b, 570b. (Identical with N.E.E. 550) May be convened with 450.

551. Nuclear Physics (3) I Theory of nuclear systems, including stability, decay, nuclear forces, scattering, reactions, structure, and interaction with electromagnetic radiation. P. CR, 570a-570b.

552. The Many-Body Problem in Nuclear Physics (3) I (Rpt.) II 1990-91 For a description of course topics, see 450. Graduate-level requirements include an in-depth paper on a topic in solid-state physics. P. 330 or 412b. May be convened with 460.

556a-556b. Electrodynamics of Conducting Fluids and Plasmas (3-3) 1990-91 (Identical with Phys. 556a-556b)

560. Introductory Solid-State Physics (3) III 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 412b. May be convened with 460.

570a-570b. Quantum Mechanics (3-3) Principles of quantum mechanics: wave mechanics and matrix mechanics; applications to atomic structure. P. 475a-475b recommended but not required.

571. Symmetry Groups in Physics (3) I Algebraic results of the group theory of quantum mechanics and applications to quantum mechanics and particle physics. Continuous groups, Lie algebras, discrete groups, irreducible tensors. P. 570a-570b.

571a-571b, Advanced Relativistic Quantum Mechanics (3-3) 1990-91 Continuous groups; scattering theory; relativistic wave equations; quantum electrodynamics, Feynman diagrams, dispersion theory, renormalization. P. 515b, 570b.

580a-580b. Quantum Field Theory (3-3) 1990-91 Meaning of quantized fields; symmetry principles, free fields, general properties of quantum mechanics and interactions. Electrodynamics and gravity. P. 515a-515b. May be convened with 475a-475b.

577a-577b. Theory of Relativity (3-3) 1989-90 Special theory of relativity and its application to mechanics and electromagnetics; tensor calculus and general relativity, relativistic astrophysics and cosmology. P. 475b.

579a-579b. Advanced Relativistic Quantum Mechanics (3-3) 1990-91 Continuous groups, scattering theory, relativistic wave equations; quantum electrodynamics, Feynman diagrams, dispersion theory, renormalization; strong and weak interactions. P. 515b, 570b.

580a-580b. Quantum Field Theory (3-3) 1990-91 Meaning of quantized fields; symmetry principles, free fields, general properties of quantum mechanics and interactions. Electrodynamics and gravity. P. 515a-515b. May be convened with 475a-475b.

581. Elementary Particle Physics (3) II 1989-90 Production, interaction, and decay of mesons, baryons and leptons; high energy physics (1) I CDT For a description of course topics, see 450. Graduate-level requirements include advanced examinations, as determined by the instructor. P. 410, Math. 254, CR, 415a-415b. May be convened with 475a-475b.

582. High Energy Astrophysics (3) II 1989-90 (Identical with Astr. 582)

583a-583b. Plasma Physics and Thermodynamics (2) I 1989-90 (Identical with Phys. 583a-583b)

585. Stellar Pulsation (1-3) I (Rpt.) II I Stellar pulsations, the solar atmosphere, solar seismology and long-term solar variability related to theoretical interpretation. P. 436.


596. Seminar (3) II 1990-91 (Identical with Mircr. 596a)

a. The Physics of Thin Films (3) II P. 460.

643. Quantum Optics (3) II 1990-91 (Identical with Opti. 643a)

685. Graduate Physics Laboratory (3) II I Introduction to modern research methods and experiments. Problems in low-temperature physics, solid-state, atomic, and nuclear spectroscopy; based data acquisition and analysis, solar-energy physics, and others.


Physiological Sciences

Arizona Health Sciences Center, Room 4104
(602) 626-6511
Committee on Physiological Sciences

Professors: William H. Dantzler, Chairperson, (Physiology), Eldon J. Harken (Physiology), Darrel E. Goll (Animal Sciences), Robert W. Gore (Physiology), Joseph F. Gross (Chemical Engineering), Raphael P. Gruner (Physiology), David J. Hartshorne (Animal Sciences), Paul C. Johnson (Physiology), Murray A. Katz (Internal Medicine), Otakar Koldovsky (Pediatrics), Richard J. Lemen (Pediatrics), Timothy G. Lohman (Exercise and Sport Sciences), Eugene Morkin (Internal Medicine), William R. Roese (Internal Medicine), Douglas G. Stuart (Physiology), Charles M. Tipton (Exercise and Sport Sciences), Associate Professors Ronald E. Allen (Animal Sciences), Roger M. Enoka (Exercice and Sport Sciences), Ziaul Hasan (Physiology), Murray Koc (Internal Medicine), Timothy W. Secomb (Physiology), Marc E. Tischler (Biochemistry), David J.A. Vleck (Ecology and Evolutionary Biology), Stephen H. Wright (Physiology), Assistant Professors Edmund A. Arbas (Division of Neurobiology, Arizona Research Laboratories), Joy C. Burt (Exercise and Sport Sciences), Janis M. Burt (Physiology), Patricia B. Hoyer (Physiology), Richard B. Levine (Division of Neurobiology, Arizona Research Laboratories), Douglas R. Sealls (Exercise and Sport Sciences), Mark E. Wise (Animal Sciences)

The interdepartmental Committee on Physiological Sciences offers graduate work leading to a master's degree with a major in physiological sciences. The Master of Science degree is offered only in rare instances when individuals qualified to study for the Ph.D. degree are forced to terminate their graduate education. Research training is an integral part of the Ph.D. program. The research areas of the faculty in the program include: cellular and transmembrane processes, circulation and respiration, including microcirculation; comparative physiology, endocrinology, exercise physiology, gastrointestinal physiology, muscle physiology; CNS pharmacology and control; renal mechanisms, and reproductive and developmental mechanisms.

For admission and degree requirements, consult the Graduate Catalog.
Physiology (PSIO)
Arizona Health Sciences Center, Room 4103
(602) 626-7642

(College of Medicine)

Professors Douglas G. Stuart, Head, James R. Bluedel (Research, Barrow Neurological Institute, Phoenix), Eldon J. Braun, William H. Dantzer, Robert W. Gore, Joseph F. Gross (Chemical Engineering), Raphael P. Grunen, Paul C. Johnson, Murray Katz (Internal Medicine), Otakar Krc* (Internal Medicine, Pediatrics), Eugene Morkin (Internal Medicine, Pediatrics).

Associate Professors Alan R. Gibson (Research, Barrow Neurological Institute, Phoenix), Alexander N. Gortz (Respiratory Physiology), Ziaul Hasan, L. Claire Parsons (Nursing), Timothy W. Secomb, Marc E. Tischler (Biochemistry), Stephen H. Wright.

Assistant Professors Edmund A. Arbas (Division of Neurobiology, Arizona Research Laboratories), Ann L. Baldwin (Research), Janis M. Burt, Roger M. Enoka (Exercise and Sport Sciences), Thomas M. Hamm (Research, Barrow Neurological Institute, Phoenix), Patricia B. Hoyer, Richard J. Lamen (Pediatrics), Richard B. Levine (Division of Neurobiology, Arizona Research Laboratories), Steven C. Ova* (Research, Pediatrics), Wayne J. Morgan (Research, Pediatrics), Richard C. Schaeffer (Research), Douglas R. Seals (Exercise and Sport Sciences), Mark E. Wise (Animal Sciences).

The department of Physiology teaches and does scholarly work on physiological mechanisms of significance to medicine. In both teaching and research, the orientation of the department is broad, encompassing single cell, organ, and total body function.

The Department of Physiology participates in a program of instruction leading to the Doctor of Philosophy degree with a major in physiological sciences through the Committee on Physiological Sciences. For admission and degree requirements, please see the Graduate Catalog. A Master of Science degree is offered only in rare instances when individuals qualified to study for the Ph.D. were forced to terminate their graduate education.

In addition to the courses listed below, the Department of Physiology offers temporary courses in the following areas, subject to faculty availability and student interest: neurophysiology, renal physiology, physiology of muscle, endocrinology, peripheral vascular physiology, muscle and developmental physiology, membrane transport processes in physiology, and cardiac physiology.

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 A.M.E. 418, Ch.E. 418 and E.C.E. 418)

419. Physiology Laboratory (2) I Laboratory experiments in physiology intended to provide experience and measurement techniques. Designed for engineering students enrolled in the clinical engineering and biomedical engineering options. 6L. Open to nonmajors only. (Identical with A.M.E. 418, Ch.E. 418 and E.C.E. 418)


495. Physiology Laboratory (1) II Experiments intended to reinforce principles of physiological phenomena; designed primarily for students in pharmacy and health related sciences. Open to pharmacy majors; others should consult department before enrolling. P, Chem. 243b, Math. 123, Phys. 102b, CR, 480. (Identical with Tox. 480) May be convened with 581.

503. Cellular Physiology (4) I Fundamental changes, by examining mechanisms which operate at the cellular level. Topics include organelle structure and function, transport processes in physiology, and cardiac function. P, Chem. 243b, Math. 123, Phys. 102b, CR, 503. (Identical with Math. 160.) May be convened with 595z.

509. Principles of Cellular and Molecular Neurobiology (4) I (Identical with Nrsc. 588) 598. Principles of Systems Neurobiology (4) I (Identical with Nrsc. 589)


581. Physiology Laboratory (1) II For a description of course topics, see 481. Graduate-level requirements include demonstration of in-depth understanding of human physiology through several written assignments. P, Chem. 243b, Math. 123, Phys. 102b, CR, 581. (Identical with Tox. 580) May be convened with 595z.

582. Topics in Neuromuscular Physiology (2) I 1989-90 (Identical with Nrsc. 582) 591. Seminar (3-12) [Rpt./2 units] I


601. Systems Physiology (8) II Comprehensive coverage of systemic physiology with emphasis in the underlying principles of function. Provides an overview of systemic level neuroendocrine function and cellular and organ systems. Open to nonmajors only. (Identical with Med. 602a and 801) 103b, 104b, 214b, 241b, 243b, Phys. 102b. May enroll for credit in 602 or 601, but not both. Consult department before enrolling.

602. Systems Physiology for Neuroscience Students (7) II Comprehensive coverage of systemic physiology, with emphasis on the underlying principles of function. Includes overview of cardiovascular, renal, respiratory, gastrointestinal, and endocrine physiology and cellular and organ systems. Open to nonmajors only. (Identical with Med. 602a and 801) 103b, 104b, 214b, 241b, 243b, Phys. 102b. May enroll for credit in 601 or 602, but not both. Consult department before enrolling.

605. Neurosciences (6) II (Identical with Anat. 605)

610. Research Methods in Physiology (1-3) I I Laboratory course providing students with an understanding of the types of research available in the department. (Maximum length is 8 weeks.) Consult with department before enrolling.

695. Colloquium a. Motor Control (2) [Rpt./8 units] II (Identical with Ex.S.S. 695a)

696. Seminar a. Physiology Society (1) [Rpt./3] II Open to majors only.

700. Human Physiology (6) II

805. Neurosciences (6) II (Identical with Anat. 805)

901. Preceptorship a. Physiology (3-12) [Rpt./12 units] I


*Available as both 595 and 895

Planetary Sciences (PTYS)
Space Sciences Building, Room 325
(602) 621-6963


Participating Scientists from the Lunar and Planetary Laboratory.
105. The Universe and Humanity: Origin and Destiny (3) I Fall. Survey of the origins of the universe, the solar system, and life; evolution which led to our existence; the future of life in the solar system; life elsewhere. Designed for nonscientists. (Identical with Astr. 105)

106. Survey of the Solar System (4) A) I Interdisciplinary synthesis of planetary and space science; the sun, planets, satellites, interplanetary gas, comets, small bodies, space missions. Designed for nonscientists. 3R, 3L, P. Math. 179NS (Identical with Astr. 106 and Geos. 106)


411. Introduction to Planetary Geology (4) I Fall 1990-91 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.

503. Introduction to the Solar System (3) I Fall 1989-90 For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper on a selected topic and an oral and written examination. This course may count toward the major requirements in planetary sciences. P. Phys. 103a-103b. (Identical with Astr. 503 and Geos. 503) May be convened with 503.

504. Exploration of the Solar System (3) I S Spring 1989-90 Exploration of planetary surfaces, including that of the Earth, with remote sensing. Emphasis on compositional determination using visible and infrared methods. Basic principles, image and spectroscopic analysis techniques, geologic and astrogeologic sample studies, and planetary remote sensing. (Identical with Astr. 555 and Geos. 555)

556a-556b. Electrodynamics of Conducting Fluids and Plasmas (3-3) 1990-91 Geophysical and astrophysical processes and magnetohydrodynamics. (556a) Introduction; discussion of solar wind and planetary magnetospheres, with a focus on interplanetary and interstellar interactions. (556b) Introduction to geophysical electrodynamics. P. Phys 415a-415b. (Identical with Astr. 556a-556b and Phys. 556a-556b)


567. Inverse Problems in Geophysics (3) I Fall 1990-91 (Identical with Geos. 567)

571. Constitution and Evolution of the Terrestrial Planets (3) 1989-90 Geophysically and geochronologically driven processes used to deduce composition and evolution of terrestrial planets. Topics include the Earth, Moon, Mars, Venus, Mercury, and the terrestrial satellites and Moons. (Identical with Geos. 571 and Phys. 571)

582. High Energy Astrophysics (3) II 1989-90 (Identical with Astr. 582)

589. Topics in Theoretical Astrophysics (3) (Identical with Phys. 589)

596. Seminar in Planetary Science (3) (Identical with Phys. 596)

518. Modern Astronomical Instrumentation and Techniques (3) I 1989-90 (Identical with Astr. 518)

519. Global Tectonic Processes (3) II (Identical with Geos. 519) May be convened with 419.

520. Meteors (3) I Fall 1990-91 Classification; chemical, mineralogical and isotopic composition, potential sources, interaction with the solar and terrestrial environment, relation to comets and asteroids. P. 510. (Identical with Geos. 520)

527. Planetary Geodynamics (3) I (Identical with Geos. 527)

530. Chemical Evolution of the Earth (3) I (Identical with Geos. 530)

544. Physics of High Altitudes (3) I Fall 1989-90 Physical properties of upper atmosphere, including gaseous composition, temperature and density, ionosphere, and mesosphere, with emphasis on changes in tephra and eddy transport. (Identical with Atmo. 544)

545. Stellar Atmospheres (3) I 1989-90 (Identical with Geos. 545)

551. Satellite and Planetary Perturbation Theory (3) II Two- and three-body problems; potential theory; Lagrange's planetary perturbation equations; methods of solution, application of the results (Identical with M.A.P. 551)

555. Remote Sensing of Planetary Surfaces (3) I Spring 1989-90 Exploration of planetary surfaces, including that of the Earth, with remote sensing. Emphasis on compositional determination using visible and infrared methods. Basic principles, image and spectroscopic analysis techniques, geologic and astrogeologic sample studies, and planetary remote sensing. (Identical with Astr. 555 and Geos. 555)


567. Inverse Problems in Geophysics (3) I Fall 1990-91 (Identical with Geos. 567)

571. Constitution and Evolution of the Terrestrial Planets (3) 1989-90 Geophysically and geochronologically driven processes used to deduce composition and evolution of terrestrial planets. Topics include the Earth, Moon, Mars, Venus, Mercury, and the terrestrial satellites and Moons. (Identical with Geos. 571 and Phys. 571)

582. High Energy Astrophysics (3) II 1989-90 (Identical with Astr. 582)

589. Topics in Theoretical Astrophysics (3) (Identical with Phys. 589)

596. Seminar in Planetary Science (3) (Identical with Phys. 596)

602. Analytic Methods in Planning and Management 597. Workshop be convened with 483.


573. Geology and the Urban Environment (3) (Identical with Geog. 563) May be convened with Geog. 561.

571. Problems in Regional Development (3) I (Identical with Geog. 571) May be convened with W.S.M. 250.

539. Perception of Environment (3) I (Identical with M.A.P. 507).

540. Project Planning and Modeling (3) I (Identical with M.A.P. 507).


543. Site Planning (2) I (Identical with M.A.P. 507).

544. Planning the Built Environment (2) I (Identical with M.A.P. 507).

611. Projects in Regional Planning (1-5) (Rpt./1) I (Identical with M.A.P. 610).


552. Efficiency Analysis in Health Administration (3) I (Identical with M.A.P. 655).

553. Spatial Analysis (3) I (Identical with M.A.P. 655).

554. Growth Controls (3) I (Identical with M.A.P. 655).

562. Aging and Public Policy (3) I (Identical with M.A.P. 662).


693. Internship h. Land-Use Regulation (3) I (Identical with M.A.P. 696), which is home.

696. Seminar "The General Plan (3) [Rpt./6 units] I (Identical with M.A.P. 696), which is home.

575a-575b. General Mycology (3-3) 1990-91 Comprehensive study of fungi, including their ecological importance. 575a: Basidiomycetes and associated agents of plant pathology, with emphasis on diseases caused by fungi. 575b: Ascomycetes and Fungi Imperfect: 575b. Xycomycetes, Pyrenomycetes, and Ascomycetes. 2R, 3L. P, 457. 575a is not prerequisite to 575b.

561. Plant Pathology (PLP) I (Identical with M.A.P. 668). The department offers the degrees of Bachelor of Science in Agriculture, Master of Science and Doctor of Philosophy with a major in plant pathology. Courses are designed to acquaint students with causal agents of plant diseases, techniques used to manipulate pathogens, epidemiological and physiological aspects of plant-pathogen interactions, and procedures used to control or prevent diseases of plants. Major: Students enrolled in the B.S. program must complete course work in six study areas, as listed under the general education requirements in the College of Agriculture section of this catalog.

601. Plant Pathogenic Fungi (3) I (Identical with M.A.P. 668). Current literature and concepts concerning the structure, function, classification, genetics, and ecology of plant pathogenic fungi. 2R, 3L. P, 457. 575a is not prerequisite to 575b.

bolic alterations in plants in response to patho-

694. Practicum

Plant Protection
Committee on Plant Protection (Graduate)
The Committee on Plant Protection, an inter-
departmental committee in the College of Agri-
culture, offers a program leading to the Master of
Science degree with a major in plant protection.
For admission and degree requirements, please see the Graduate Catalog.

Plant Sciences (PLS)
Forbes Building, Room 201
(602) 621-1977

Professors Brian A. Larkins, Head, Paul G. Bar-
tels, Robert E. Briggs, Albert K. Dobrenz,
Lloyd W. Gay, Keith C. Hamilton, Merle H.
Jensen, Richard G. Jensen, Fred T. Kot-
terminal, Jr., Jack R. Mauney (Adjunct),
Robert G. McDaniel, Norman F. Oebker,
Mark E. Thomas, J. McCoy.

Assistant Professors Douglas A. Bailey, Janice
M. Coons, Alan H. Goldstein, Fredric R. Lehe,
Charles F. Mancino, Victoria Marcari
(Research), Steven P. McLaughlin (Adjunct),
William B. Miller, John W. Moon, Karen K.
Oishi, David A. Palzkill, Dennis T. Ray, Steven
E. Smith.

Assistant Research Scientists Jon P. Chernicky,
Esmail Faramahi, John J. McGrady

Extension Specialists Donald J. Garrot, Jr., E.
Stanley Heathman, Michael W. Kilby, David
M. Kopec, Michael J. Ottman, Jeffrey C.
Silvertooth.

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 Agricul-
ture is available to undergraduate students with majors in agronomy, horticulture, and plant sciences. A minor is also available in the above three areas.

Undergraduate students must complete course work in five of the six study areas, as listed under the general education require-
ments in the College of Agriculture section of this catalog.

The majors in agronomy, horticulture, and plant sciences: The following courses are required for each of the above majors: Chem.
102a-103b, 104a-104b, 241a-241b, 243a-243b; Math. 124 or equivalent; M.C.B. 181; Phys. 102a, 103a or 180a; P.S. 100, 101, 312, 495a and a
course in plant physiology. Each major requires an additional minimum of 12 upper-division units chosen from the departmental course offerings depending on the area of the students interest and selected in consultation with a
major advisor.

The agricultural business curriculum: Students selecting this curriculum may major in agronomy, horticulture or plant sciences. Students must complete the requirements for any of the majors as indicated above with the
exception that only one of the following courses is required: H.E.E. 220, H.E.E. 221, H.E.E. 425, Agric. 451 or Plant Pathology 451.

Additional course requirements for the agricultural business curriculum are Acc. 200, A.Ec. 213, 215, 450, and three courses from the
following: Econ. 300, 330, Accct. 210; M.A.P. 320;
A.Ec. 213, 313, 403, or 404.

A three-semester-formal education option is available to students with majors in horticulture or agronomy. Students choosing this option will take A.Ec. H.E.E. 220, H.E.E. 221, H.E.E. 425, Agric. 451 or Plant Pathology 451, plus two selective courses from an approved list available from the student's advisor.

The minor in agriculture, horticulture, or plant sciences: Students may obtain a minor in agronomy, horticulture, or plant sciences. Twenty units are required from the departmental course offerings with the prerequisites satisfied in consultation with the student's major advisor. 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 economic plant species; how these plant pro-
cesses are affected by the environment.
101. Plant Sciences Laboratory (1) I II Lab-
oratory exercises in plant sciences. P or CR, 100.
130. Home Gardening (2) I II Care and main-
tenance of home gardens, hedges, and lawns; principles of transplanting, pruning, and plant protection.
220. Microcomputers in Agriculture (2) I II Introduction to the use of microcomputers for disciplines in the College of Agriculture, 1R, 3L.
234a-234b. Plant Materials (3-3) I I (Identical
with Agri. 220) 234a-234b, Plant Materials (3-3) I I (Identical
with Agri. 220) 234a-234b.
312. Plant Genetics (4) Critical examination
of the various theories of heredity and their application to plant breeding, including demonstra-
tions illustrating genetic factors in economic plant sciences: Students may obtain a minor in
the student's major advisor.

330. Plant Propagation (3) I Principles and prac-
tices of plant propagation by seed and asexual methods, including use of growth reg-
ulators, rooting media and misting systems. Physiolog-
ical basis of propagation methods will be emphasized. 2R, 3L, P, 100, 101, and one
semester of chemistry.
339. Nursery Systems Management (3) I II 1990-91 Principles and practices of nursery operations: control of environmental factors and cultural practices involved in nursery produc-
tion of plants. P, 227a, 312 or Ecol. 320, A.Ec.
343. Floriculture Crop Production (3) I II 1990-91 Environmental and nutritional require-
ments of horticultural plants; applied plant phys-
354. Landscape Horticulture (3) I 1989-90 Horticulture practices which influence perfor-
mance of plants in the landscape. Installation, establishment and maintenance of plants in the landscape. 2R, 3L, P, 234a-234b, Ecol. 260.
355. Turfgrass Science and Culture (3) I 1990-91 Species, growth and development, use
and establishment, and environmental stresses influencing cultural practices. P, 100, 101.
361. Vegetable Production (3) I Vegetable indus-
tries, including climatic adaptation, culture, and special requirements for vegetable crops. P, 100, 101.
364. Orchard Management (3) I 1990-91 Prin-
369. Fiber and Oiled Seed (3) I 1990-91 Principles and practices of growing and har-
372. Principles of Grain Crop Production (2) I 1989-90 Environmental, genetic and eco-
nomic aspects of major grain crop plant development and production. P, 100, 101.
405. Weed Science (3) I Principles and effects of weeds on economic plant sciences; methods of controlling agronomic and horticultural weeds, with emphasis on chemical control methods; weed identification. 2R, 3L, P, 6 units of plant sciences. May be convened with 505.
415. Principles of Plant Breeding (3) I II Application of the principles of genetics, botany and agriculture. May be convened with 532 or Ecol. 320.
515. Principles of Plant Breeding (3) I II Application of the principles of genetics, botany and agriculture. May be convened with 532.
521. Research Methods in Plant Sciences (3) I Principles and techniques used in the design and implementation of experiments including the hypoth-
ture review. P, 361, Ecol. 260 or M.C.B. 460. May be convened with 452.

561. Selected Methods in Plant Physiology
(4) I Current techniques for qualitative and quantitative studies of physiological and biochemical processes. 1R, 5L. Ecol. 361, M.C.B. 460. I

562. Plant Immunoregulatory Metabolism (3) II 1990-91 (Identical with M.C.B. 562)

564. Plant Growth and Development (3) II 1989-90 (Identical with M.C.B. 564)


582. Plant Cell and Tissue Culture (3) I For a description of course topics, see 482.

615. Plant Tissue Culture (3) I 1990-91 Plant processes, modification of environmental interactions in relation to growth of crop plants, with emphasis on recent advances and research techniques. P, Ecol. 260 or M.C.B. 460.

631. Advanced Genetics (3) I 1990-91 Strand and tetrad analysis; chromosome structure and organization; recombination at the molecular level and gene conversion. Mutations, classification and origins; genetic complementation and its relation to a genetic unit and its function. P. 312 or Ecol. 320. (Identical with Gene. 627) I

631. Advanced Genetics (3) I 1990-91 Strand and tetrad analysis; chromosome structure and organization; recombination at the molecular level and gene conversion. Mutations, classification and origins; genetic complementation and its relation to a genetic unit and its function. P. 312 or Ecol. 320. (Identical with Gene. 627) I

637. Advanced Cytogenetics (4) I 1990-91 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 Gen. 635) I

638. Genetics of Plant Cell Cultures (2) I 1989-90 Comprehensive study of the genetic changes that occur during growth of plant cells, and genetic manipulations in vitro including mutant selection, genomic rearrangements, somatic hybridization and transformation. P. 312 or Ecol. 320, Ecol. 260 or M.C.B. 460. (Identical with Gene. 638) I

696. Seminar
a. Plant Science (1) [Rpt.4]. I

b. Political Science (POL)

Political Science (POL)

Social Sciences Building, Room 315 (602) 621-7600


Assistant Professors Paul G. Buchanan, Richard Jankowski, Deborah R. Mathieu, John P. Willenort

The Department of Political Science offers courses on the philosophies, processes, organizations, methods, and policies of government and 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 military.

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 Arts in Political Science are also available. For information on graduate degrees, please see the Graduate Catalog.

Major: Thirty units of course work in political science must be taken, including 102 and at least one of the following: 120, 140, 160. At least 18 units of this course work must be upper-division course (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.

Teaching minor: Twenty units of course work in political science must be taken, including 102 and either 130 or 214 (110 is not applicable). At least 18 units of these 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:

Teacher certification: The U.S. and Arizona Constitutions requirement for a teacher's certification may be satisfied by three course options: 102, 130, 102, 214; or 110. An additional option is the constitutional 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. Chapters of the American Political Science Association and the American Society for Public Administration 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 242a, 242b, 247.

102. American National Government (3) I II General survey of the constitutional basis, 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 structures, policies, institutions and processes of the Western European and Asian political systems. Course includes a view to preparation for more advanced study.

160. Introduction to Political Ideas (3) I II Basic issues in political thought, with emphasis on the development of ethical, political, philosophical, and theological ideas over time. Credit allowed for this course or 242a, but not for both.

206. Public Policy and Administration (3) I II Theory and practice of executive agencies, governmental and nongovernmental organizations, the policy making and other functions, processes, personnel, and fiscal management, and administrative law.

214. Arizona Government (1) Arizona constitutional requirements, government processes and government within the American political system.

227. Nuclear Age (3) I 1989-90 (Identical with Hist. 227)

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, regionalism, international relations, environmental policies, Canadian-U.S. relations.

242a-242b. Western European Political Systems (3) I Examination of the ideological framework, political cultural traditions, political systems, and processes of the Western European political systems. 242a: Britain, Ireland, and France. 242b: Germany, Italy, and Spain. 242a is not pre-requisite to 242b.

247. Introduction to Latin-American Politics (3) I Survey of the political forces and social groups important in shaping contemporary Latin America: mestizos, slaves, and their descendants; peasants, landlords, labor, the middle sectors, and the military; discussion of theories of instability.

250. Contemporary International Politics (3) I Analysis of conflicts of national interests; decision making in the present international system; role-playing and simulation experience.

252. Political Science with the minor in United Nations and its agencies, with emphasis on major issues confronting the organization.

260. Politics and the Vietnam War (3) I The international system, Vietnamese history, and the different forms of political systems, political institutions, and political processes.

264. War and Peace in the World (3) I History and political development of the nation and its neighbors, with emphasis on the role of demography and resources.
290. Politics and the Novel (3) I Discussion and analysis of significant political questions as seen through the eyes of 19th and 20th century novelists, including Balzac, Maupassant, Orwell, Waugh, Bellow, Malraux, Camus, and Zola. (Identical with Engl. 290)

297. Workshop I (1-6) May be convened with 509.

299. The Judicial Process (3) I Structure, function, and theory of the "third branch" of the American government.

315. Political Sociology (3) I (Identical with Soc. 315)

325. Problems in Contemporary Political Theory (3) I Intensive examination of selected problems and concepts in political theory.

330. Minority Groups and American Politics (3) I The problems of the poor, analysis of systematic poverty in the U.S. and economic causation; selected policy problems: education, housing, job training, enforcement of antidiscrimination statutes; future of "power" movements. (Identical with Bl.S. 330 and M.A.S. 330)

331. Politics and the Labor Movement (3) I The role of the labor movement in American politics, its organization and structure, personalities, and issues that have initiated major changes in American society. A special concentration on legislation and litigation establishing contemporary labor rights.

332. Politics of the Mexican-American Community (3) I Political structure and processes of the Mexican-American community, with emphasis on the history, sociology, behavior, and class; future trends; bibliography. (Identical with M.A.S. 332)

333. Political Research and Methodology (3) I Introduction to research design and methods, with attention to philosophical foundations of modern political science.

334. Politics and American Indians (3) I Examination of public policy on American Indians and analysis of the political culture of American Indian communities. (Identical with A.H. 334)


393. Internship I a. Administrative Internship (1-6) [Rpt/6 units] I S 090H. Honors Proseminar (3) I 496. Bureaucracy, Politics, and Policy (3) I Description and analysis of the executive branch of government: how federal agencies capture policy-making; why bureaucracy develops; the rules of bureaucratic culture; who controls the administrative branch. May be convened with 506.

407. Congress and American Politics (3) I Examination of policy-making, personalities, and career patterns of congressional members, the organization and structure of Congress, and the role of Congress in policy leadership and representation of the public. May be convened with 507.

408. Parliamentary Procedure (3) I (Identical with Comm. 408)

409. Style in the Presidency (3) I Examination of the campaign strategies and tactics of those seeking the nation's most powerful office from 1960 to the present through films and readings. May be convened with 509.

412. Local Government and Administration (3) I Examination and analysis of local decision-making structures and their policy outputs. May be convened with 512.

421. Ancient and Medieval Political Theory (3) I Development of Western political thought from the Greeks to Machiavelli. May be convened with 521.

422. Early Modern Political Theory (3) I Western political thought from Machiavelli to Marx. May be convened with 522.

423. Modern Political Thought (3) I Political thought from Marx to the present. May be convened with 523. Writing-Emphasis Course**

426. American Political Thought (3) I American political ideas from colonial times to the present.

431. Political Culture and the Dynamics of Change in American Society (3) I Examination of the ways in which attitudes about politics and political problems are acquired from exposure to music and television, and the manner in which such attitudes lead to political action. May be convened with 531.

432. Preference Groups (3) I Formation, structure, and place of pressure groups in the democratic society; the function of interest groups in the political process, with emphasis on political parties, internal organization, and membership loyalty. May be convened with 532. Writing-Emphasis Course.

436. Political Socialization (3) I Description and analysis of how and why people wield, and respond to, authority. Based on the assumption that people's reactions to the public order are influenced by the private order activity or disorder of their childhoods. May be convened with 536. Writing Emphasis Course**

437. Democratic, Emerging, and Evolving (3) I Analysis of conditions of stability and breakdown of democratic regimes with particular emphasis on the developing democracies of the third world. May be convened with 537. Writing-Emphasis Course**

438a. Philosophy of Law (3-3) I (Identical with Phil. 438a-438b) May be convened with 538a. Writing-Emphasis Course**

440. Politics and Mythology (3) I The role of the non-rational/irrational in politics: cults, utopias, crusades, conspiracies, cultural revitalization movements. Writing-Emphasis Course**

441. Arab-Israeli Conflict (3) I Traces the birth and growth of the Arab-Israeli conflict since 1948 with particular attention to the internal impediments to conflict resolution on both the Arab and Israeli sides. Also surveys the role of the Great Powers in Middle East politics generally. (Identical with Or.S. 441) May be convened with 541.

442. Transformation of Agrarian Societies in the Middle East (3) I (Identical with Or.S. 442) May be convened with 542.

443. Soviet Politics (3) I Revolution and continuity in the development of a political system: parties, organizations, economic and social planning, citizens, models of autocracy and pluralism. 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. May be convened with 544.

445. Comparative Political Revolution (3) I Examination of 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**

446. Politics of Developing Areas (3) I Survey of politics and problems in Asia, Africa, and Latin America, including political violence, elections, bargaining, elites, parties, and the military, and ideology.

447. Latin-American Political Development (3) I Presentation of strategies for development in Latin America, with emphasis on case studies from Cuba, Brazil, Chile, Guatemala, and other countries. May be convened with 547.

448. Government and Politics of Mexico (3) I Development of Mexico's political institutions, its political system, and its foreign policy, with emphasis on Mexican-U.S. relations. (Identical with M.A.S. 448) May be convened with 548.

449. The Politics of Cultural Conflict (3) I The role of the media in the creation of political conflict and the decision-making process in Mexican-U.S. relations. May be convened with 549.

450. Religion and Politics (3) I A comparative examination of the relationship between religion and politics in the United States and the Middle East. (Identical with Rel. 450) May be convened with 550.

451. Soviet Foreign Policy (3) I End and disintegration of the Soviet Union, and its foreign policy. May be convened with 551.

452. Communist Foreign Relations (3) I Interrelations of fourteen Communist-party states, with emphasis on China's role in the world. (Identical with Rel. 452) May be convened with 552.

454. International Relations (3) I Introduction to the theories of international relations on the levels of the nation-state, the international system, and the international system, with a logical and empirical evaluation of approaches and theories. May be convened with 554.

455. American Foreign Policy (3) I Examination of the Cold War: Congressional-Executive debates over foreign policy control; approaches to American foreign policy. May be convened with 555. Writing-Emphasis Course**

456. International Law (3) The international state system, legal-political problems, including territory, environment, seas. 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 the state level in the United States and Latin America. May be convened with 557.

459. Problems of World Order (3) I Examination of complex, interrelated global problems, threats to survival, quality of life, and exploration of past and present policies and future worlds. Course is course-oriented and prescriptive. May be convened with 559.

460. China's Regional 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 policies from 1949 to the present. (Identical with Or.S. 460) May be convened with 560.

464. International Relations of East Asia (3) I Relations between China, the United States, Japan, Russia, and the Soviet Union, and influence of domestic politics in interstate relations in East Asia. (Identical with Or.S. 464) May be convened with 564.

467. Environmentalism and Environmentalism in the Middle East (3) I (Identical with Or.S. 467) May be convened with 567.

468. Government and Politics of Africa (3) I Might of the People and Government of African nations
470. Constitutional Law: Federalism (3) I I Development and analysis of constitutional law at the U.S. level; problems of distribution of powers. Graduate-level requirements include extensive research, readings, and research paper. May be convened with 471.

471. Constitutional Law: Civil Liberties (3) II I Analysis of the constitutional guarantees of civil liberties. May be convened with 470.

474. Administrative Law (3) I I Law governing the organization, powers, and procedures of the federal and administrative establishment, with emphasis on the limitations imposed by the American constitutional system. May be convened with 574.

475. Concepts in Criminal Law (3) I I Focus on questions such as what constitutes a crime; what is the meaning of criminal punishment; when is killing murder; what makes punishment just; what must exist between justifiable and excusable crimes.

476. Women and the Law (3) I I 1990-91 Legal status of women in America, including constitutional protections, marriage and family relationships, educational and vocational opportunities, political issues (identical with W.S. 476) May be convened with 576.

480. Formation of Public Policy (3) I I Needs and demands for public action on policy issues; organization and role of public support; processes and problems of decision making in the formation of public policy at the national, state, and local levels. Writing-Emphasis Course**

481. Environmental Policy (3) II I Role of government in management of energy, natural resources and environment; process and policy alternatives; non-governmental issues related to the environment. May be convened with 581.

484a-484b. Development of Federal Indian Policy (3-3) 484a: European colonial precedents through the treaty-making period. 484b: End of treaty-making to the present. 484a is not prerequisite to 484b. (Identical with A.I.S. 484a-484b) May be convened with 584.

485. National Security Policy (3) I I Decision-making structures, processes, and outcomes relevant to American security policy, comparison with the Middle East (identical with Or.S. 486) May be convened with 585.

486. Political Systems of India and Pakistan (3) II (Identical with Or.S. 486) May be convened with 586.


489. The Politics of National Policymaking (3) I I Analysis of institutional and political basis for cooperation and conflict between Congress, the President, and the Court in different policy areas. May be convened with 589.

490. Seminar a. Russian and Soviet Studies (3) (Identical with R.S.S. 490a, which is home) For a description of course topics, see 406.

506. Bureaucracy, Politics, and Policy (3) I I For a description of course topics, see 406. Graduate-level requirements include additional research paper. May be convened with 406.

507. Congress and American Politics (3) I I For a description of course topics, see 407. Graduate-level requirements include a higher level of performance on term paper or research paper, and/or an additional paper of 8-10 pages. May be convened with 407.

509. Struggle for the Presidency (3) I I For a description of course topics, see 409. Graduate-level requirements include an additional research paper. May be convened with 409.

512. Local Government and Administration (3) I I For a description of course topics, see 412. Graduate-level requirements include an additional research paper. May be convened with 412.

521. Ancient and Medieval Political Theory (3) I I For a description of course topics, see 421. Graduate-level requirements include an additional research paper. May be convened with 421.

522. Early Modern Political Theory (3) II For a description of course topics, see 422. Graduate-level requirements include an additional research, readings, and research paper(s). May be convened with 422.

523. Recent Political Thought (3) I I 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.


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 an extended 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 an extended 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 I For a description of course topics, see 436. Graduate-level requirements include an extended research paper. May be convened with 436.

537. Democracies, Emerging and Evolving (3) I I For a description of course topics, see 437. Graduate-level requirements include additional research and reading and a research paper. 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 an additional research paper. (Identical with Or.S. 541) May be convened with 441.

542. Transformation of Agrarian Societies in the Middle East (3) II (Identical with Or.S. 542) May be convened with 442.

543. Soviet Politics (3) I I For a description of course topics, see 443. Graduate-level requirements include additional 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 research, readings, and research paper(s). May be convened with 444.

545. Comparative Political Regulation (3) I I For a description of course topics, see 445. Graduate-level requirements include extended research and a research paper. May be convened with 445.

546. The Political American Political Development (3) II For a description of course topics, see 446. Graduate-level requirements include additional course readings. Open to juniors and seniors only. May be convened with 446.

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. May be convened with 448.
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. International Political 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 W.R.A. 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) III 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 additional research, readings, and paper(s). 584a is not prerequisite to 584b. (Identical with A.In.S. 584a-584b) May be convened with Southwestern Indian Policy.

585. Political Risk and Intelligence Analysis (3) II Examination of political risk and intelligence analysis with emphasis on forecasting problems in international business.

586. Political Systems of India and Pakistan (3) III (Identical with Or.S. 586) May be convened with 486.

587. New 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. and B.S. 587) May be convened with 487.

588. The Politics of National Policymaking (3) I For a description of course topics, see 488. Graduate-level requirements include additional term paper. May be convened with 489.

595. Colloquium a. American Political Institutions (3) I II
b. Political Behavior (3) I II
c. Survey of Political Theory (3) I II
d. Comparative Politics (3) I II
e. International Relations (3) I II
g. Public Policy (3)

596. Seminar a. American Political Institutions (3) [Rpt./2]
b. Political Behavior (3) [Rpt./2] I II (Identical with Comm. 596b)
c. Political Theory (3) [Rpt./2] I II
d. Comparative Politics (3) [Rpt./2] I II
e. International Relations (3) [Rpt./2] I II
f. Public Law and the Judicial Process (3) [Rpt./2] I II
g. Public Policy (3) [Rpt./2] I II
h. American Indian Law and Policy (3) [Rpt./2] I II (Identical with A.In.S. 596h)
i. Water and Equity in the Southwest (3) [Rpt./2] I II (Identical with R.N.R. 596)
j. Social Policy (3) [Rpt./2] I II (Identical with Hist. 596m, which is home)

610a-610b. Fiscal and Budgetary Administration of Public Agencies (3-3) (Identical with A.M.P. 610a-610b)

696. Seminar a. Public Choice I (3) II (Identical with Econ 696w, which is home)
b. Public Choice II (3) II (Identical with Econ. 696w, 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.)

Portuguese
(See Spanish and Portuguese)
405. Advanced Statistical Methods in Psychology (3) II Rationale and methods of statistical inference; analysis of variance, correlation, and regression. P. 255. May be convened with 503. Writing-Emphasis Course*.


412. Animal Learning (3) II Animal learning with emphasis on interspecies comparisons. P. 255. May be convened with 512. Writing-Emphasis Course*.

414. Personality and Social Development (3) I I Research and theory in developmental psychology with an emphasis on social cognition, social and emotional growth. P. 255, 315. May be convened with 514.

415. Cognitive Development (3) II Introduction to major theories, methods, and research findings associated with the development of cognition and intelligence. P. 255, 315. May be convened with 515.

416. Advanced Personality (3) I I Advanced study of personality theory, methods and results of personality study. P. 255, 316. May be convened with 516.

418. Abnormal Psychology (3) I II Nature and etiology of various forms of behavior disorder, mental deficiency, and other deviations; critical evaluation of current theories. P. 255. May be convened with 518.

421. Psychology of Death and Loss (3) I I Basic concepts in a psychology of death and loss, with emphasis on both the adjustment to death and loss, and the underlying phenomenal, humanistic and current social considerations. P. 255 or graduate standing. May be convened with 521.

427. Field Methods in Environmental Psychology (3) II Behavior in man-made or managed environments; field assessment and methods; designed for students having a professional interest in environmental design or management. P. 371 or graduate standing. (Identical with AR. 427 and LAR. 427) May be convened with 527.

428. Antisemitism (3) (Identical with Hist. 428)

430a-430b. Psychology, Law and Social Policy (3-3) Critical review of theory, methods and research in the psychology, law and social policy interface. P. 255, 300. 6 units of a social science, or graduate standing. 430a is not prerequisite for 430b. May be convened with 530a-530b.

435. Psychological Problems of the Aged (3) I Cognitive, intellectual, personality, and behavioral correlates of aging: general psychological theory to the problems of aging. P. 255, or 101 and two courses on gerontology or graduate standing. (Identical with Gerol. 435) May be convened with 535.

449. Social Cognition (3) [Rpt./6 units] I I Analysis of cognitive processes in the context of personality and social interaction; perception, memory, language, emotion, and behavior concerning self, others, and social situations.

450. Psychological Assessment and Testing (3) I I Evaluation of assessment procedures and their measurement of intelligence, aptitudes, personality, and interests; test theory, social implications. P. 255. May be convened with 550. Writing-Emphasis Course*.

452. Psychology of Creativity (3) I 1989-90 An analysis of the nature and nurture of creativity, including theories of major theories; concepts; assessment techniques, and cognitive, social and personality aspects. P. 255 or consult department before enrolling.

457. Mental Health and Mental Health (3) I Mental health in cross-cultural perspective; universal and culture specific disorders, traditional and western psychotherapy, cultural values in treatment. P. 101, 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. 255. May be convened with 558.

462. Human Memory and Cognition (3) II Human memory, learning, and cognition; emphasis on information-processing approach to results and theory. P. 255, 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.

474. History of Psychology (3) I 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. 255 and 6 upper-division units in psychology or graduate standing. May be convened with 579. Writing-Emphasis Course*.

480. Sleep and Sleep Disorders (3) I I Topics include sleepwake rhythms, sleep deprivation dreams, and the diagnosis and treatment of sleep disorders. P. 255, 300.

483. Topics in the Biological Bases of Behavior (3) [Rpt./1] I I Variable content (consult schedule). learning, cognition, perception, psycholinguistics, emotion, other aspects. P. 255 and 6 units of upper-division psychology, or graduate standing. May be convened with 583. Writing-Emphasis Course*.

487. Topics in the Cognitive and Affective Bases of Behavior (3) [Rpt./1] I I Variable content (consult schedule). physiological, cognitive, and motor systems; comparative psychology, others. P. 255 and 6 units upper-division psychology or graduate standing. May be convened with 587. Writing-Emphasis Course*.

489. Topics in the Social Bases of Behavior (3) [Rpt./1] I I Variable content (consult schedule). developmental psychology, personality, psychopathology, and others. Consult schedule. P. 255 and 6 units of upper-division psychology, or graduate standing. May be convened with 589. Writing-Emphasis Course*.

498. Computational Linguistics (3) I (Identical with Ling. 498) May be convened with 598.

496. Seminar a. Special Topics in Cognitive Science (3) I I Recent advances in cognitive psychology and related fields. May be 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. 101, 302, 306 or 8 units of biological lab. science. May be convened with 401.

502. Principles of Neuroanatomy (4) I I (Identical with Anat. 502)

503. Methods of Neurological Psychology (3) I I For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper on a single aspect of current problem in neurological psychology. P. 101, 255, 302. May be convened with 403.


507a-507b. Statistical Methods in Psychological Research (3-3) 507a: Research design, analysis and theory or method of social psychology. P. 255, 6 units upper-division psychology; or graduate standing. Open to psychology majors only.

509. History of Psychological Theories and Research (3) I I Development of psychological theories; major advances, famous investigators.

510. Advanced Social Psychology (3) I I For a description of course topics, see 410. Graduate-level requirements include an in-depth research paper on a single aspect of psychological comparisons, and computer techniques in psychological research. 507b: Selected methodological issues and multivariate methods in psychological research with computer applications. Open to psychology majors only.

511. Animal Learning (3) I I For a description of course topics, see 412. Graduate-level requirements include an in-depth research paper on a single aspect of animal behavior. P. 255. May be convened with 411.

512. Animal Learning (3) I I 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) I I 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, 313. May be convened with 414.

515. Cognitive Development (3) I I 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 I 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 I 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.

520. Neurobiology (3) [Rpt./1] I I 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 I For a description of course topics, see 421. Graduate-level requirements include an in-depth research paper on a single aspect of psychology and behavior. P. 101, 302 or 8 units of biological lab. science. 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. Cognitive Neuroscience (3) [Rpt./1] II Recent advances in the study of the human brain from an ethological/evolutionary perspective.

527. Field Methods in Environmental Psychology (3) [Rpt.] II A description of course topics, see 427. Graduate-level requirements include an in-depth research paper on an aspect of environmental psychology methods. P. 371 or graduate standing. (Identical with Arch. 527 and LAr. 527) May be convened with 427.

528. Cognitive Neuroscience (3) [Rpt./1] II Recent advances in the analysis of the neural bases of cognitive functions, such as learning, memory, and thinking.

530a-530b. Psychology, Law and Social Policy (3) [Rpt.] I For a description of course topics, see 430a-430b. Graduate-level requirements include an in-depth research paper on an aspect of psychology, law, and social policy. P. 255, 371 or graduate standing. 530a is not prerequisite to 530b. May be convened with 430a-430b.

535. Psychological Problems of the Aged (3) [Rpt.] I For a description of course topics, see 453. Graduate-level requirements include an in-depth research paper on an aspect of specific psychological problems of the aged. P. 255, or 101 and 371 or graduate standing. (Identical with Ger. 535) May be convened with 453.

540. Perception and Attention (3) [Rpt./1] II recent advances in the area 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 language processing and the contribution of linguistic theory to an understanding of psychological mechanisms.

544. Cognitive Neuropsychology (3) [Rpt./1] II 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 perception.

546. Environmental Cognition (3) [Rpt.] II Recent advances in the area of environmental cognition, with an emphasis on cognitive aspects of environmental psychology.

550. Psychological Assessment and Testing (3) [Rpt.] II For a description of course topics, see 450. 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) [Rpt.] I (Identical with Sp.H. 551) I (Identical with Sp.H. 551)

554. Culture and Mental Health (3) [Rpt.] I For a description of course topics, see 454. 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) [Rpt.] 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.

560. Law and Social Science (3) [Rpt./1] II Major issues in the relationship between law and social behavior in general, and law and psychology in particular.

562. Mental Health Policy (3) [Rpt./1] II Major issues in mental health policy, including law and policies relating to the clients and providers of mental health services, and the organization/structure of the system for delivering the services.

572. Human Memory and Cognition (3) [Rpt.] 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) [Rpt.] I For a description of course topics, see 473. Graduate-level requirements include an in-depth research paper on an aspect of natural language processing. P. 255 and 6 upper-division units in psychology. May be convened with 473.

575. History of Psychology (3) [Rpt.] I For a description of course topics, see 475. Graduate-level requirements include an in-depth research paper on an aspect of the history of psychology. P. 255 and 6 upper-division units in psychology. May be convened with 475.

579. Topics in the Cognitive and Affective Bases of Behavior (3) [Rpt./1] 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. Cognitive and Affective Bases of Behavior (3) [Rpt./1] II Cognitive and affective sequelae of human central nervous system disease/damage, with emphasis on clinical evaluation, management, and rehabilitation.

581. Topics in the Biological Bases of Behavior (3) [Rpt./1] II For a description of course topics, see 481. Graduate-level requirements include an in-depth research paper on an aspect of biological bases of behavior. P. 255 and 6 units of upper-division psychology or graduate standing. May be convened with 481.

583. Topics in Social Bases of Behavior (3) [Rpt./1] II Recent advances in research and theory concerning psychological contributions to health maintenance, illness prevention and treatment, and the organization of health services.

585. Contemporary Issues in Psychology (3) [Rpt.] I For a description of course topics, see 485. Graduate-level requirements include an in-depth research paper on contemporary psychological research. P. 255 and 6 units of upper-division psychology; or graduate standing. May be convened with 485.

587. Topics in Individual Bases of Behavior (3) [Rpt./1] II For a description of course topics, see 487. Graduate-level requirements include an in-depth research paper on an aspect of individual bases of behavior. P. 255 and 6 units of upper-division psychology; or graduate standing. May be convened with 487.

588. Computational Linguistics (3) [Rpt.] I (Identical with Ling. 588) May be convened with 488.

596. Seminar (3) [Rpt.] I Recent advances in the area of cognitive psychology, with an emphasis on the contribution of the brain to cognitive activities including memory, thinking, learning, and perception.

597. History of Psychology (3) [Rpt./1] II For a description of course topics, see 473. Graduate-level requirements include an in-depth research paper on an aspect of the history of psychology. P. 255 and 6 upper-division units in psychology. May be convened with 473.
Religious Studies (RELI)

Modern Languages Building, Room 371 (602) 621-7416

Committee on Religious Studies

Professors James Boheek (Sociology), Joseph L. Cowan (Philosophy), Robert Gimello (Classics), David Soren (Classics), John Ulrich (English), Donald Weinstein (History) Lecturer Robert A. Burns, Chairperson, (Classics)

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, 439, 522). 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 Religions of the Western World: Judaism, Christianity, Islam.

126. Greek Mythology (3) I (Identical with Clas. 126)

130. Asian Religions (3) I II (Identical with Or.S. 130)

140. South Asian and Middle Eastern Traditions (3) I (Identical with Or.S. 140)

142. Chinese Traditions (3) I (Identical with Or.S. 142)

233. Philosophy of Religion (3) I (Identical with Phil. 233)

271. The History of Christianity (3) S (Identical with Hist. 271)


302a-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 Or.S. 330a-330b)

331. Taoist Traditions of China (3) I 1989-90 (Identical with Or.S. 331)

332a-332b. Judaic Thought and Culture (3-3) (Identical with Or.S. 332a-332b)

333. Buddhist Meditation Traditions (3) I (Identical with Or.S. 333)

340. Jesus in Contemporary Thought (3) I 1989-90 Survey of present thinking about the meaning of Jesus, including humanistic, Jewish, and various Christian interpretations.

348. Myth and Archetype (3) I II (Identical with Clas. 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 Or.S. 372a-372b)

374. The Holocaust (3) I II 1990-91 (Identical with Or.S. 374)

382. Archaeology and the Bible (3) II (Identical with Or.S. 382)

405a-405b. Medieval Europe (3-3) (Identical with Or.S. 405a-405b)

407. Intellectual History of Medieval Europe (3) II (Identical with Hist. 407)

408. The Renaissance (3) I II (Identical with Hist. 408)

409. The Reformation (3) II (Identical with Hist. 409)

410. History of Hell in Early Europe (3) II (Identical with Hist. 410)

411. Anthropology of Religion (3) I (Identical with Anth. 411)

416. Tudor-Stuart England (3) I (Identical with Hist. 416)

425. Women and Religion (3) I (Identical with Hist. 425)

428. Antisemitism (3) I II (Identical with Hist. 428)

430. Prophecy in Ancient Israel (3) II (Identical with Or.S. 430)

431. Indian Religion and Thought (3) I II 1989-90 (Identical with Or.S. 431)

432. Islamic Thought (3) I II (Identical with Or.S. 432)

445. Hindu Mysticism (3) I II 1990-91 (Identical with Or.S. 445)

450. Religion and Politics (3) I II (Identical with Pol. 450)

455. Spanish Inquisition (3) I II 1990-91 (Identical with Hist. 454)

456. Introduction to Rabbinic Literature (3) I II (Identical with Or.S. 456)

487a-487b. History of Eastern Buddhist Thought (3-3) (Identical with Hist. 487a-487b)

490. History of Byzantium (3) I II (Identical with Hist. 490)

490. Indian Religions and Spirituality (3) I II (Identical with A.in.S. 490)

499. Colloquium in Religious Studies (1) I (Identical with Hist. 499)

499. Colloquium in Confucianism: the Classical Period (3) I (Identical with Hist. 495s, which is home)

499. Colloquium in the Neo-Confucian Tradition (3) I (Identical with Hist. 495j, which is home)

Remote Sensing (REM)

1002 N. Warren Avenue, Room A17 (602) 621-4242

Committee on Remote Sensing

Professors Philip N. Slater (Optical Sciences), Charles B. Day (Geology), Victor R. Baker (Geosciences), Dinshaw N. Contractor (Civil Engineering), Lloyd W. Gay (Renewable Natural Resources), Benjamin N. Herman (Atmospheric Sciences), John A. Reagan (Electrical and Computer Engineering), Richard W. Reeves (Geography and Regional Development), Soroosh Sorooshian (Hydrology and Water Resources)

Remote sensing concerns the collection of information related in some way to the Earth's natural resources or remote environment. Images are primarily collected by satellite and aircraft systems in conjunction with localized ground-based surveys and measurements. The data is 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, Engineering, and Mines, and in the Office of Air Land Studies and the Optical Sciences Center. For further information concerning the minor, please see the Graduate Catalog.

696. Seminar in Remote Sensing (1) II 1990-91

Renewable Natural Resources (RNR/LAR/RAM/WSM/WFSC/ NRR)

Biological Sciences East, Room 325 (602) 621-7255


Assistant Professors: Philip Quinn, Robert M. Itami, Mitchell P. McClaran, E. Gregory McPherson, Bruce A. Roundy, Frank W. Telewski (Tree-Ring Laboratory), Martin R. Yoxle

Adjunct: Charles D. Ziebell

Extension Specialists George B. Ruyje, John R. Stair

Programs of the School of the Renewable Natural Resources concern the management of renewable natural resources for water, wood, forage, recreation, wildlife, fisheries, soil and aesthetic values.

The Bachelor of Science in Renewable Natural Resources degree is available with majors in natural resource recreation, range management, watershed management and wildlife and fisheries science. A Bachelor of Science in Agriculture under the agriculture business curriculum is available with a major in range management. Undergraduate minors are available in range management, natural resource recreation, watershed management, wildlife and fisheries. Bachelor of Science in Agriculture under the agriculture business curriculum is available with a major in range management, watershed management, wildlife and fisheries science or renewable natural resources studies.
Range Management (RAM)

The major in range management provides students with the background necessary to begin professional careers in management of rangelands for livestock production, wildlife habitat, watershed protection, and other range resource values. Students majoring in range management may obtain a Bachelor of Science in Renewable Natural Resources or a Bachelor of Science in Wildlife Management. The B.S. in Renewable Natural Resources meets standards for federal employment as a range conservationist and is recommended for students interested in ranch management, agricultural lending institutions, private consulting, international development, ranch appraisal or similar careers, and for preparation for graduate study in business/economics or related fields. Students in this curriculum may qualify for government employment by additional course work. The range management curriculum is accredited by the Society for Range Management.

All students must take: Engli. 101, 102 or 103H, 104H, 307 or 308; Comm. 100, 102; Econ. 201a; M.C.B. 181; Ecol. 182, S.W. 200, 201; and Math. 160 or 263, 456, 477 or 474; M.I.S. 111 or S.I.E. 170; R.N.R. 202, Ra.M. 305, 382, 416, 436, 446, 456, 467, 495a. Students electing the B.S. in Renewable Natural Resources must meet the requirements of the curriculum in natural resources plus the following additional courses: M.C.B. 460; Econ. 201b; Geos. 101a, 102a; Math. 160 or 263; Phys. 150a, 150b; S.W. 200, 201; R.N.R. 321; Ws.M. 422; Ra.M. 318; and at least 9 credits from the following courses: N.R.R. 381; Ws. M. 410, 460, 480; W.F.S. 325, P.S. 368. Students electing the B.S. in Agriculture must meet the requirements for the curriculum in agriculture business, plus the following additional courses: 6 additional elective credits in agriculture, 3 additional credits in physics, atmospheric science, geology, or chemistry; Math. 119, M.A.P. 275, 373 or 375 or A.Ec. 339; 33 credits in the business core (see agricultural business curriculum requirements).

A student minor in range management Twenty-two units of foundation courses must be completed before the minor is initiated. Foundation courses are: Chem. 103a-103b; M.C.B. 181; Ecol. 182, S.W. 200, 201; and Math. 160 or 263. Required courses in the minor total 13 or 14 units and are R.N.R. 202 or Ra.M. 305, 382, 416, 436, 446, and 456 or 486. To complete the minor, additional upper-division level courses totaling 6 or 7 units will be selected from the offerings in the College of Agriculture. Selection will be made after consulting an advisor in the faculty of range management.

305. Principles of Rangeland Management (3) I Historical, political, economic and biological factors affecting multiple-use management of rangelands; range management practices, including grazing management, prescribed fire, revegetation, erosion and plant control, inventory, planning, and economic analysis; relationships of species, biomes, ecosystems, and the environment including woody plants, wildlife, water and recreation on rangeland.

318. Field Studies in Rangeland Management (2) I Field course on current management of Arizona rangelands; includes field studies of range and nonmilitary areas, public land agencies, private ranches, Indian reservations to get firsthand knowledge of range vegetation and potential solutions for multiple-use management. Fee

382. Rangeland Plant Communities of the West (3) I Structure and function of western U.S. rangeland plant communities focusing on vegetation dynamics and anthropogenic influences. Laboratory includes classroom and field identification of communities and plant species. 2R, 3L. P. 301, 416, 418, 420, 495. May be convened with 516.


436. Grazing Management (3) II Application of knowledge of animal diet and nutrition, grazing behavior, and vegetation-soil-herbivore interactions to improve livestock production, range protection, and nutrient cycling. 1R, 3L. P, R.N.R. 321, 381, Ws.M. 422; Ra.M. 318; and at least 9 credits from the following courses: N.R.R. 381; Ws. M. 410, 460, 480; W.F.S. 325, P.S. 368. Students electing the B.S. in Agriculture must meet the requirements for the curriculum in agriculture business, plus the following additional courses: 6 additional elective credits in agriculture, 3 additional credits in physics, atmospheric science, geology, or chemistry; Math. 119, M.A.P. 275, 373 or 375 or A.Ec. 339; 33 credits in the business core (see agricultural business curriculum requirements).

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436. Grazing Management (3) II Application of knowledge of animal diet and nutrition, grazing behavior, and vegetation-soil-herbivore interactions to improve livestock production, range protection, and nutrient cycling. 1R, 3L. P, R.N.R. 321, 381, Ws.M. 422; Ra.M. 318; and at least 9 credits from the following courses: N.R.R. 381; Ws. M. 410, 460, 480; W.F.S. 325, P.S. 368. Students electing the B.S. in Agriculture must meet the requirements for the curriculum in agriculture business, plus the following additional courses: 6 additional elective credits in agriculture, 3 additional credits in physics, atmospheric science, geology, or chemistry; Math. 119, M.A.P. 275, 373 or 375 or A.Ec. 339; 33 credits in the business core (see agricultural business curriculum requirements).
Forest-Watershed Resources
Richard H. Hawkins, Program Leader

Watershed Management (WSM)

Watershed management courses, which consider the management needs of whole watersheds and their multiple uses, qualify the student for a professional career. Students may obtain a major in watershed management with an emphasis in watershed hydrology, forest-watershed management, or rural watersheds. The minor in watershed management provides students with the education needed to manage forests for multiple uses and beneficial uses of water resources on water and forest lands. The watershed management program is accredited by the Society of American Foresters.

In addition to the requirements for the curriculum in natural resources, the following courses are required for both options in watershed management: Chem. 103a, 103b, 104a, 104b; Econ. 201a, 201b; Eng. 201, 102 or 103h, 104h, 307 or 308; M.C.B. 181; Ecol. 182; Geol. 101a, 102a; Math. 160; Phys. 102a or 103a, 180a; Ra.M. 305; R.N.R. 100; S.W. 210, 205; Comm. 100, 102; W.S. 410, 460. 462. The watershed hydrology option also requires: Atmo. 171; M.C.B. 460; Chem. 241a; C.E. 471; Math 125a or 125b; Phys. 100b or 180b; Hyd. 305; 405 or 470; A.En. 406 or 407. S.W. 305; S.W. 410, 440, 480, 415, 440. 445. 440. The forest-watershed management option also requires: Chem. 24a and M.C.B. 460; or 9 units of m.a.p. electives. (3) S.C. 111 or S.I.E. 272; Math. 123 or 125a, N.R.R. 381; W.S. 250, 342, 408, 415, 422, 430, 440, 480, 481, 489; Wr.Sc. 325. Students in the forest-watershed management option selecting the m.a.p. electives may use up to 6 units of m.a.p. courses to fulfill their social science/humanities requirement.

Minors are available under both options 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, Ws.M 342, 410, and 460. Minors in forest-watershed management shall also select two courses from R.N.R. 321, Ws.M. 410, 440, and either Ws.M. 462 or hydrology shall select Ws.M. 462 and either A.En. 406, Hyd. 405, or S.W. 470.

250. Forest Pathology (3) (Identical with P.P. 250)
330. Introduction to Remote Sensing (3) (Identical with Geo. 330)
342. Silvics and Dendrology (4) (1 Application of ecological principles to forests; silvic properties and identification of American forest trees and shrubs. 3R. 3L. P. S.W. 200, Ecol. 182, R.N.R. 202)

408. Wildland Fire Management (3) (Principles of fire behavior in forest, range and other vegetation types; interrelationships of fuels, weather, and topography; pyrologic and combustion processes; effects of fire; fuel inventory; prevention; detection, and control techniques; fire danger rating and fire behavior modeling. May be combined with 525. G.E.M. 460) May be convened with 510. Writing Emphasis Course. 415. Mensuration (3) (Measurement and inventory of forest land, forest ground, raw materials, and construction materials. May be combined with 525.
420. Photogrammetry (1) (1-999-91) Aerial photographic planning for natural resource management. Techniques for planimetric and topographic mapping. 1R. 3L. P or CR. 422. May be convened with 520.

422. Photointerpretation (2) (2) Reading and interpreting aerial photographs; natural resource inventory from aerial photographs; remote sensing techniques. 1R. 3L. May be convened with 522.

430. Water Resources (2) (2) 1990-91 Harvesting, processing, and marketing of wood products. P. M.C.B. 181. May be convened with 525.

430. Forest Resource Management (3) (Decision making in the management of forest lands. 2R. 3L. P. 410, 415, 440. May be convened with 530.

440. Forest Resource Economics (3) (Economics of forest resources and services from forest lands; decision making in micro-forest resource management situations; supply and demand relationships for products of forest resources. P. Econ. 201a, 201b, Math. 123. (Identical with A.Ec. 440)

460. Watershed Hydrology (3) (Application of fundamental principles to quantifying the basic hydrologic processes occurring on watersheds. P. Geos. 100a; S.W. 200, 201, Math. 160. (Identical with Hyd. 460) May be convened with 560.

462. Watershed Management (3) (1) Evaluating the biophysical systems of the watersheds to include silviculture, range, mining, and recreation use. P. Geos. 100a; S.W. 200, 201; Math. 160. May be convened with 560.

502. Snow Hydrology (2) (2) 1990-91 Physical properties of snow, melt and runoff characteristics, measurements, water and flood water yield processing. P. 460 or C.E. 423. (Identical with Hyd. 502)


508. Weather Fire Management (3) (1) For a description of course topics, see 408. Graduate-level requirements include a research paper on a specific fire issue or problem in the student's professional discipline area. May be convened with 520.

510. Silviculture (3) (2) For a description of course topics, see 410. Graduate-level requirements include a scholarly paper on the application of hydrologic principles to problems related to arid land management. P. 342 or Ra.M. 382; Ecol. 182. May be convened with 410.

515. Mensuration (3) (1) For a description of course topics, see 410. 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) (2) 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. Graduate-level requirements include a scholarly paper on a special topic assigned by the instructor related to the management of ecosystems. May be convened with 540.

525. Wood Products (2) (1) For a description of course topics, see 425. Graduate-level requirements include a scholarly paper on a specific fire issue or problem in the student's professional discipline area. May be convened with 520.

530. Forest Resource Management (3) (1) For a description of course topics, see 430. Graduate-level requirements include a scholarly exercise and report on multi-resource management. P. 440, 510, 515. May be convened with 430.

531. Dryland Forest Management (3) (1) 1990-91 Utilization and management of forest resources in developing nations. Biophysical and socio-economic issues related to the development of forest commodities and amities. P. 6 units of upper-division Ws.M.

532. Agroforestry (3) (1) 1989-90 Ecological and socio-economic factors related to the planning and implementation of agroforestry systems. P. 6 units of upper-division Ws.M.

533. Urban Forestry (3) (1) 1989-90 Technical practices and social implications of fuelwood management in dryland ecosystems of the world. P. 6 units of upper-division Ws.M.

534. Nursery and Plantation Management (3) (1) 1990-91 Tree nursery and forest plantation establishment and management, with emphasis dryland ecosystems. P. 6 units of upper-division Ws.M.

535. Water Management in Dryland Ecosystems (3) (1) Hydrologic principles as applied to arid and semi-arid ecosystems with water management applications in dryland resources management. P. 539, S.W. 201.

536. Urban Forestry (2) (1) 1989-90 Principles and practices of urban forestry, including vegetation structure and function, inventory and evaluation techniques, and planning and management approaches. (Identical with L.A. 536)

545. Systems Analysis in Watershed Management (3) (1) 1990-91 Application of hydrologic modeling and system analysis for optimizing management of watersheds. P. 460. 462.

550. Quantitative Dendrochronology (3) (1) (Identical with Geo. 550)

560. Watershed Hydrology (4) (3) For a description of course topics, see 460. Graduate-level requirements include an in-depth paper on the application of hydrologic principles to problems related to arid land management. P. 340a; S.W. 300, 201; Math. 160. (Identical with Hyd. 560. May be convened with 460.

Renewable Natural Resources 237
56.3. Plant-Water Relations (3) (I) (Identical with M.GC. 563)

56a-56b. Introduction to Dendrochronology (3-3) (I) (Identical with Geos. 56a-56b) May be convened with 464a-464b.

565. Hydrochemistry (3) II 1989-90 (Identical with S.W. 565).


571. Water Quality Control (3) (I) (Identical with C.E. 571) May be convened with 471.


580. Forest Policy and Administration (3) (I) For a description of course topics, see 487. Graduate-level requirements include an in-depth policy analysis paper. P. 440 or A.Ec. 215 or 476. (Identical with A.Ec. 580 and W.R.A. 580) May be convened with 486.

581. Simulation of Renewable Natural Resources (3) (II) For a description of course topics, see 488. Graduate-level requirements include the completion of a simulation project and accompanying report. P. 430. May be convened with 481.

587. Forestry in Arid Environments (4) S For a description of course topics, see 487. Graduate-level requirements include a report on the application of course topics to the student's homeland situation. Field trip. Fee. May be convened with 497.

588. Resource Development of Watershed Lands (6) S For a description of course topics, see 488. Graduate-level requirements include a report on the application of course topics to the student's homeland situation. Field trip. Fee. May be convened with 498.

595. Colloquium a. Non-Point Source Pollution from Watersheds (3) II P. 460.

d. Fire Ecology (2) II 1990-91.

655. Dendrochronology (3) II 1990-91 (Identical with Geos. 655).

696. Seminar a. Watershed Management (1-2) [Rpt.] (I) 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)."

Wildlife, Fisheries, and Recreation Resources

Wildlife and Fisheries Science (WFSC)

A major in wildlife and fisheries science provides the student with a broad background for a professional career with state and federal fish and game departments, with federal fish and wildlife or other natural resource management agencies, or for graduate study. In addition to the course requirements, it is recommended that students seek summer employment in related work with a state or federal agency. Students may obtain a major in wildlife and fisheries science with an option in wildlife ecology or in fisheries science.

In addition to the requirements for the curriculum in natural resources, the following courses are required for both options in wildlife and fisheries science:

- Wildlife Ecology, M.C.B. 404L, 409, 410, 414, 424a, 243a; Econ. 20a, 20b, or A.Ec. 217; Engl. 1, 100, 102 and 103, 110A, 110H, 104H; M.C.B. 181; Ecol. 182, 210a, 210b; 220a, 220b; 230, or An.S. 213; N.R.R. 381; Phys. 102a, 180a, 200a, 200b; Comm. 100, 102, 106, 205.
- The wildlife ecology option also requires: Engl. 425 or 426; Math. 23 or 125a, 160 or 263; Ra.M. 382, 305 or 416; W.F.Sc. 455R; R.N.R. 202, 295a, 321; V.Sc. 400a or 400b; W.R.A. 456. W.F.Sc. 416, 448, 484, 485. The fisheries science option also requires: Chem. 241b, 243b; or V.Sc. 400a or 400b; C.E. 471; Ecol. 477; Math. 117R, 118, 160 or 263; W.F.Sc. 444, 445L.

A minor is available in wildlife, fisheries, and recreation resources. Twenty-one units of foundation courses must be completed before the minor is initiated. Foundation courses are: Chem. 103a-103b, Math. 160 or 263, M.C.B. 181, Ecol. 182, and S.W. 200, 201. Required courses in the minor are: W.F.Sc. 325, R.N.R. 381, and either Chem. 241b, 243b, or V.Sc. 400a or 400b. To complete the minor, an additional 12 units must be selected from the following courses: W.F.Sc. 416, 444, 448, 484, 485, R.N.R. 321 and 424.


321. Introduction to Wildlife and Fisheries Ecology (3) (I) Study of the nature and importance of wildlife and fisheries resources, basic principles of fish and wildlife biology and management, and contemporary issues in the field. P, M.C.B. 181, Ecol. 182.

405. Aquatic Entomology (3) II 1990-91 (Identical with A.Ec. 405) May be convened with 405.


441. Limnology (4) (I) Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters. 2R, 6L. Weekend field trips. P, six units of biology and 3 units of chemistry. (Identical with Ecol. 441) May be convened with 446.

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. 325. 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.

455R. Fishery Management Laboratory (1) II For a description of course topics, see 455R. Graduate-level requirements include a detailed report and presentation on a current, advance in fishery management techniques. P, C.R. 555R, 482. May be convened with 455L.

544. Fishery Management Laboratory (1) II For a description of course topics, see 455R. Graduate-level requirements include a detailed report and presentation on a current, advance in fishery management. P, C.R. 555R, 482. May be convened with 455L.

585. Colloquium a. Big Game Management (2) I 1990-91 P. 455R.

c. Wildlife Habitat Analysis (2) II 1989-90.

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.


696. Seminar (1-3) (I) a. Fish and Wildlife Ecology (1) [Rpt.]

"Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)."

Natural Resource Recreation (NRR)

Students in the natural resource recreation program are qualified to pursue professional careers with federal and state agencies as recreation specialists, or with private organizations. Sufficient flexibility has been created in the program to allow students to emphasize additional study in the professional areas of water-based recreation, resource planning, interpretation, park management administration and forest recreation management.

In addition to the requirements for the curriculum in natural resources, the following courses are required for natural resource recreation: Chem. 103a-103b, 104a-104b; M.C.B. 181; Ecol. 182, 482, 20a, 20b; Eng. 1, 101 or 102, 103H, 104H, 104L; W.F.Sc. 455; 482, May be convened with 555L.

482. Ichthyology (4) I 1989-90 (Identical with Ecol. 482) May be convened with 482.

455L. Fishery Management Laboratory (1) II (Identical with Ecol. 584) May be convened with 484.

589. Selected Studies of Birds (2) [Rpt.] (I) (Identical with Ecol. 589) May be convened with 46.

595. Colloquium a. Big Game Management (2) I 1990-91 P. 455R.


696. Seminar (1-3) (I) a. Fish and Wildlife Ecology (1) [Rpt.]

"Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)."
395. Colloquium


b. 489a-489b. Advanced Environmental Interpretation (2-2) For a description of course topics, see 489a-489b. Graduate-level requirements include development and presentation. The program implements a new original interpretative program. Students who are not available for some methodological field trips. P. 12 units in biology or renewable natural resources. May be conveyed with 489a-489b. 589a-589b. Advanced Environmental Interpretation (2-2) For a description of course topics, see 489a-489b. Graduate-level requirements include development and presentation.

595. Colloquium

a. Recreation Resource Management (2) II 1990-91

*Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

Russian and Slavic Languages (RUS)

Modern Languages Building, Room 340
(902) 621-7341

Professors John Garrard, Joe Malik, Jr.
Associate Professors Margaret Gibson, Head, Adele Barker, Alexander Dunkel, Delbert Phillips, Boris Roberts

The department's emphasis is on building competence in the Russian language as preparation for government service, business careers, teaching, graduate study, and research. The department offers the degrees of Bachelor of Arts and Master of Arts with a major in Russian and Slavic Languages. Bachelor of Arts in Education and Master of Education are also available with a teaching major in Russian. For graduate admission and degree requirements, consult the Graduation Bulletin.

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. In consultation with the major advisor, the student must take 3 upper-division units in Russian and Soviet Studies courses. 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 university-wide disciplines with the assistance and approval of the major advisor.

The teaching major: 22 units beyond the 200-level courses including 301a-301b, 305a-305b, 307a-307b, 407a-407b. 310 is highly recommended.

The teaching minor: 10 units beyond the 200-level courses including 301a-301b, 307a-307b. The department participates in the Honors Program. Prospective honors students must consult with the department advisor.

101a-101b. Elementary Russian (4-4) Both 101a and 101b are offered each semester. (The first year of work offered in a foreign language shall not be counted toward a minor.) Phillips

120. Soviet Union Today (3) I Introduction to contemporary Soviet society with emphasis on the daily life of Soviet citizens. P. 201a

120a. Intermediate Russian (4-4) I 101b

130a. Reading Scientific Russian (4) Alternate courses for 201b for students interested in reading and translating scientific literature. P. 201a

207a-207b. First Level Russian Conversation (3) I, II

215. Phonetics (1) [Rpt./3 units] I General improvement of the student's language skills through aural/oral training in Russian phonetics. P. 201b

217. Intonation (1) [Rpt./3 units] II General improvement of the student's language skills through aural/oral training in Russian intonation. P. 201b

250a-250b. Russian Humanities in Translation (3-3) 250a: I II The Quest for Identity: Russia's cultural heritage—literature, art, music, architecture, religious tradition—from the earliest times to 1850. 250b: I II The Search for Utopia: 20th century literature, art, music, architecture, film, and theater in pre- and post-revolutionary Russia and the emigration. The emphasis is not prerequisite to 250b.

296. Seminar

a. Language Program in U.S.S.R. I (3) S Training in Russian conversation, grammar and phonetics conducted in Moscow by specialists trained in the teaching of Russian to foreigners. Field trips.

305a-305b. Readings in Russian Texts (3-3) P, 201b or 205

307a-307b. Second Level Russian Conversation (2-2) GRD P. 207b

310. Russian Civilization and Culture: Pre-Christian Era to the Present (3) I Selected topics in Russian culture and civilization: architecture, film, fine art, literature, music and theater, with emphasis on the political, social and cultural contexts. Taught in English. P, 201b or 205

396. Honors Proseminar (3) I 295a-295b. Survey of Russian Literature (3-3) H Designed to acquaint students with the literary terminology and facilitate comprehension of Russian language literature. P. 307b or 305b

407a-407b. Third Level Russian Conversation (3-3) P. 307b

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Gen. 485) May be conveyed with 485.

589. Russian and Slavic Studies (3) I, II, III, P, 301b or 305b

589. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with Gen. 485) May be conveyed with 485.

685. Poetry (3) Examination of the poetry of Pushkin and Lermontov. P. 405b.

686. Russian Drama (3) Examination of the major dramatic works of nineteenth- and twentieth-century Russian playwrights. P. 405b.

696. Seminar

c. Russian Language: 18th Century (3)

d. Russian Language: 19th Century (3)

d. Russian Literature: 20th Century (3)

Russian and Soviet Studies (RSS)

Modern Languages Building, Room 324
(902) 621-5585

Committee on Russian and Soviet Studies

Professors Robert Browder (Emeritus, History), John Garrard (Russian and Slavic Languages), Seymour Goodman (Management Information Systems), Richard Reeves (Geography and Regional Development), Allen Whiting (Politics and Government), Associate Professors Adele Barker, Chairperson, (Russian and Slavic Languages), Alexander Dunkel (Russian and Slavic Languages), and Philip Weltner (History). Assistant Professors Douglas Weiner (History), Hohm Pat Willerton (Political Science), Affiliated Staff Andrew Makuch (Collection Development Bibliographer)

Russian and Soviet studies is an interdisciplinary academic major that offers courses in the many disciplines involved in the study of Russia 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: R.S.S. 301a-301b, Hist. 411, 421, Russ. 250a or 250b, Econ. 305, Pol. 443, Hist. 425, R.S.S. 450 or Geog. 409, R.S.S. 496a, 496b. R.S.S. 496a must be taken in the spring semester following the junior year, R.S.S. 496b in the fall semester of the senior year. The student must have completed 36 units and have advanced standing in order to take Econ. 305 and R.S.S. 450.

Although not required for the major, R.S.S. 100 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 the following departments: Economics, History, Management Information Systems, Oriental Studies, Political Science. A list of
courses, considered suitable for the minor is available from the chairperson.
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.

450. Soviet Technology and Science (3) I I (identical with M.I.S. 450)
496. Seminar
a. Russian and Soviet Studies I (3) P, Russ. 301b. (identical with Pol. 496a)
b. Russian and Soviet Studies II (3) P 496a

Secondary Education
(See Teaching and Teacher Education)

Sociology (SOC)

Social Sciences Building, Room 400
(602) 621-3531

Professors Albert J. Bergesen, Raymond V. Bowers (Emeritus), Richard F. Curtis, Andrew
M. Grele, Michael E. Hamblyn, Michael N. Hechter, Travis W. Hirsch, Gary F.
Jensen, Robert C. Leonard, Linda D. Malm, Bruce D. Sales (Psychology), David A. Snow,
I. Roger Washington

Associate Professors Douglas J. Adam, James T. Bohe, Courtney B. Cleland, Robert R. Evans, Celestino Fernandez, Neil D.
Fligstein, Patricia L. MacCorquodale, Jerry L. Miller, Walker P. Powell

Assistant Professors Roberto M. Fernandez, Debra Friedman, Calvin K. Morrill (Communications), Kathleen C. Schwartzman, James Shockley

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 in a major in sociology.

The major: 36 units, including 301, 375a-375b, 401. A major 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.

100. Introduction to Sociology (3) I I Sociological concepts and principles, with special
reference to contemporary society.

150. Sociology of Women (3) I I Sociological approach to women's roles in American society,
with emphasis on trends and problems relating to sex-role identification and socialization. P, 100 or 301. (Identical with W.S. 150)

160. Minority Relations and Urban Society (3) I I 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 Bl.S. 160 and M.A.S. 160)

161. The Chicano in American Society (3) I I 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 I Basic concepts of population studies, analysis of social trends,
causes of, and reactions to, changes in the structure and size of the world's populations. P, 100 or 301.

201. American Social Problems (3) I I An examination of the theoretical perspectives and
research on social problems. P, 3 units of social sciences.

243. Sociology of Adult Life (3) I I The life course perspectives in relation to environment.
Middle and later life; implications for personal and social planning in the United States. P, 6 units of social science. (Identical with F.S. 243 and Ger. 243)

251. Sociology of Education (3) I I Educational aspects of American society; the organization,
structure, impact on society, and effects on students in alternative structures. P, 3 units of social sciences.

301. Sociological Analysis (3) I I A survey of sociological concepts and principles for sociol-
ogists. I I Study of social structure, sociological data. 2R, 3L. No lower-
division courses may serve as a substitute for 375a or 375b.

340. Sociology of Childhood and Youth (3) I I Analysis of family structure and its influence on
socialization of young adults in American society, their social roles, relations, and problems. P, 6 units of sociology.

341. Juvenile Delinquency (3) I I Nature and causes of, and reactions to, juvenile delin-
quency. P, 201, 3 additional units of sociology.

342. Criminology (3) I I Study of the social origins of criminal law, criminal behavior, and
criminal justice system. P, 375a-375b. Social Research Methods (3-3)
375b: Problems of conceptualization and design; elementary techniques of data collect-
ion, statistical analysis. P, 301 and Math. 177W. Writing Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses", in the Academic Guidelines section of the catalog). 375b: Techniques of statistical description and elemen-
tary statistical inference, as applied to sociological data. P, 301.

384. Sociology of Latin American Societies (3) I I Analysis of their social structures and institutions, including government, religion, family, education, stratification, urban and rural development, economics, migration. P, 100 or 301; 3 additional units in sociology or anthropology. (Identical with Anth. 384)

386. Honors Proseminar (3) I I

401. Sources of Sociological Theory (3) I I Critical review of the works of leading sociolo-
gists. P, for all students, 9 units of social science orish. (Identical with Anth. 401) May be convened with 504.

402. Communication and the Legal Process (3) I I Open only to students who meet the
requirements for Advanced Standing as specified in the Academic Guidelines section of the catalog. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses", in the Academic Guidelines section of the catalog). 402: Participation in the Honors Seminar.

403. Sociosomatics (3) I I The social control of bodily process and structure, including social determinants of health. Both macro and microanalytic perspectives. P, completion of the writing-portfolio requirement. P, 100 or 301; 6 additional units of sociological science. P, 3 units of social sciences or consult department before enrollment. May be convened with 503.

404. Peasant Communities (3) I I Analysis of populations, cultures, and social problems in their regional setting, with emphasis on the Southw.
P, 100 or 301; 6 additional units of sociological science. P, 3 units of social sciences or consult department before enrollment. May be convened with 504.


422. Complex Organizations (3) I I Theories and research regarding large-scale organiza-
tions and their roles in the individual and society. P, 9 units of sociology. (Identical with Anth. 422) May be convened with 502.

435. Functional Analysis (3) I I Open only to students who meet the requirements for
Advanced Standing as specified in the Academic Guidelines section of the catalog. (Identical with Pol. 435) May be convened with 504.

444. Group-Process Methods in Management (3) 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 the catalog. (Identical with Anth. 444) May be convened with 504.

450. Social Stratification (3) I I 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.
Introduction to Geographic Information Systems (3) (Identical with R.N.R. 517) May be convened with 417.

Evapotranspiration (3) II Theories and applications of potential and actual evapotranspiration in arid regions; measurement and estimation methods, and plant growth-evapotranspiration relations. P. Math. 125b, Phys. 102b.

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.

Soil Morphology, Classification and Survey (3) III 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.

Remote Sensing in Agriculture (3) II Remote sensing techniques and applications for improved natural resource utilization of soils, waters, grasslands, and forests. 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.

Soil and Water Conservation (3) III 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.

Soil-Plant Relationships (3) II Theories and concepts of soil fertility and soil-plant relations. P. 100d.


502. Evapotranspiration (3) II Theories and applications of potential and actual evapotranspiration in arid regions; measurement and estimation methods, and plant growth-evapotranspiration relations. P. Math. 125b, Phys. 102b.

Hydrochemistry (3) II Natural-chemistry affecting the solute content of water, relations and effects of above on water quality criteria and pollution, analytical procedures used by water testing laboratories. 2R, 3L. Chem. 322 or C.E. or 471. (Identical with Micr. 545)

505. Chemical Analysis of Soils and Plants (4) II Principles and methods of chemical analysis of soils and biological materials with emphasis on instrumental techniques. 2R, 6L. P. Chem. 322, 323; Phys. 102b, 102b. Hendricks

507. Hydrology of Unsaturated Media (3) II (Identical with Hydr. 407) May be convened with 407.

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. P. 200. Chem. 103b, 104b. May be convened with 411, Bohm

517. Introduction to Geographic Information Systems (3) (Identical with R.N.R. 517) May be convened with 417.

520. Evapotranspiration (3) II Theories and applications of potential and actual evapotranspiration in arid regions; measurement and estimation methods, and plant growth-evapotranspiration relations. P. Math. 125b, Phys. 102b.

531. Soil Morphology, Classification and Survey (3) 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. P. 241a, Ecol. 101b. (Identical with Micr. 535) May be convened with 435, Pepper.

541. Soil Genesis (3) II Physical and chemical processes and mineralogy of weathering and soil formation; quantitative pedology, the soil as part of the ecosystem. Field trips. P, 330 or Phys. 102b. May be convened with 553.
303a-303b. Comprehensive Spanish for the Bilingual (3-3) II Speaking, reading and writing skills; designed for the native speaker of Spanish with some formal study of the language. Students receiving credit for this course will not receive credit for 301a-301b, 329, or 330. (Identical with M.A.S. 303a-303b)

310. Advanced Placement Examination. Consent of department required for students who need to perfect pronunciation. P. 202

320. Readings in the Literary Genres (3) I I P. 301b

329. Intermediate Grammar and Writing (3) I I P. 301b

333. Writing and Oral Skills for the Bilingual (3) I I P. 329. Credit is allowed for this course or 326, but not both.

364. Mexican-American Spanish and Bilingualism (3) I I Mexican-American Spanish and bilingualism as a point of departure for developing standard vocabulary and grammar at the dialect level. Open only to students who need to complete this course or 329, but not both. P. 303b.

329. Intermediate Grammar and Writing (3) I I P. 329

355. Selected Spanish Theatre (3) I 1990-91 Major Spanish dramatic works from the Renaissance to the present. P. 320.

371. a Commercial and Technical Spanish (3-3) P. 329

400a-400b. Survey of Spanish Literature (3-3) 400a: From the beginning through the 17th century. 400b: 18th and 19th centuries. P. 320. 400a is a prerequisite to 400b. P. 320. 401a-401b. Survey of Spanish-American Literature (3-3) 401a: From the beginning through the 19th and 20th centuries. P. 320. 401a is a prerequisite to 401b.

402. Survey of Mexican Literature (3) S Major works by Mexican writers. Offered in Guadalajara only. P. 320. (Identical with M.A.S. 409)

404. Advanced Composition and Conversation (3) I I Study and practice in formal discussion and expository writing. P. 330. May be convened with 504.

414. Teaching of Modern Languages (3) I Identical with T.T.E. 414. May be convened with 514.

415. Creative Writing in Spanish (3) II Practice in writing poetry and fiction in Spanish. P. 405. May be convened with 515.

416. Writing Project (1) I May be repeated for credit.

422. Introduction to Romance Philology (3) I Survey of the development of the modern Romance languages. P. 422. (Identical with Ger. 422 and Port. 422) May be convened with 521.

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) I I P. 320. May be convened with 535.


442. Mexican-American Literature (3) I I 1990-91 Major works (Spanish and bilingual) in contemporary Mexican-American/Chicano poetry, from 1960s to date. P. 320. (Identical with M.A.S. 442) May be convened with 542.


445. Novel of the Mexican Revolution (3) I I How the revolution of 1910 has been portrayed by Mexico's leading writers. P. 320. May be convened with 545.


450. Spanish-American Short Story (3) S Development of the modern short story in Latin America, with examples from various countries and authors. Offered in Guadalajara only. P. five semesters of college Span. May be convened with 550.


473. Spanish for the Bilingual Classroom Teacher (3) I I Practical Spanish for the elementary and secondary school subject-matter teacher. Designed to put into practice the medium of instruction. P. 303a or 329 or 330. (Identical with M.A.S. 473) May be convened with 573.

479. Linguistic and Computer-assisted Approaches to Language (3-6) II 479a: Identification of the four-semester language proficiency group requirement may be satisfied by completing with a passing grade Span. 202, 203, 204, 205. Placement by exam. Consent of department may also be satisfied by placing in the fifth semester on the departmental placement examination or through Advanced Placement examinations. Once a course in a language skill sequence is successfully completed, no lower numbered course taken subsequently in that sequence will count toward the major.

479. Spanish for the Bilingual Classroom Teacher (3) I I Practical Spanish for the elementary and secondary school subject-matter teacher. Designed to put into practice the medium of instruction. P. 303a or 329 or 330. (Identical with M.A.S. 473) May be convened with 573.

479. Linguistic and Computer-assisted Approaches to Language (3-6) II 479a: Identification of the four-semester language proficiency group requirement may be satisfied by completing with a passing grade Span. 202, 203, 204, 205. Placement by exam. Consent of department may also be satisfied by placing in the fifth semester on the departmental placement examination or through Advanced Placement examinations. Once a course in a language skill sequence is successfully completed, no lower numbered course taken subsequently in that sequence will count toward the major.

479. Spanish for the Bilingual Classroom Teacher (3) I I Practical Spanish for the elementary and secondary school subject-matter teacher. Designed to put into practice the medium of instruction. P. 303a or 329 or 330. (Identical with M.A.S. 473) May be convened with 573.

479. Linguistic and Computer-assisted Approaches to Language (3-6) II 479a: Identification of the four-semester language proficiency group requirement may be satisfied by completing with a passing grade Span. 202, 203, 204, 205. Placement by exam. Consent of department may also be satisfied by placing in the fifth semester on the departmental placement examination or through Advanced Placement examinations. Once a course in a language skill sequence is successfully completed, no lower numbered course taken subsequently in that sequence will count toward the major.

479. Spanish for the Bilingual Classroom Teacher (3) I I Practical Spanish for the elementary and secondary school subject-matter teacher. Designed to put into practice the medium of instruction. P. 303a or 329 or 330. (Identical with M.A.S. 473) May be convened with 573.

479. Linguistic and Computer-assisted Approaches to Language (3-6) II 479a: Identification of the four-semester language proficiency group requirement may be satisfied by completing with a passing grade Span. 202, 203, 204, 205. Placement by exam. Consent of department may also be satisfied by placing in the fifth semester on the departmental placement examination or through Advanced Placement examinations. Once a course in a language skill sequence is successfully completed, no lower numbered course taken subsequently in that sequence will count toward the major.
506. Fifteenth Century Spanish Literature (3) II 1990-91 Traditional courtly and satiric literature; the Castilian, 420a or 420b.

508. Golden Age Theater II: Lope de Vega and His School (3) II 1990-91 The drama at apogee, principally in the plays of Lope de Vega and of Tirso de Molina. P, 400a or 401a.

509. Golden Age Theater III: Calderon and His School (3) II 1989-90 The crystallization of the classic drama, 400a.


514. Teaching of Modern Languages (3) II (Identical with TIE 514) May be convened with 415.

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 from various authors' perspectives. P, 400a. May be convened with 415.


521. The Generation of '98 (3) I 1989-90 Major literary expressions concerning the problems of Spain and the Spanish 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 on the history 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) For a description of course topics, see 423a-423b. 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) I 1990-91 The novel since the Civil War.

525. Contemporary Spanish Poetry (3) II 1989-90

526. Contemporary Spanish Drama (3) II 1990-91 Major Spanish theatrical trends from the Civil War (1936-39) to the present. P, graduate standing, 400b.

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.

528. Spanish-American Baroque (3) I 1989-90 Spanish-American works in the baroque or manierista literary current from the seventeenth and eighteenth centuries, largely in verse. P, 420a or 420b.


531. Spanish-American Civilization (3) II For a description of course topics, see 431. Graduate-level requirements include additional readings and reports. P, 330. May be convened with 431.

532. Pre-Columbian Culture and Myths (3) II 1990-91 For a description of course topics, see 432. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 432.


534. Colonial and Literary Origins of Hispanic Southwest (3) I 1989-90 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 Quijote (3) II Graduate-level requirements include an in-depth research paper and formal oral presentations. P, 401a. May be convened with 435.


539. Fourteenth Century Spanish Literature (3) I 1990-91 Waning of the epic, culmination of the Neoclassical Period in Spain and the New World. P, 400b or 401b.

540. Realism and Naturalism (3) II 1990-91 Major prose writers of the 19th century from Galdos to Blasco Ibanez.

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 LITS 541) May be convened with 441.

542. Mexican-American Poetry (3) I 1990-91 For a description of course topics, see 442. Graduate-level requirements include additional readings and reports. P, 320. 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 LITS 543) May be convened with 443.

544. Mexican-American Narrative (3) I 1990-91 For a description of course topics, see 444. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 444.

545. Novel of the Mexican Revolution (3) I Graduate-level requirements include additional readings and reports. P, 320. May be convened with 445.

546. Mexican-American Theater (3) I 1989-90 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 For a description of course topics, see 447. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 447.

548. Mexican and Mexican-American Film (3) I 1989-90 For a description of course topics, see 448. Graduate-level requirements include additional readings and reports. P, 320. May be convened with 448.

550. Spanish-American Short Story (3) S For a description of course topics, see 450. Graduate-level requirements include additional readings and reports. Offered in Guadalajara only. P, five semesters of college Spanish. May be convened with 450.
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 healthcare settings, as public school teachers, or in private practice. Professional certification in the state of Arizona and with the American Speech-Language-Hearing Association requires graduates to take courses with the acquisition of at least 30 semester credits or a Master of Science degree.

The department offers the following degrees: Bachelor of Science, Master of Arts and Master of Science, Master of Science and Doctor of Philosophy with a major in speech and hearing sciences. For graduate admission and degree requirements, see the Graduate Student Handbook. The major: 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 8 hours in a laboratory science course. For graduate students, requirements include, including 260, 449, 450, 461, 470a, 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 8 hours in a laboratory science course. For graduate students, requirements include, including 260, 449, 450, 461, 470a, and 483.

106. Voice and Articulation (2) Designed to improve voice, articulation, and fluency patterns related to communication disorders. P, 301a or 302a. May be convened with 495.


260. Speech Science (4) 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 Hist. 569a.)

280. Hearing Science (4) II Anatomy, neuroanatomy, physiology of the auditory mechanism; acoustics and psychoacoustics; decibel scale, normal auditory function. 3R, 3L.

350. The Structure and Function of Language (3) II The phonetic, phonological, and phonological processes of language and their role in language development and impairment. 3R, 3L.

370a-370b. Introduction to Communication Disorders: Child and Adult (3-3) 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 471.

450. Clinical Trials: Audiology (1-3) R, 3L. I I 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.

461R. Speech and Hearing Science Instrumentation (2) Consideration of some common and specific instruments and methods employed in speech and hearing laboratories and clinics. P, 260, 280 or CR.

461L. Speech and Hearing Science Instrumentation (2) I Basic clinical procedures for managing a limited range of hearing losses in children and adults. P, 260, 280 or CR. May be convened with 471L.

471L. Laboratory in Communication Disorders (1) I Open to majors only. P, 471R or CR. May be convened with 571R.

483. Principles of Audiology (3) I Basic principles and techniques of audiological testing; implications of normal and impaired functioning, and intervention strategies. P, 260 or graduate standing.

484. Audiologic Rehabilitation: Adults (3) II Speech reading; auditory training; problems encountered with amplification units; social, psychological, educational, speech, and language problems encountered by the hearing handicapped. P, 280, 483. May be convened with 586.

500. Introduction to Graduate Study (3) II Introduction to the conduct of research and graduate study in speech and hearing sciences.

502. Principles of Neuroanatomy (4) II (Identical with Anat. 502.)

510. Counseling Techniques in Communication Disorders (3) II Basic counseling techniques pertinent to clinical practice with the communication handicapped and their families.

551. Language Acquisition (3) I Normal development of language in the child; relationship to cognitve and social development. P, 393 (identical with Ling. 551.)


553R. Language Disorders in Preschool Children (1-3) Syndromes of childhood language impairment are described in relation to etiology, diagnosis, and therapy. Emphasis is given to language learning patterns across and within systems. P, 553 (identical with Linguistics 553).

553L. Laboratory in Preschool Language Disorders (1) II

554R. Adult Aphasia (2) I Etiology, evaluation and therapy for language disorders associated with brain damage. P, 370, 450 or 551; CR or subsequent registration in 554L. For majors.

554L. Laboratory in Adult Aphasia (1) I P, 554R or CR.

558a-558b. Intermediate Clinical Studies: Speech-Language Pathology (1-3-1 to 3) [Rpt./9 units] I II Under faculty supervision, students assess speech and language functions, develop treatment plans, and carry out remedial programs based on empirical data and current therapy. 558b is in an extern setting and may be counted toward 558a. P, 471.

559. Intermediate Clinical Studies: Audiology (1-3) [Rpt./9 units] II Under faculty supervision, students assess hearing impairments, formulate objectives, and carry out remeial programs based on the application of research data and current technology to clinical treatment. Open to majors only. P, 471.

560a-560b. Experimental Phonetics (3-3) III Systematic examination of current experimental and research in speech as motor
behavior, with emphasis on physiological investigations of normal, impaired, and pathological speech and language processes, with special reference to the evaluation and management of persons with speech and language disorders. P. 260, 494b.

569. Colloquium (Identical with Math. 641)

Statistics (STAT)

Economics Building, Room 317
(602) 621-4158

Professors J.L. Denny (Mathematics), Acting Head, Jean E. Weber

The department offers a program leading to the Master of Science degree with a major in statistics.

The Master of Science degree is not required, but up to 6 units may be earned by writing one. For the Master of Science degree, at least 18 of the 30 units must be taken within the department. Of the 18 units, at least 12 must be at the 500 level or above.

In addition to the 12 units of graduate work taken within the department, at least 18 of the 30 units must be taken within the College of Arts and Sciences.

A thesis is not required, but up to 6 units may be earned by writing one. For the Master of Science degree, at least 18 of the 30 units must be taken within the department. Of the 18 units, at least 12 must be at the 500 level or above.

Further information is available from the Graduate Catalog.

275. Statistical Methods in Management (3) I II GRD Statistical analysis and methods applied to management issues. P. Math. 119

361. Statistics for Engineering and the Physical Sciences (3) II Probability theory, point estimation, interval estimation, hypothesis testing, and regression analysis; applications to quality control and reliability theory. P. 9 units of 500 level or above.

461. Elements of Statistics (3) II Advanced degree credit available for nonmajors only. (Identical with Math. 461)

564. Theory of Probability (3) I II (Identical with Math. 464) May be convened with Math. 468. May be taken by nonmajors only.

566. Theory of Statistics (3) II (Identical with Math. 466) May be convened with Math. 468. May be taken by nonmajors only.

568. Applied Stochastic Processes (3) II (Identical with Math. 468) May be convened with Math. 468. May be taken by nonmajors only.


563. Nonparametric Statistics (3) I Distribution free statistics, chi-square tests, related samples, independent samples, correlations, tests of significance, confidence bands. P. one course in statistics.


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. P. one semester of calculus. (Identical with Math. 565)

566. Theory of Statistics (3) II (Identical with Math. 566) May be convened with Math. 466. May be taken by nonmajors only.

568. Applied Stochastic Processes (3) II (Identical with Math. 568) May be convened with Math. 468. May be taken by nonmajors only.

569. Seminar (Identical with Math. 569)

These courses are available in the following departments and institutions:

- Applied Mathematics
- Economics
- Engineering
- Psychology
- Sociology
- Statistics

For further information, see the Graduate Catalog.

246 Departments and Courses of Instruction

567. Applied Multivariate Analysis (3) II Consideration of multivariate statistical analyses,
with emphasis on applications, interpretation of computer output, and effects of violations of model assumptions. P, 660.

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, 660.

**Systems and Industrial Engineering (SIE)**

Engineering Building, Room 111

(602) 621-6551

Professors A. Terry Bahill, Lucien Duckstein, William R. Ferrell, Marcel F. Neus, John S. Ramberg, Donald G. Schultz (Emeritus), Alan Wayne Wymore (Emeritus), Sidney J. Yakowitz, and A. Terry Bahill

Assistant Professors William P. Cosart (Chemical Engineering), Acting Head, Ronald G. Askin, Robert L. Baker, Duane L. Dietrich, Samraj Sen, and Jeffrey B. Goldberg

Assistant Professors Jeffrey B. Goldberg, Julia L. Higle, Bernard F. Lannon, Shu Li, Paul J. Sanchez, Jeffrey C. Tinkle

Instructor John R. Lyon

The Department of Systems and Industrial Engineering in the College of Engineering and Mines offers the degrees of Bachelor of Science in Systems Engineering, Bachelor of Science in Industrial Engineering, Master of Science in Systems and Industrial Engineering, Master of Science in Industrial Engineering, and Doctor of Philosophy in Systems and Industrial Engineering. For specific undergraduate program requirements, see the College of Engineering and Mines section of this catalog.

**230. Introduction to Engineering Probability and Statistics**


**250. Introduction to Systems Engineering and System Theory**

(3) I The process of systems engineering, sets, system models, coupling of systems, subsystems, and system hierarchy, system modeling, system modeling techniques, layout, group technology, product and process design, and automated assembly. The student will be required to work in groups. Solutions will be presented using both written and oral reports. P, 662.

**464. Engineering Decision Making Under Uncertainty**


**466. Engineering Quality Control**


**475. Sampling and Experimental Design**

(3) I II Analysis of linear and non-linear models. P, 321, 330R-330L.

**476. Numerical Analysis**


**535. Programming and High-Level Languages**

(3) I II Introduction to programming and high-level languages. A project will be assigned for a final report on a current issue. P, 230, Math 254. May be convened with Systems and Industrial Engineering 247.

**540. Software Engineering**

(3) I A study of the design of computer programs and software. P, 330R-330L.

**542. Systems Design Projects**


**560. Advanced Quality Control**

(3) I Advanced statistical techniques for process control and improvement. Topics include multi-variate statistical methods, design of experiments, statistical process control, and total quality management. P, 321, 330R-330L. (Identical with Systems and Industrial Engineering 247).

**566. Introduction to Robotics**

(3) I A study of the principles involved in the design and control of robots, including homogeneous transformations, kinematics, trajectory selection, dynamics, control and sensing. P, 350. May be convened with 585.

**586. Modeling Manufacturing Systems**

(3) I II An intermediate-level introduction to topics in hierarchical design, planning, and control of manufacturing systems and their applications. P, 230, Math 254. May be convened with Systems and Industrial Engineering 247.

systems and industrial engineering 247
Introduction to Discrete Event Dynamical Systems


550. Theory of Linear Systems (3) II An intensive study of continuous and discrete linear systems from the space-state 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 analysis, and applications of system engineering techniques to physiological systems.


554. Mathematical System Theory (3) II Mathematical theory of discrete systems and models for large-scale, complex, real-time systems.


563. Facility Layout and Location (3) II Mathematical characterizations of single and multifacility location models as minimum norm problems; mathematical programming methods for facility location; introduction to computer-aided design systems. P, 350.


566. Advanced Production Control (3) I Quantitative models in the planning, analysis, and control of production systems. Topics include aggregate production planning, capacity planning, inventory control and flexible manufacturing. P, 321, 330R-330L.

567. Advanced Production Planning Under Uncertainty (3) II Review of statistical decision theory; utility, games, Bayesian decision theory. Conjugate priors, worth of data, worth of information. Decision making under uncertainty; computer and water resource applications. P, 422.

574. Expert Systems (3) I For a description of course topics, see 475. Graduate-level requirements include research grade expert system implementation. P, familiarity with computers. May be convened with 474.

575. Computational Methods for Games, Decision-Making and Artificial Intelligence (3) II For a description of course topics, see 475. Graduate-level requirements include a comprehensive and intensive instructional project. P, 210, 370, 374. 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. Assignments include problem sets, project assignments, P, Engr. 102, Math. 254, or equivalent skill in PASCAL or FORTRAN. 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, CAPP, real-time scheduling, networking and system justification.

584. Manufacturing Automation (3) I Current topics in hardware for automation, selection and implementation of manufacturing process control, computer vision, automated warehousing and manufacturing, computer control, NC machining, on-line control, and computer control. Laboratory computer systems.

585. Introduction to Robotics (3) I For a description of course topics, see 485. Graduate-level requirements include solution of more difficult problems in homework and test. P, 350. May be convened with 485.

586. Modeling Manufacturing Systems (3) I For a description of course topics, see 486. Graduate-level requirements include solution of more difficult problems in homework and test. P, 350. May be convened with 485.
The department offers a program leading to the Bachelor of Science in Agriculture with a major in veterinary science which prepares students for careers with a special emphasis on animal health and welfare, biological or biomedical sciences and biotechnology or related fields which require scientific-based academic preparation. Also complete preprofessional courses required for application to professional schools of medicine, veterinary medicine, nursing, osteopathy, optometry, podiatry, physical or occupational therapy and dentistry while working towards completion of the major. Admission to these schools is not guaranteed and depends to a great extent upon the student's academic record and the participation of the schools in the Western Interstate Commission for Higher Education (WICHE) professional student exchange program (see "Special Academic Programs" in the College of Arts and Sciences section of this catalog).

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. 261 for the academic record. 103a-103b, 104a-104b, 21a-21b, 243a-243b; Phys. 102a-102b or 103a-103b; and 180a-180b; Ecol. 181 and 182; Micr. 205 or 420; Econ. 25a-25b; An. S. 213 or Ecol. 320; VSc. 400a-400b and 495a plus 9 additional units (no more than 3 units of independent studies and/or internship in VSc.); Highly An. S. 141, 415, 415L, 430, 436, and any animal production courses; M.C.B. 410a and 456 and additional courses in biological sciences, business or psychology. A minimum of 18 units of humanities/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 required to 400b. P. Ecol. 181, 182; Chem. 243a; Math. 117R/S. May be convened with 500a-500b.

403R. Biology of Animal Parasites (3) I Biological and medical courses in parasitology 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 Ecol. 403R and Micr. 403R) May be convened with 503R.

403L. Parasitology Laboratory (1) I Parasite morphology and diagnostic laboratory techniques. P. 9 units of ecology or microbiology. CR. 403R. (Identical with Ecol. 403L and Micr. 403L) 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. 415L)

415L. Physiology of Reproduction Laboratory (1) I (Identical with An.S. 415L)

419L. General Immunology Laboratory (2) (Identical with Micr. 419L)

420R. Bacteriology (3) I (Identical with Micr. 420R) May be convened with 520R.

423L. General Pathology Laboratory (1) I Gross and histologic changes occurring in tissues and organs of selected human and animal diseases and disease processes. P. Micr. 420R. (Identical with Micr. 423R and Tox. 423R) May be convened with 523L.

425L. General Pathology Laboratory (1) I Gross and histologic changes occurring in tissues and organs of selected human and animal diseases and disease processes. P. Micr. 420R. (Identical with Micr. 423R and Tox. 423R) May be convened with 523L.

430. Animal Diseases (3) I Integration of management, husbandry, and preventive veterinary medicine, as related to animal diseases. May be convened with 530.

459. Systematics and Evolution of Animal Parasites (3) I For a description of course topics, see 459. Graduate-level requirements include an in-depth research paper dealing with the differential diagnosis and treatment of one species of parasitic protozoa or helminth. (Identical with Ento. 459) May be convened with 559.

458. Comparative Parasitology (3) I For a description of course topics, see 458. Graduate-level requirements include an in-depth research paper dealing with the differential diagnosis and treatment of one species of parasitic protozoa or helminth. (Identical with Ento. 458) May be convened with 558.

460. Experimental Surgery (2) I 1989-90 Exercises in the surgical procedures commonly necessary in animal experimentation, including aseptic technique, anesthesia, surgical operations, and care of the postsurgical patient. P. 1R, 3L. P. 3 units of mammalian anatomy.

460. Gross Anatomy (4) I For a description of course topics, see 460. Graduate-level requirements include an in-depth research paper on the gross anatomy of one species of animal. (Identical with Ento. 460) May be convened with 560.

461. Biostatistical Methods in Microbiology (2) I (Identical with Micr. 461) May be convened with 561.

Women's Studies (WS)
Douglass Building. Room 102 (602) 621-7338
Committee on Women's Studies
Myra Dinnerstein, Chairperson
Professors Barbara Babcock (English, Anthropology), Herbert E. Carter (Arid Lands Resource Sciences), William Ittelson (Psychology), Eliana Rivero (Spanish and Portuguese), Alice Schlegel (Anthropology), Myra Dinnerstein, Chairperson
Assistant Professors Susan Hardy Aiken (Psychiatry), Assistant Professor Shirley Fahey (Psychiatry)

Women's studies is an interdisciplinary academic program that offers courses focusing on the new scholarship on women's experiences and perspectives. The committee offers the Bachelor of Arts degree with a major in women's studies. The major allows students to specialize in courses focusing on women and at the same time to pursue concentrated study in one major discipline and a supporting minor. The student is required to take 36 credit hours: two required courses (from the core) and one course on each of the four major concentration areas. The four major concentration areas are: women and the arts, women and the sciences, women and the law, and women and the social sciences. The major requires 12 additional courses (3 required, 9 electives) in women's studies. The minor requires 12 additional courses (at least 6 in women's studies) in women's studies. The minor requires that at least 6 of the 12 courses be taken at Oregon State University.
dent's advisor; four other upper-division women's studies electives; and four upper-
division courses in one of the humanities or
social sciences departments. At least one of
these four humanities or social science courses
must be a Writing-Emphasis course (see
"Writing-Emphasis Courses" in the Academic
Guidelines section of this catalog).

The minor in women's studies consists of at
least 20 units selected by the student in con-
sultation with the chairperson of the committee
in charge and approved by the student's
advisor. Students with a minor in women's stud-
ies are encouraged to take courses sequen-
tially, beginning with W.S. 100, then taking
intermediate-level courses, and finishing with a
senior seminar.

A major in women's studies provides a sound
liberal arts preparation for graduate or profes-
sional school. It is also useful for students who
wish to pursue careers in journalism, social
work, or administration of affirmative action with
an emphasis on women's issues.

100. Introduction to Women's Studies (3) I II
Introduction to the new information and
research on women in literature, history, sociol-
ogy, philosophy, anthropology, psychology, and
political science; investigations of each disci-
pline's approach to women's roles and status.

150. Women in Western Culture: Plato to
Plath (3) Women as depicted in leading works
by outstanding male and female philosophers,
painters, sculptors, and writers from the classi-
cal Greek period to the 1960s.

200. Women in Western Culture: Plato to
Plath (3) Women as depicted in leading works
by outstanding male and female philosophers,
painters, sculptors, and writers from the classi-
cal Greek period to the 1960s.

216. Psychological and Biological Perspec-
tives on Gender Differences (3) II (Identical
with Psy. 216)

253a. History of Women in the United
States (3) I II (Identical with Hist. 253a-253b)

303. Gender and Communication (3) I
1990-91 (Identical with Anth. 303)

310. Women in Antiquity (3) II 1989-90 (Identical
with Hist. 310)

341. Women and Health (3) I II (Identical with
Nurs. 341)

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)

425. Women and Religion (3) I Comparative
study of religious images and ideologies of
women, roles played by women in religious set-
grings and women's contemporary innovations in
theology and community structures. (Identical
with Reli. 425) May be convened with 525.

439. Women in the Literature of the Amer-
icas (3) I 1989-90 (Identical with Eng. 439)

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. History of Women in Latin America (3)
II (Identical with Hist. 468)

476. Women and the Law (3) I 1990-91 (Identical
with Pol. 476)

480. Women In Management (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)

487. Women In South Asia (3) II 1989-90
(Identical with Or.S. 487)

489. Women In East Asia (3) I (Identical with
Hist. 489)

496. Seminar

1. Women's Studies (3) [Rpt./2] I II
For a description of course topics, see 425. Graduate-level
requirements include an essay on secondary
sources and a major paper. May be convened
with 425.

571. Counseling Women (3) II (Identical with
Coun. 571)

595. Colloquium

a. Advanced Studies in the History of
Women (3) [Rpt./5] I II (Identical with Hist.
595e, which is home)

596. Seminar

a. Women's Studies (3) [Rpt.] I II (Identical
with Engl. 596w, which is home)

Zoology

(See Ecology and Evolutionary Biology)
Memberships and Accreditations

**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 Society of Landscape Architects; 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; 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 Council for Accreditation of Teacher Education; National League for Nursing; North Central Association of Colleges and Schools.

**Memberships**—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 Learned Societies; American Association of University Women; American College Theatre Festival; American Council of Graduate Schools; American Council on Education; American Home Economics Association; American Psychological Association; American Society for Engineering Education; American Society for Public Administration; American Statistical Association; Argonne Universities Association; Associated Western Universities; Association for Gerontology in Higher Education; Association for Public Policy and Management; Association for University Business and Economic Research; Association of Academic Health Centers; Association of American Colleges; 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 Systematics Collections; Association of Universities for Research in Astronomy; Association of University Summer Sessions; Border State Universities Consortium for Latin America; Broadcasters Educational Association; 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; EDUCOM, Interuniversity Communications Council; Eisenhower Consortium; Graduate Management Admissions Council; Institute of International Education; International Museum of Photography; Latin American Scholarship Program of American Universities; Mid-America College Art Association; Midwest Association of Graduate Schools; National Association of Colleges and Teachers of Agriculture; National Association of College and University Attorneys; National Association of Schools of Art and Design; National Association of State Universities and Land Grant Colleges; National Consortium for Black Professional Development; National Public Radio; National University Continuing Education Association; North American Association of Summer Sessions; Pacific Mountain Network; Public Broadcasting Service; Rocky Mountain Science Council; Society of Architectural Historians; Speech Communication Association; Travel Research Association; Universities Council on Water Resources; Universities Research Association; University Corporation for Atmospheric Research; University Film Association; University Resident Theatre Association; University Space Research Association; Western Association of Graduate Schools; Western College Association; Western Interstate Commission for Higher Education (WICHE), Western Institute of Nursing.
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 reorganized 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 Science, and the Faculty 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 333 acres and 147 buildings. Its purpose remains, in the language of the organic law, to provide the inhabitants of the 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.

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 programs in Family Studies; Clothing and Textiles; Interior Design; Counseling and Guidance; Home Economics Education; Consumer Studies); School of Renewable Natural Resources (with programs of Landscape Resources; Range Resources; Forest-Watershed Resources; Wildlife Fisheries and Recreation Resources). Departments: Agricultural Economics; Agricultural Education; Agricultural Engineering; 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; Drama; Ecology and Evolutionary Biology; English; French and Italian; Geography and Regional Development; Geosciences; German; History; Journalism; Linguistics; Mathematics; Media Arts; Oriental Studies; Philosophy; Physics; Planetary Sciences; Political Science; Psychology; Russian and Slavic Languages; Sociology; Spanish and Portuguese; Speech and Hearing Sciences; Statistics. University Departments of: Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology. Committees on: Dance; Russian and Soviet Studies.

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.

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.

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.

College of Nursing.

College of Pharmacy. Departments of: Pharmaceutical Sciences; Pharmacology and Toxicology; Pharmacy Practice.
School of Health-Related Professions. Divisions of: Community and Environmental Health; Medical Technology; Department of: Exercise and Sport Sciences.

Graduate College. Committees on: American Indian Studies; Applied Mathematics; Arid Lands Resource Sciences; Cancer Biology; Comparative Literature and Literary Theory; Environment and Behavior; Genetics; Gerontology; History and Philosophy of Science; Latin American Studies; Medieval Studies; Neuroscience; Nutritional Sciences; Optical Sciences; Pharmacology and Toxicology; Physiological Sciences; Planning; Plant Protection; Remote Sensing.

General Departments. School of Military Science, Naval Science, and Military Aerospace Studies.

University Departments. Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology.

General Committees. American Indian Studies; Applied Mathematics; Biomedical Engineering; Black Studies; Business Administration; Gerontology; Humanities; Latin American Studies; Mexican American Studies; Religious Studies; Remote Sensing; Women's Studies.

Extended University and the Summer Session.

The University Libraries.

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. Research is also conducted on farms, orchards, ranches, rangelands, and forests in cooperation with farmers, ranchers, and officials of various state and federal agencies.

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 research technology, 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 modeling, 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 spon-
sors various workshops throughout the year. These activities serve to provide an environment for student and faculty interaction.

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 and personnel of the unit 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 Study Unit (1973), located in the School of Renewable Natural Resources, is engaged in research to support the natural 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, post-graduate, 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 Heart Center operates as a division of the College of Medicine, reporting to the Dean of the College. Its programs are linked to faculty and staff in the college, in the University Medical Center, and in other colleges and units in the University.

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 the cognitive science program and the departments/committees of 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 (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 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) is the 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 college or department. A major thrust of the organization is to form research groups to initiate new programs of high priority to the development of the University and to enhance 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 Geology and Mineral Technology (1915) was reorganized by the state legislature, effective July 1, 1988, to form the Arizona Geological Survey as an independent state agency. The Arizona Geological Survey will replace the former Geologic Survey Branch of the bureau and will continue to serve as the primary source of geologic information in the state.

The mission of the Mineral Technology Branch will be maintained through the College of Engineering and Mines. Dissemination of information relating to mining, including health and mine safety and geological engineering, will be 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 and distributed services and facilities in support of the instructional, research, and administrative computing needs of the University. The University’s network of shared computers consists of a Control Data Corporation CYBER 175 computer, three VAX 11/780’s, a VAX 11/750, a VAX 8800, and a VAX 8650 computer system in a cluster environment, an IBM 4381 and an IBM 3090 computer, one Prime computer system, and a Scientific Computer Systems (SCS-40) minicomputer. These computers are interconnected to allow data transfer between systems.

The CCIT provides a campus-wide data communications network supporting both central and distributed processors. Access to facilities is available 24 hours a day. Additionally, CCIT provides access to outside networks such as Bitnet and NSFNET, and to other major national supercomputer networks. Connections are available to the national supercomputer centers at Princeton, Cornell, Pittsburg, Illinois, San Diego and NCAR. The CCIT provides terminal access centers at various locations on campus and dial-up access to the University system.

The CCIT offers many services to assist users in taking advantage of available computing resources. Services include consulting on the use of the University’s computers and various microcomputers; assistance in user acquisition of computing facilities; communications and networking between user-owned equipment and the University’s systems; computer facility planning and preparation; selection, acquisition, and installation of microcomputer hardware and software; mainframe and microcomputer training facilities; programming and applications services; and dissemination of information through user publications, manuals, and program library documentation.

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 available through subscription. Photographs and archive materials are available through both exhibition and personal print viewing appointments.

The Center for Middle Eastern Studies is engaged in a variety of aspects of research on the modern Middle East. It is
The Center for the Management of Information (CMI)—The Center for the Management of Information, established through a grant from IBM, fosters programs designed to develop interdisciplinary approaches to the management of information. CMI activities have resulted in the development of a new integrated MBA curriculum that was implemented in the fall of 1986, and laboratories equipped with state-of-the-art technology are available for student use in support of management decision making in all MBA classes. In 1987 the Collaborative Management Room was opened as a facility for group planning, problem solving and decision making; and research in these areas has been established.

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 heretofore 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 related 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 Cooperative Extension Service (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 sciences, youth development (4-H), and community leadership and resource development. The service 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 homes. Assistance 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, planning, and public policy; to complement the formal education of students with research experience; 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, analyzes the effects of public policy alternatives, and provides technical assistance for computerized corporate and government planning applications. It publishes the semi-annual Arizona Review, the monthly Arizona’s Economy, the chart book Arizona Economic Indicators, and the Arizona Statistical Abstract. It also produces forums and seminars for the public. In addition, DEBR answers requests from business, 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, research and public broadcasting services to the University, community and state. The division operates three maximum-power public broadcasting stations: KUAT-TV (Channel 6 and KUAS-Channel 27 in the Catalina Foothills), KUAT-AM (1550 kHz), and KUAT-FM (90.5 MHz and Translator Frequency, 89.7 MHz in northwest Tucson and Sierra Vista and 105.5 in Phoenix). The stations are affiliated with Public Broadcasting Service (PBS), National Public Radio (NPR) and American Public Radio (APR).

Professional production facilities are maintained in the Modern Languages Building, the Audiosvisual Building and the Harvill Building. Production capability includes color studio and television.

The VideoCampus produces and distributes university courses to business and industry in the Tucson area through a two-channel interactive Educational Television System (ITS) and through the nation by videotape and live satellite transmission. See below for further information.

Instructional Production and Engineering provides high technology educational support including: (1) Pre-production and instructional design for video and audio. Production and post-production and distribution via nationwide Ku Band uplink facilities, ITS and Microwave Transmission to Tucson and Fort Huachuca, satellite reception facilities, large screen viewing facilities and teleconference facilities. (2) Videotaping for teaching assistant evaluations, meetings, conferences and seminars is available as well as satellite reception of Soviet and French television programs for use in foreign language classes. (3) Equipment maintenance and repair for departments is an additional service of Engineering and Production.

The Graphics Center provides outstanding graphic and photography services to the University.

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. In addition to basic research, graduate programs in neuroscience are offered through the Committee on Neuroscience.

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 development of new exchange institutions to meet the information and technological demands of a wide variety of environments.

ESL operates a computer laboratory dedicated to conducting economic, political, and business and government policy experiments. Other programs include lectures by visiting scholars, seed money for faculty and graduate student
entrepreneurs discuss business plans.

Through an annual dialogue on significant national economic business plans. Approximately 35 students are included in the entrepreneurship and practical courses on the development of gram offers both academic courses for students interested in fellowships are also available. The Entrepreneurial Studies Pro-

is supported through the recruitment of Karl Eller Chair holders and (3) to provide for business /academic exchange. Research three broad objectives: (1) to promote research in basic market within the College of Business and Public Administration. It has specialized medical equipment. which houses two hospital beds and is equipped with spe-

interviews or preliminary examinations, and the main room drugs in humans with the ultimate goal of developing improved within the study of weather, climate, and earth systems science. Par-

science exhibit halls and 16 -inch telescope are open free to the public. Open daily except Mondays.

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 global climate.

The Jeffrey M. Golding 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 special-

ized 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 also available in Entrepreneurial Studies Pro-

gram 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. Business/academic exchange occurs through an annual dialogue on significant national economic issues and through semiannual new venture forums where entrepreneurs discuss business plans.

The Laboratory of Tree-Ring Research (1937) is an outgrowth of the pioneering tree-ring studies initiated by Andrew Elliot Douglass at the University of Arizona in 1906. A division of the College of Arts and Sciences, the Laboratory conducts a unique program of tree-ring 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 reconstruc-
tion of paleohydrologic, paleoclimatic, and paleoecologi-

variables, and the documentation and development of prehistoric chronometric 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 and data files containing processed tree-ring chronologies, relevant climatic and hydrologic records, and archaeological tree-ring dates and site information.

The Lunar and Planetary Laboratory (1960) is the research institute associated with the Planetary Sciences Department. Laboratory staff engage in research and graduate instruction in conjunction with the Planetary Sciences Department and frequently undertake projects in collaboration with other campus units as well, including the departments of Astronomy, Geo-

sciences, and Physics, and the Steward Observatory.

Research programs at the Lunar and Planetary Laboratory are closely associated with the NASA space program and include numerous lunar and planetary missions. Several of the faculty of the department and the laboratory have been principal investigators or co-investigators on space experiments, including Apollo, Mariner, Voyager, and Pioneer spacecraft. Major ground-based research facilities include the University of Arizona telescopes (150 cm, 100 cm, 70 cm aperture reflectors on Mt. Lemmon; 154 cm aperture reflector and 46/71 cm Schmidt camera near Mt. Bigelow; 53 cm reflector on Tumamoc Hill; 220 cm Cassegrain reflector on Kitt Peak; and the multiple mirror telescope on Mt. Hopkins), a scanning electron micro-

neutron activation analysis laboratory, a digital image processing laboratory, and the Space Imagery Center. In addi-

tion, the laboratory conducts high-altitude observational pro-

grams for solar, planetary, and stellar infrared spectroscopy using NASA jet aircraft.

Research interests of the laboratory and department include experimental and theoretical geochemistry and cosmochemistry, lunar and planetary geology, spacecraft imaging of planetary surfaces, the physics of planetary interiors, cosmic rays, the sun and solar wind, astrophysical plasmas, polarimetry and studies associated with the origin of the solar system, infrared Fourier spectroscopy, planetary atmospheres, infrared astrono-

my, and astrometry. The laboratory is housed in the Gerard P. Kuiper Space Sciences Building.

The Mexican American Studies and Research Center engages in research, publication, public service, and under-

graduate and graduate educational activities which enhance the study of the Mexican American experience and related issues. Major objectives of interdisciplinary 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 behavior and intervention strategies. Special research and serv-

ices conducted through university funds and outside support. Funds of sponsored grants support training of stu-

ents in a variety of 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 pub-

lic 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, natural resources development and management, environmental studies, economic botany, new crop development, water and energy conservation, farming systems research, information services, remote sensing, geographic 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 interdisciplinary 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 optical physics. Areas in which research is currently being conducted include electro-optics, image formation, image 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, 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 Circuitry Cooperative and the Optical Data Storage Center.

Special facilities of the Optical Sciences Center include CVD and vacuum-deposition thin-film facilities, dark rooms, an electronics shop, infrared laboratory, instrument shop, mass-spectrometers, mass-spectrometry shop, a small optics shop, student/faculty machines, 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 Laboratory (1977) in the College of Pharmacy is primarily an analytical laboratory where new assays are developed to quantify drugs and their metabolites from biological fluids. These assays are used in conjunction with animal and clinical research projects to better define the disposition 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.

The Social and Behavioral Sciences Research Institute promotes fundamental and applied research focusing on both individuals and social groups. The areas of fundamental research encompass individual behavior, including its linguistic and psychological expression, social organization, theory and philosophy, and to understand the nature of computation as it plays a role in the workings of the human mind. Laboratories designed for study of human perception and cognition and of experimental psycholinguistics support cognitive science research.

The Southwest Center (1982) is a unit of the Faculty of Social and Behavioral Sciences that fosters research, teaching, and public programming on the history, culture, and development of the Greater Southwest (including Northwestern Mexico). Associated with the center is the Bloom Southwest Jewish Archives, 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 opportunities 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 vigorous publishing program; and engages in a broad range of public outreach and programming: conferences, seminars, lectures, speakers' bureau, 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-in. (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 Mount Hopkins summit in the Santa Rita Mountains, Arizona. The mirror is a 6.1-m reflector (1979); the Kitt Peak station, and the 61-in. (155-cm) Cassegrain reflector located at the Mt. Bigelow station in the Santa Catalina 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 northeast part of the University campus adjacent to the original 36-in. dome which now houses a 21-in. 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, and radio galaxies. Observational work is concentrated in the optical and infrared but includes work at radio, ultraviolet and x-ray wavelengths using other facilities. The observatory owns and operates a variety of sampling 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...
interest—that are appropriate to its list.

publish children's books or volumes of original fiction or verse.

folklore, and life-ways of the region. The UA Press does not

professional writers of the natural history, geography, history,

Southwest borderlands, including accounts by scholars and

other fields. Also on the UA Press list are trade books on the

the special strengths of the University of Arizona, Arizona State

university disciplines requiring or desiring to use various analytical procedures in
teaching or research activities. The UAC serves the university community by providing analytical equipment, analytical advice, methods development, sample analysis, and the training of both technical and non-technical personnel in various aspects of analytical measurements. In addition, the UAC maintains an active program of both basic and applied research. The research activities provide a means of continuously expanding Analytical Center capabilities and ensuring that equipment and personnel are kept at "state-of-the-art" levels in various analytical areas. The UAC is a state-certified laboratory.

The University of Arizona Museum of Art—The University of Arizona is exceptionally fortunate in that it possesses several outstanding art collections. Housed in our modern building are the masterpieces of the Samuel H. Kress Collection, which include the surviving panels of the Retablo de 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 on weekdays from nine to five and on Sunday from noon to four. There is no admission fee.

The University of Arizona Press (1959), a department of the University of Arizona, is a nonprofit publisher of regional and scholarly 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, arid lands studies, biology, Latin American studies, Asian studies, American Indian 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 or volumes of original fiction or verse.

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, whose separate editorial and subscription office is in the UA Main Library.

The VideoCampus (1972) is an education delivery system which uses video cassettes, live interactive microwave and satellite transmission to make University of Arizona classes available to students throughout the U.S. Students in remote locations who want university credit must be admitted to the University and register for classes in absentia. Successful completion of a course results in a university credit transcript entry. In addition to regular courses, videotaped short courses provide up-to-date information on diverse subjects, but are not available for university credit. Developed in the College of Engineering and Mines, VideoCampus has grown to include courses from many other colleges and is now part of the Division of Media Services.

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.

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 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 22. 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 280,000 graduates and former students.

**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 35 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**—Of the 11 colleges within the University of Arizona, 9 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 Office.

- **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.

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**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.

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**The University of Arizona Foundation**

**Officers**

- David F. Peachin — President
- J. Luther Davis — Vice President
- John G. Payson — Treasurer
- Darryl B. Dobras — Secretary
- Richard F. Imwalle — Executive Vice President

**Board of Directors**

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- Robert M. Charles
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- Darryl B. Dobras
- Roy P. Drachman
- Stevie Eller
- William A. Estes, Jr.
- Douglas S. Holsclaw
- Richard F. Imwalle
- Leonard R. Judd
- Peter Kiewit, Jr.
- Henry Koffler
- Humberto S. Lopez
- Duane D. Miller
- James F. Morrow
- Diane A. Neffson
- Olivia Oberschall
- John G. Payson
- David F. Peachin
- Charles M. Pettis
- Mary Margaret Raymond
- Floyd W. Sedlmayr, Jr.
- Donald F. Soltwedel
- Jay C. Stuckey, Jr.
- Tracy R. Thomas
- Michael M. Williams

**Ex-Officio Directors**

- Allan Beigel, M.D.
- Cedric W. Dempsey
- Kent Rollins
- Ben J. Tuchi

---

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- Jay C. Stuckey, Jr.
- Tracy R. Thomas
- Michael M. Williams

**Ex-Officio Directors**

- Allan Beigel, M.D.
- Cedric W. Dempsey
- Kent Rollins
- Ben J. Tuchi
Arizona Board of Regents

### Ex Officio

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Rose Mofford</td>
<td>Governor of Arizona</td>
</tr>
<tr>
<td>C. Diane Bishop</td>
<td>State Superintendent of Public Instruction</td>
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</table>

### Appointed

<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>Patrick McWhortor</td>
<td>Assistant Treasurer</td>
</tr>
<tr>
<td>Donald S. Shropshire</td>
<td>Treasurer</td>
</tr>
<tr>
<td>A. Jack Pfeifer, LL.B.</td>
<td>Treasurer</td>
</tr>
<tr>
<td>Edith S. Auslander, Ph.D.</td>
<td>Treasurer</td>
</tr>
<tr>
<td>Herman Chanen, President</td>
<td>Treasurer</td>
</tr>
<tr>
<td>Donald Pitt, J.D. Secretary</td>
<td>Treasurer</td>
</tr>
<tr>
<td>Esther C. Capn M.Ed. Treasuer</td>
<td>Treasurer</td>
</tr>
<tr>
<td>Andrew D. Hurwitz</td>
<td>Treasurer</td>
</tr>
<tr>
<td>Douglas J. Wall</td>
<td>Treasurer</td>
</tr>
</tbody>
</table>

### Administrative Officers

#### Year of first University appointment in parentheses after each name.

- **Henry Koffler** (1982), President of the University B.S., 1943, University of Arizona; M.S., 1944, Ph.D. 1947, University of Wisconsin; D.Sc., 1977, Purdue University; LL.D., 1981, Amherst College; D.Sc. 1981, University of Arizona.
- **Jack R. Cole** (1957), Acting Provost; B.S. 1953, University of Arizona; Ph.D. 1957, University of Minnesota.
- **Ben J. Tuchi** (1985), Senior Vice President for Administration and Business; B.S., 1959, M.S., 1962, Western Oregon State University; Ph.D. 1970, St. Louis University.
- **Sarah A. Blake** (1983), Vice President for Planning and Budgeting; B.S., 1977, University of Arizona.
- **Michael A. Cusanojich** (1969), Vice President for Research; Dean, Graduate College; B.S., 1963, University of the Pacific; Ph.D. 1967, University of California at San Diego.
- **George H. Davis** (1970), Vice Provost for Academic Affairs; B.A., 1964, College of Wooster; M.A., 1966, University of Texas; Ph.D. 1971, University of Michigan.
- **Albert B. Weaver** (1958), Executive Vice President Emeritus; A.B., 1940, University of Montana; M.S., 1941, University of Idaho; Ph.D. 1952, University of Chicago.
- **Richard M. Edwards** (1959), Vice President Emeritus for Student Relations; B.S.Ch.E., 1941, Purdue University; M.S.Ch.E., 1943, University of Washington; Ph.D., 1945, E. Chem., 1974, University of Arizona.
- **Arno Richard Kassander** (1954), Vice President Emeritus for Research; B.A., 1941, D.Sc. 1971, Amherst College; M.S., 1943, University of Oklahoma; Ph.D., 1952, University of Arizona.

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**J. Gregory Fahy** (1984), Assistant Vice President for Planning and Budgeting; B.A. 1968, Arizona State University; M.A. 1971, Princeton University.

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**Lee Sigelman** (1967), Dean, Faculty of Social and Behavioral Sciences, College of Arts and Sciences; B.A., 1967, Carleton College; M.A. 1971, Ph.D. 1973, Vanderbilt University.

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**Bodo Bartocha** (1986), Director, International Programs; B.S., 1951, M.S. 1953, Ph.D. 1956, Philipps-Universität Marburg.

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**Peter Bemingham** (1978), Director, Art Museum; B.A. 1964, M.A. 1968, University of Maryland, Ph.D. 1972, University of Wisconsin.

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**Frederick H. Chaffee** (1984), Director, Multiple Mirror Telescope Observatory; A.B. 1963, Dartmouth College; Ph.D. 1968, University of Arizona.

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**Michael A. Cusanojich** (1969), Acting Director, Arizona Research Laboratories; 1963, University of the Pacific; Ph.D. 1967, University of California at San Diego.

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Dallas, William J. (1985), Associate Professor of Radiology

Daten, James E. (1988), Dean of the College of Medicine

Dahood, Roger G. (1970), Professor of English, B.A., 1961, University of Wisconsin

Dahlgran, Roger A. (1985), Assistant Professor of Agricultural Economics, B.S., 1984, Idaho State University

Damas, Thomas P. (1980), Associate Professor of Pharmacology, B.S., 1975, University of Arizona; Ph.D., 1980, University of California at San Diego

Dapena, Prabir (1986), Assistant Professor of Finance, B.S., 1980, University of Arizona; M.B.A., 1983, Arizona State University; Ph.D., 1986, University of Arizona

Dawson, George A. (1966), Professor of Atmospheric Sciences, B.S., 1965, Institute of Atmospheric Sciences; M.S., 1967, University of California at San Diego; Ph.D., 1972, University of California at Berkeley

Davies, Owen K. (1982), Associate Professor of Geosciences, B.S., 1975, University of Nevada; M.S., 1979, University of California; Ph.D., 1982, University of Arizona

Davis, George H. (1970), Vice Provost for Academic Affairs; Professor of Education, A.B., 1949, State University of New York; M.S., 1965, University of Arizona; Ph.D., 1970, University of Arizona

Decker, Michael T. (1987), Associate Professor of Landscaping and Golf Course Management, B.S., 1980, State University of New York; M.S., 1987, Virginia Polytechnic Institute and State University

DeFeo, Anthony B. (1981), Director of the Speech Pathology Clinic in Speech and Hearing Sciences, B.S., 1975, University of Arizona; M.A., 1977, University of Southern California; Ph.D., 1981, University of Arizona


Deitz, William D. (1983), Assistant Professor of Music, B.M.E., 1976, West Virginia University; M.M., 1986, University of Arizona

Dillon, Robert C. (1966), Lecturer in Mathematics, B.A., 1960, Washburn University

Dinta, Satish M. (1978), Director of the Center for Research in Undergraduate Education; Associate Professor of Educational Psychology; Adjunct Lecturer in Architecture, B.S., 1961, University of Minnesota; M.A., 1963, Ph.D., 1966, University of Michigan State College


Dinnerstein, Myra (1975), Chairperson and Research Social Scientist for the Committee on Women's Studies, A.B., 1966, University of Pennsylvania; M.A., 1963; Ph.D., 1971, Columbia University

Dixon, Darcy L. (1980), Professor of Accounting, B.A., 1979, University of Nebraska

Dixon, William J. (1985), Associate Professor of Political Science, B.S., 1977, Montana State University; M.A., 1980, Colorado State University; Ph.D., 1985, University of Arizona

Dobbs, Dan B. (1977), Rosenstiel Distinguished Professor of Law, B.S., 1968, University of Kentucky; J.D., 1970; M.S., 1975, University of Arizona; Ph.D., 1972, University of Illinois
Farlee, Jim (1987), Associate Professor of Naval Science.


Fan, Paula (1976), Associate Professor of Music, B.M., 1972, University of Arizona; M.S., 1976, Arizona State University; Ph.D., 1981, University of Arizona.

Fan, Paula (1976), Associate Professor of Music, B.M., 1972, University of Arizona; M.S., 1976, Arizona State University; Ph.D., 1981, University of Arizona.

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Fan, Paula (1976), Associate Professor of Music, B.M., 1972, University of Arizona; M.S., 1976, Arizona State University; Ph.D., 1981, University of Arizona.


Henderson, Robert C. (1972), Professor of Anthropology, B.A., 1956, University of New Mexico; Ph.D., 1963, University of California at Berkeley.


Henn, Harold (1955), Professor of Soil and Water Science, B.S., 1960, M.S., 1962, Ph.D., 1966, University of California at Davis.


Hesse, Evan M. (1986), Professor of Internal Medicine, B.S., 1960, State University of New York; M.D., 1964, University of Arizona.


Hersh, Evan M. (1986), Professor of Internal Medicine, B.S., 1960, State University of New York; M.D., 1964, University of Arizona.


Hertzig, Michael (1976), Associate Professor of Psychology, B.S., 1963, University of Pennsylvania; M.A., 1964, Ph.D., 1967, University of Wisconsin; Ph.D., 1968, University of Wisconsin.


Hettick, David L. (1963), Professor of Nuclear Engineering, B.S., 1963, Rensselaer Polytechnic Institute; Ph.D., 1954, University of California at Los Angeles.

Hettich, J. (1976), Assistant Professor of Molecular and Cellular Biology, and Biochemistry, B.S., 1964, Southern University of California; Ph.D., 1972, University of California at Davis.


Hicks, Mary J. (1977), Associate Professor of Pathol- ogy, B.S., 1966, M.D., 1973, University of Arizona.

Hicks, Neil G. (1969), Mechanical Engineer and Research Coordinator for Aquaculture in the Environmental Research Laboratory, B.S., 1968, Texas Technological College.


Higdon, Thomas D. (1965-71), Director of the Health Sciences Library, Librarian in the Health Sciences Library, B.S., 1957, University of Oklahoma; M.S., 1958, Columbia University.


Hilgartner, Scott (1948-51; 1969-87), Professor Emeritus of Agricultural Economics, B.S., 1941, Louisiana State University; M.S., 1942, Ph.D., 1943, University of Illinois.


Hinojosa, F. (1967), Assistant Professor in the Department of Zoology, A.B., 1960, University of California at Berkeley; Ph.D., 1967, University of California at Berkeley.

Hinshaw, Donald C. (1980), Assistant Professor of Internal Medicine, Pediatrics, B.S., 1965, M.D., 1968, University of Iowa.


Hinrichs, John G. (1985), Division of the Director of the Division of Neurobiology in the Arizona Research Laboratories; Professor of Neurobiology, Biochemistry, Molecular and Cellular Biology, and Entomology, A.B., M.A., 1964, Harvard College; Ph.D., 1969, Rockefeller University.


Hoffman, R. L. (1956), Professor of Physics and in the Arizona Research Laboratories, B.S., 1953, Univer-
Ingram, Helen M. (1972), Professor of Political Science, B.A., 1959, Oberlin College; Ph.D., 1967, Columbia University.

Irnmar, Billie J. (1962), Director of the Humanities Program, B.S., 1953, Cleveland State University; Ph.D., 1972, University of California at Berkeley.

Jaffe, M. (1956), Professor of Art, B.S., 1944, University of Michigan; M.A., 1946, Columbia University; Ph.D., 1956, University of California, Berkeley.

Jimenez, Luis A. (1985), Professor of Art, B.S., 1964, University of Texas at Austin.


Joe, Jannan, Professor of the Native American Research and Training Center; Assistant Professor of Family and Community Medicine, B.S., 1964, University of New Mexico; M.D., 1968, Stanford University.

Jones, Lynn A. (1981), Associate Professor of Veterinary Medicine, B.S., 1967, Kansas State University; M.S., 1971, Iowa State University.

Jones, Robert L. (1960), Professor of Economics, B.S., 1949, University of Oregon; M.B.A., 1950, University of California, Berkeley.


Just, Kurt W. (1961), Professor of Physics, Dr. R. Nat., 1954, Privat Dozent, 1958, Free University of West Berlin.


Kaku, Bhadr K. (1984), Assistant Professor of Management, B.S., B.F.A., 1972, Musula Aided College of Technology; M.B.A.; Aided College of Technology.

Kalkan, Christopher J. (1983), Assistant Professor of Agricultural Education, B.S., 1952, Agricultural Institute; M.S., 1961, Ohio State University.

Kamel, Hussein A. (1967), Professor of Aerospace and Mechanical Engineering, B.S., 1955, Cairo University; B.S., 1960, Imperial College of Science and Technology.


Kantar, Ilyasina K. (1988), Assistant Professor of Management Information Systems, B.Tech., 1980, Banaras Hindu University; Ph.D., 1988, Purdue University.

Karol, Michael D. (1964), Assistant Professor of Pharmacological Sciences, B.S., 1973, University of Colorado; Ph.D., 1984, University of Colorado.

Kashy, Jean L. (1975), Professor of Music, B.M., 1961, Curtis Institute of Music; M.A.T., 1971, Oklahoma City University.


Keller, Philip C. (1966), Professor of Chemistry, B.A., 1961, University of California at Berkeley; Ph.D., 1969, MIT.

Kelley, Alec E. (1952-83), Professor Emeritus of Chemistry, B.S., 1944, University of Texas; M.S., 1948, Ph.D., 1952, Purdue University.


Kelley, Peggy J. (1976), Associate Professor of Drama, B.A., 1971, M.A., 1974, University of Wisconsin.

Kellogg, Frederick (1967), Associate Professor of History, B.A., 1952, Stanford University; M.A., 1956, University of Southern California; Ph.D., 1966, Indiana University.

Kelly, Annamaria (1965-69), Lecturer Emerita in French and Italian, B.S., 1956, M.A., 1966, University of Wisconsin; Ph.D., 1975, University of Rome.

Kelly, John D., Jr. (1994), Assistant Professor of Family and Consumer Resources, B.S., 1972, M.S., 1976, University of Massachusetts; Ph.D., 1982, Ohio State University.
Levy, Eugene H. (1975), Head of the Department of Planetary Sciences; Director of the Lunar and Planetary Laboratory; Professor of Planetary Sciences and the University of Arizona; B.S., 1946; Rutgers University; Ph.D., 1971, University of Chicago.

Levy, Jerold E. (1972), Professor of Anthropology; M.A., 1956, Ph.D., 1959, University of Chicago.


Li, Shu (1988), Assistant Professor of Systems and Industrial Engineering; B.S., 1982, Hauzhong University; M.S., 1985, University of Illinois; Ph.D., 1986, Harvard University.

Lecace, Gary D. (1984), Director of the Karl Kari Graduate School of Management; Professor of Economics; B.A., 1968, University of Montana; M.A., 1976, University of Pennsylvania.

Lichtenberger, Dennis L. (1979), Professor of Chemistry; B.S., 1969, Indiana University; Ph.D., 1974, University of Wisconsin.


Liebert, James W. (1976), Professor of Astronomy; B.S., 1973, State University of New York; M.S., 1976, Ph.D., 1976, University of California at Berkeley.

Liebler, Daniel C. (1987), Assistant Professor of Pharmacology; B.S., 1980, Virginia Commonwealth University; Ph.D., 1984, Vanderbilt University.


Liebold, Thomas J. (1970), Associate Professor of Molecular Physiology and Biophysics; B.S., 1963, Gustavus Adolphus College; Ph.D., 1969, University of Iowa.

Linday, Everett H. (1967), Professor of Geochronology; B.A., 1940, Pomona College; Ph.D., 1945, University of California at Berkeley.

Lindsey, Roger E. (1984), Professor of Surgery, B.S., 1940, Louisiana State University; M.D., 1943, M.P.H., 1949, Ph.D., 1950, Yale University; M.S., 1965, University of Michigan.

List, Alan F. (1988), Assistant Professor of Internal Medicine, B.S., 1976, Bucknell University; M.D., 1980, University of Pennsylvania.

Little, Jeffrey K. (1985), Assistant Professor of Military Aerospace Studies, B.S.M.E., 1982, Auburn University; M.S., 1986, University of Tennessee at Knoxville.

Little, John W. (1977), Associate Professor of Biochemistry and Molecular Biology, B.S., 1965, University of Tennessee; Ph.D., 1975, University of Wisconsin.

Litter, Charles A. (1957-83), Professor Emeritus of Art, B.A., 1951, New York University; M.A., 1956, University of Iowa; Ph.D., 1969, University of California at Berkeley.

Liu, Tessie P. (1986), Assistant Professor of History; M.A., 1981, Ph.D., 1986, University of Massachusetts at Amherst; B.S., 1980, Villanova University.

Long, Austin (1968), Professor of Geosciences, and Hydrology; Ph.D., 1968, University of Arizona; B.S., 1957, Midwestern University; M.A., 1962, University of Iowa; Ph.D., 1966, University of Arizona.

280 University Affiliations, Organization, Administration and Faculty

1965, Roosevelt University; Ph.D., 1970, Arizona State University

Morris, Russell O. (1989), Head of the Department of Military Science; Professor of Military Science, B.S., 1970, United States Military Academy; M.S., 1978, Rensselaer Polytechnic Institute

Morris, Thomas M. (1959-62), Professor Emeritus of Metallurgical Engineering, B.S., 1938, Arizona State University; M.S., 1940, Columbia University; Ph.D., 1950, University of Missouri


Morse, Bart J. (1970), Associate Professor of Art, B.S., 1962, Binghamton University; M.F.A., 1964, University of Washington

Morse, Richard L. (1976), Professor of Nuclear and Energy Engineering, B.S., 1965, University of Colorado; Ph.D., 1965, University of California at San Diego

Moser, Elizabeth Kraus (1978), Professor of Music, B.M., 1957, M.M., 1958, University of Southern California at Los Angeles

Mount, David W. (1969), Professor of Molecular and Cellular Biology, Microbiology and Immunology, and Biochemistry, B.Sc., 1960, University of Alberta; M.A., 1963, Ph.D., 1965, University of Toronto

Mount, Jack D. (1984), Science-Engineering and Maps Librarian, Assistant Librarian in the University Library, B.S., 1973, State University at Los Angeles; M.S., 1972, University of California at Los Angeles; M.L.S., 1972, Rutgers University

Mrsny, Reid K. (1956), Professor of Military Science, B.T., 1979, University of Colorado


Nagle, Raymond B. (1976), Professor of Pathology, B.S., 1976, University of Wisconsin; M.D., 1974, University of Washington

Nagy, Bartholomew S. (1968), Chief Scientist of Organic Geochemistry in Geosciences, Professor of Geosciences, B.S., 1948, Peter Pannam University; M.A., 1953, Pennsylvania State University

Nakamoto, Kent (1987), Assistant Professor of Marketing, B.S., 1975, California Institute of Technology; M.A., 1976, Harvard University; Ph.D., 1985, Stanford University

Nan, Ichong (1987), Assistant Professor of Economics: B.A., 1977, National Taiwan University; M.A., 1987, Ph.D., 1987, University of Michigan


Narayan, N. (1968), Associate Astronomer in the Space Science Center; Ph.D., 1968, University of Arizona; Ph.D., 1969, University of Rochester; Ph.D., 1970, Arizona State University


Nasser, Kam (1965), Assistant Professor of Health Education and Physical Education, B.S., 1965, University of Arizona; M.A., 1966, Ph.D., 1965, University of Oregon

Nathanson, Ronny (1965), Assistant Professor of Educational Psychology, B.A., 1964, Tel-Aviv University; M.A., 1967, Long Island University; Ph.D., 1969, University of Pennsylvania

Navin, Helen L. (1962-87), Lecturer Emerita in Nursing, B.S., 1969, University of Arizona; M.S., 1970, University of California at San Francisco


Newman, Charles M. (1979), Professor of Mathematics, B.S., 1978, University of Arizona; M.S., 1979, Texas A&M University; Ph.D., 1979, Brown University

Nicolay, James S. (1976), Professor of Management, B.S., 1969, University of Arizona; M.S., 1970, Stanford University; Ph.D., 1971, Harvard University

Nichols, Andrew W. (1970), Professor of Family and Community Medicine, B.S., 1963, Grand Canyon College; M.D., 1969, Northern Arizona University; Ed.D., 1972, University of Arizona


Newton, Deborah A. (1986), Assistant Professor of Spanish, B.A., 1986, University of Wyoming; M.A., 1990, University of Nebraska


Nielsen, Douglas R. (1987), Assistant Professor of Dance, B.A., 1970, Augsburg College


Nikravesh, Parviz E. (1984), Associate Professor of Aerospace and Mechanical Engineering, B.S., 1968, Tehran University; M.S., 1973, Ph.D., 1976, University of California

Norwood, S. (1984), Assistant Professor of Accounting, B.A., 1961, University of Minnesota; M.B.A., 1976, University of Montana; Ph.D., 1984, University of Wisconsin

Nouwak, Kenneth (1985), Assistant Professor of Military Aerospace Studies, B.A., 1977, University of Arizona; M.A., 1981, University of Arizona

Norby, Gene M. (1996), Head of the Department of Agricultural Engineering; Professor of Agricultural Engineering, B.S., 1951, South Dakota State University; M.S., 1954, Ph.D., 1955, University of Minnesota

NorQuest, Jan L. (1984), Assistant Agent in 4-H, B.S., 1984, University of Arizona


Norton, Derek L. (1973), Professor of Geosciences, B.A., 1970, University of Buffalo; Ph.D., 1984, University of California at Riverside
Rund, John V. (1963), Associate Professor of Chemistry.
Rund, Hanno (1968), Professor of Mathematics in the University of Wisconsin.
Rudd, Joel (1985), Associate Professor of Family and Consumer Resources.
Rubis, David D. (1956-86), Professor Emeritus of Plant Sciences.
Roth, Robert L. (1971), Assistant Research Scientist.
Rosser, Rosemary A. (1975), Associate Professor of Psychology.
Ross, Chet J. (1979), Adjunct Lecturer in Family and Consumer Resources.
Rosenzweig, Michael L. (1975), Professor of Ecology and Evolutionary Biology.
Rosenblatt, Paul (1958), Professor of English, B.A., 1958, Northwestern University.
Romney, C. Park (1976), Assistant Agent in 4-H, B.S., 1976, Kansas State University.
Rogers, Willard L. (1959-81), Professor Emeritus of Mechanical Engineering.
Rogers, William M. (1975), Professor of Ecology and Evolutionary Biology.
Rouby, Bruce A. (1984), Assistant Professor of Range Management.
Rowe, David G. (1988), Associate Professor of Family and Consumer Resources.
Rowenbush, Jerry W. (1968), Assistant Professor of Electrical and Computer Engineering.
Rubs, David D. (1956-86), Professor Emeritus of Plant Sciences.
Rudolph, Carol J. (1976), Associate Professor of Family and Consumer Resources.
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Journalism
Landscape Architecture
Language Arts-Social Studies
Latin
Latin American Studies
Law
Library Science
Linguistics
Management & Policy
Management Information Systems
Marketing
Materials Science & Engineering
Mathematics
Medicine
Mechanical Engineering
Media Arts
Medical Technology
Merchandising & Fashion Promotion
Mexican American Studies
Microbiology
Mineral Economics
Mining Engineering
Molecular & Cellular Biology
Music
(Music) Composition
Music Education
(Music) Performance
Music Theory
(Music) Theory and Composition
Musicology
Natural Resource Recreation
Neuroscience
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Nursing
Nutritional Sciences
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