Arizona is on Mountain Standard Time all year.

Admissions
Undergraduate — Nugent Building, Main Floor ........................................ (602) 621-3237
Graduate — Administration Building, 3rd Floor ........................................ (602) 621-3132
Law — College of Law, Room 112 ................................................................. (602) 621-3477
Foreign Student — Nugent Building, Main Floor ........................................ (602) 621-3111

Bookstores
ASUA Bookstore, west end of the Student Union, the UA Mall ................... (602) 621-2426
Medical Bookstore, AHSC, Room 1116 ......................................................... (602) 626-6669

Business Office
Administration Building, Room 208 ............................................................ (602) 621-3232

Dean of Students
Old Main, Room 203 ......................................................................................... (602) 621-7057

Center for Disability Related Resources
Second and Cherry Streets .............................................................................. (602) 621-3268

Financial Aid
Administration Building, Room 203 ............................................................. (602) 621-1858

Libraries
Main Library, Cherry Avenue and the UA Mall ............................................. (602) 621-6441
Science-Engineering Library, the UA Mall .................................................. (602) 621-6384
Medical Library, 1501 N. Campbell ............................................................... (602) 626-6241

Registrar’s Office
Residency Classification, Administration Building, Room 313 ................. (602) 621-3636
Student Information, Administration Building, Room 210 ...................... (602) 621-7809
Transcripts, Administration Building, Room 305 ....................................... (602) 621-3212

Residence Life (Housing)
A.L. Slonaker Building .................................................................................. (602) 621-6500

Student Health Services
Cherry Avenue and the UA Mall .................................................................... (602) 621-6490

Student Union
On the UA Mall ......................................................................................... (602) 621-7755

Summer Session Office
1955 East Sixth Street .................................................................................... (602) 624-UofA

Transcripts
Administration Building, Room 305 ............................................................ (602) 621-3212

Veterans’ Services
Student Union, Room 353 ............................................................................. (602) 621-6455

Visitor Center
Cherry Avenue and the UA Mall .................................................................... (602) 621-5130
The general catalog of any institution is a mine of information. This particular catalog is no different and it can provide you with both a broad brush and a more detailed picture of The University of Arizona.

I draw your attention to what the following pages can tell you about a distinguished faculty, an extensive choice of courses and academic programs, and the depth of support programs that exist to help our students.

These pages will undoubtedly answer many of your questions. If you need more information, please do not hesitate to call on the appropriate office for help.

Sincerely,

Manuel T. Pacheco
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 and New Student Enrollment to determine the acceptability of credit from other institutions and its applicability toward a program of study at The University of Arizona.

Please note:
Admitted students will receive a complimentary copy of the The University of Arizona General Catalog when they participate in one of the many organized programs designed to assist students in the orientation, testing, advising, and registration processes. Admitted students, prospective students, and applicants wanting a catalog prior to participating in one of the above programs, may purchase a copy for $4.00 from the ASUA Bookstore.

Prospective graduate students may receive a complimentary copy of The University of Arizona Graduate Catalog from the Graduate College Office. Copies may be purchased for $4 from the ASUA Bookstore.

Information regarding the times and locations courses are scheduled is found in the Schedule of Classes available free in the ASUA Bookstore. Schedules for fall and spring semesters are available in April and October, respectively. The Summer Session Schedule of Classes is available in February.

The address for all campus offices:
The University of Arizona
Tucson, AZ 85721
# ACADEMIC CALENDAR

## First Semester

<table>
<thead>
<tr>
<th>Event</th>
<th>1993-94</th>
<th>1994-95</th>
</tr>
</thead>
<tbody>
<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>Aug. 2 M</td>
<td>Aug. 1 M</td>
</tr>
<tr>
<td>Degrees awarded as of this date for students completing requirements at close of summer session</td>
<td>Aug. 12 Th</td>
<td>Aug. 11 Th</td>
</tr>
<tr>
<td>Residence halls open</td>
<td>Aug. 2 Su</td>
<td>Aug. 21 Su</td>
</tr>
<tr>
<td>New-student orientation program (last session)</td>
<td>Aug. 23-24 M-Tu</td>
<td>Aug. 22-23 M-Tu</td>
</tr>
<tr>
<td>Opening of school activities</td>
<td>Aug. 23-25 M-W</td>
<td>Aug. 22-24 M-W</td>
</tr>
<tr>
<td>Freshman Convocation</td>
<td>Aug. 25 W</td>
<td>Aug. 24 W</td>
</tr>
<tr>
<td>Classes begin</td>
<td>Aug. 26 Th</td>
<td>Aug. 25 Th</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>Sept. 2 Th</td>
<td>Sept. 1 Th</td>
</tr>
<tr>
<td>Labor Day—no classes</td>
<td>Sept. 6 M</td>
<td>Sept. 5 M</td>
</tr>
<tr>
<td>Last day for dropping courses with deletion of course enrollment from record</td>
<td>Sept. 22 W</td>
<td>Sept. 21 W</td>
</tr>
<tr>
<td>Last day for dropping courses</td>
<td>Nov. 3 W</td>
<td>Nov. 2 W</td>
</tr>
<tr>
<td>Veterans' Day—no classes</td>
<td>Nov. 11 Th</td>
<td>Nov. 11 F</td>
</tr>
<tr>
<td>Honors Convocations—no classes (9:00-11:00 a.m.)</td>
<td>Nov. 17 W</td>
<td>Nov. 17 W</td>
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<tr>
<td>Thanksgiving recess</td>
<td>Nov. 25-28 Th-Su</td>
<td>Nov. 24-27 Th-Su</td>
</tr>
<tr>
<td>Applications for bachelor's degree candidacy must be filed for degrees to be awarded at close of the following fall session</td>
<td>Dec. 1 W</td>
<td>Dec. 1 Th</td>
</tr>
<tr>
<td>Classes and laboratory sessions end</td>
<td>Dec. 10 F</td>
<td>Dec. 12 M</td>
</tr>
<tr>
<td>Semester examinations begin</td>
<td>Dec. 13 M</td>
<td>Dec. 14 W</td>
</tr>
<tr>
<td>Semester examinations end</td>
<td>Dec. 17 F</td>
<td>Dec. 21 W</td>
</tr>
<tr>
<td>Residence halls close</td>
<td>Dec. 18 Sa</td>
<td>Dec. 22 Th</td>
</tr>
<tr>
<td>Winter Commencement</td>
<td>Dec. 18 Sa</td>
<td>Dec. 22 Th</td>
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## Second Semester

<table>
<thead>
<tr>
<th>Event</th>
<th>1993-94</th>
<th>1994-95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residence halls open</td>
<td>Jan. 9 Su</td>
<td>Jan. 8 Su</td>
</tr>
<tr>
<td>New student orientation program (last session)</td>
<td>Jan. 10-11 M-Tu</td>
<td>Jan. 9-10, M-Tu</td>
</tr>
<tr>
<td>Opening of school activities</td>
<td>Jan. 10-11 M-Tu</td>
<td>Jan. 9-11 M-Tu</td>
</tr>
<tr>
<td>Classes begin</td>
<td>Jan. 12 W</td>
<td>Jan. 12 Th</td>
</tr>
<tr>
<td>M.L.King Holiday—no classes</td>
<td>Jan. 17 M</td>
<td>Jan. 16 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>Jan. 20 Th</td>
<td>Jan. 20 F</td>
</tr>
<tr>
<td>Last day for dropping courses with deletion of course enrollment from record</td>
<td>Feb. 8 Tu</td>
<td>Feb. 8 W</td>
</tr>
<tr>
<td>Spring recess</td>
<td>Mar. 12-20 Sa-Su</td>
<td>Mar. 11-19 Sa-Su</td>
</tr>
<tr>
<td>Last day for dropping courses</td>
<td>Mar. 29 Tu</td>
<td>Mar. 29 W</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>May 2 M</td>
<td>May 1 M</td>
</tr>
<tr>
<td>Class and laboratory sessions end</td>
<td>May 4 W</td>
<td>May 3 W</td>
</tr>
<tr>
<td>Semester examinations begin</td>
<td>May 6 F</td>
<td>May 5 F</td>
</tr>
<tr>
<td>Semester examinations end</td>
<td>May 13 F</td>
<td>May 12 F</td>
</tr>
<tr>
<td>Residence halls close</td>
<td>May 14 Sa</td>
<td>May 13 Sa</td>
</tr>
<tr>
<td>Spring Commencement</td>
<td>May 14 Sa</td>
<td>May 13 Sa</td>
</tr>
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</table>

## Summer Session

<table>
<thead>
<tr>
<th>Event</th>
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<th>1995</th>
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</thead>
<tbody>
<tr>
<td>Presession classes begin</td>
<td>May 16 M</td>
<td>May 15 M</td>
</tr>
<tr>
<td>Last day of registration for credit for Presession</td>
<td>May 17 Tu</td>
<td>May 16 Tu</td>
</tr>
<tr>
<td>Classes of Presession end</td>
<td>June 4 Sa</td>
<td>June 3 Sa</td>
</tr>
<tr>
<td>First Summer Session classes begin</td>
<td>June 6 M</td>
<td>June 5 M</td>
</tr>
<tr>
<td>Last day of registration for credit for first session</td>
<td>June 8 W</td>
<td>June 7 W</td>
</tr>
<tr>
<td>Independence Day—no classes</td>
<td>July 4 M</td>
<td>July 4 T</td>
</tr>
<tr>
<td>Classes of first session end</td>
<td>July 7 Th</td>
<td>July 6 Th</td>
</tr>
<tr>
<td>Second Summer Session classes begin</td>
<td>July 11 M</td>
<td>July 10 M</td>
</tr>
<tr>
<td>Last day of registration for credit for second session</td>
<td>July 13 W</td>
<td>July 12 W</td>
</tr>
<tr>
<td>Classes of second session end</td>
<td>Aug. 10 W</td>
<td>Aug. 9 W</td>
</tr>
</tbody>
</table>
The General Catalog is the University’s principal, comprehensive single source of departmental, college and university-wide information and policies related to academic programs and student life. Each student is responsible for knowing and abiding by its policies. On many subjects, more detailed information is available from departments, colleges, or administrative units responsible for various programs and services. Students should seek information from these sources as needed.

The General Catalog is divided into nine sections, each containing important information relevant to your academic career at the University of Arizona. Highlights of each section follow:

I. General Information
This section provides information regarding the history, organization and academic programs of the University. Of particular interest to the student wanting an overview of available academic programs is the chart of majors and degrees. Also of special reference value is the outline of academic divisions which places each school, department and committee within the college in which they are administered. Although not a part of this section, students should be aware of the academic calendar which identifies start and close dates of terms as well as final examination dates and important deadlines for such activities as course additions and deletions. It is found in the front of the catalog.

II. Admission and Registration
This section provides information on requirements and procedures for undergraduate admission for freshman, transfer and foreign students. It also includes important information on registration procedures, deadlines and withdrawal procedures.

III. Expenses, Fees, Scholarships and Financial Aid
This section provides information on general fees related to registration as well as most fees for special services. The amounts of fees identified are those which were approved at the time of the printing of the catalog (in most cases those in effect during the 1992-93 academic year) and are subject to change for subsequent years. A useful overview of scholarship and financial aid opportunities is also given as part of this section.

IV. Academic Policies and Graduation Requirements
A partial list of subjects discussed includes the honors program, academic honors and awards, good academic standing, probation, disqualification, withdrawal procedures, academic renewal, grade appeal, the pass-fail option, general education requirements, course examination policies, proficiency examinations, absence policy, as well as information on the choice of college, number of units, grade-point average, upper-division and university credit requirements for graduation. Familiarity with the information in this section is essential to efficient achievement of your academic goals.

V. Student Services, Housing and Campus Life
This section provides general information and policies regarding a variety of services, facilities, activities and organizations which support student life on the campus. In addition to noting information on housing and on co-curricular, cultural, and recreational activities, and policies on student conduct and parking and transportation, you may wish to review particularly the information on personal and academic support services available through the Student Resource Center and a variety of other offices on campus.

VI. Colleges and General Divisions
This section provides information for each college of the campus as well as several general divisions which have responsibility for providing academic programs. The college sections provide important information on degree requirements and academic policies. As you pursue your degree, it is essential that you become familiar with the information provided in the college section in which your major is located. Information relevant to the four Faculties— that is Fine Arts, Humanities, Social and Behavioral Sciences, and Science—is located within the College of Arts and Sciences section.

VII. Departments and Courses of Instruction
This section provides essential information for course selection. All permanent courses which were approved at the time of printing of the catalog are listed and described under the department section in which they are offered. Explanations of the course numbering system and the elements included in the course description, and a description of the nature of and the grades available for “house numbered” small group and individual studies courses are provided at the beginning of this section. Familiarity with this section can be of enormous assistance in helping you select courses as well as assisting you to become aware of the vast scope of course work available to enrich your study at the University of Arizona. The University augments its permanent curriculum through offering “temporary” courses. These courses are listed as part of the department offerings in the schedule of classes for each term. You must consult the offering department if you wish a description of these courses. (Temporary courses are entirely comparable to permanent courses in meeting any requirements for which they are appropriate.)

VIII. University Affiliations and Research and Public Service Units
The University maintains a large number of state, regional, national and international affiliations. A selection of these affiliations is identified in this section. The University also has a variety of research and public service units which serve its objectives of discovering new knowledge and disseminating and applying knowledge to public needs. A selection of these units is described in this section.

IX. Administration and Faculty
This section identifies the members of the Board of Regents, the University administration and the faculty who held these positions at the time of the printing of the catalog. The year of appointment and the educational degrees held are identified for each administrator and faculty member.
The following statements are brief definitions of selected terms which are frequently used in this catalog. For more detailed information regarding these terms, consult the index to additional references in the catalog.

**Academic Year:** The academic year refers to the part of the year defined by the fall and spring semesters, approximately mid-August through mid-May.

**Audit:** Audit is a registration status which allows a student to attend a course for information without receiving credit or a regular grade.

**Baccalaureate Degrees:** Baccalaureate degrees are awarded for completion of an undergraduate program of study. Bachelor of Arts and Bachelor of Science degrees are offered by the College of Arts and Science. All other bachelor's degrees identify the college or field of study with which they are associated. Bachelor's degrees are comprised of general education courses, a major, elective courses, and in some cases a minor.

**Course:** A course is a systematic plan of study which may utilize lecture, discussion, laboratory, recitation, seminar, workshop, studio, independent study, internship, or other similar teaching formats to facilitate learning for the student.

**Course Load:** Course load refers the total number of units taken for credit, audit, by correspondence, or through concurrent registration at another institution.

**Degree:** A degree is a title which a university confers on a student who has satisfactorily completed a required course of study. Degree requirements are established by the colleges and are approved by the university faculty, administration and the Arizona Board of Regents.

**Discipline:** A discipline is a recognized subject area or field of study within which courses and research are structured.

**Electives:** Electives are courses selected at a student's discretion. Electives may be partially restricted, such as a selection from a specified group of courses identified to fulfill a particular requirement or they may be "free" electives which may be selected from any course for which the student has proper prerequisites. Electives provide opportunities for students to pursue personal interests and to gain general knowledge.

**General Education Requirements:** General education is a broad program of study which provides undergraduate students with the opportunity to develop skills in language and mathematics and to explore information and thought processes of different areas of study and different cultures. The objectives and structure of general education programs are shared across all colleges although individual colleges designate the courses and number of units required in the several general education areas.

**Grade-point average:** The grade-point average is the numerical calculation of the mean average of the grades received in all courses taken for university credit and by Special Examination for Grade, except those taken for pass/fail.

**Hours of Credit or Semester Hours:** Hours of credit or semester hours are alternative designations for units of credit.

**Interdisciplinary:** Interdisciplinary describes a course or program which includes perspectives, knowledge and/or courses from more than one discipline.

**Major:** The major is a student's principal field of study. Undergraduate majors usually require approximately 30 units of credit although they may require as few as 15 or as many as 40 units of credit.

**Minor:** The minor is a secondary field of study requiring fewer units than the major. Undergraduate minors usually require between 12 and 24 units of credit.

**Option or concentration:** An option is a subspecialization within a major that allows a student to place special emphasis on a particular aspect of the major field of study.

**Residence Credit:** The University does not distinguish its credit offerings according to residence and non-residence credit. See definition of university credit.

**Semester or Term:** Semester and term are used to identify the formally designated periods during which classes are scheduled. The University schedules classes during six terms: fall and spring semesters, each lasting approximately 15 weeks; a winter intersession term of approximately three weeks; and three summer session terms, comprised of a three-week presession, and two five-week terms.

**Unit of Credit:** Unit of credit is the designation used to identify the value assigned to work expected in a course. University policy requires at least 45 hours of work by each student for each unit of credit.
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>
</tr>
</thead>
<tbody>
<tr>
<td>AAS</td>
<td>African-American studies</td>
</tr>
<tr>
<td>ABE</td>
<td>agricultural &amp; biosystems engineering</td>
</tr>
<tr>
<td>ACCT</td>
<td>accounting</td>
</tr>
<tr>
<td>A ED</td>
<td>agricultural education</td>
</tr>
<tr>
<td>AGRI</td>
<td>agriculture</td>
</tr>
<tr>
<td>AINS</td>
<td>American Indian studies</td>
</tr>
<tr>
<td>A ME</td>
<td>aerospace and mechanical engineering</td>
</tr>
<tr>
<td>ANAT</td>
<td>anatomy</td>
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<tr>
<td>ANES</td>
<td>anesthesiology</td>
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<td>AN S</td>
<td>animal sciences</td>
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<td>ANTH</td>
<td>anthropology</td>
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<tr>
<td>APPL</td>
<td>applied mathematics</td>
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<td>ARB</td>
<td>Arabic</td>
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<td>ARCH</td>
<td>architecture</td>
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<td>ARE</td>
<td>art education</td>
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<tr>
<td>AREC</td>
<td>agricultural and resource economics</td>
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<tr>
<td>ARH</td>
<td>art history</td>
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<td>AR L</td>
<td>arid lands resource sciences</td>
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<td>CBIO</td>
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<td>CCLS</td>
<td>comparative cultural and literary studies</td>
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<td>C E</td>
<td>civil engineering</td>
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<td>CHE E</td>
<td>chemical engineering</td>
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<td>CHN</td>
<td>Chinese studies</td>
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<td>CLAS</td>
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<td>COUN</td>
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<td>critical languages</td>
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<td>F A</td>
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<tr>
<td>FCR</td>
<td>family and consumer resources</td>
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<td>FIN</td>
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<td>GEO S</td>
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<td>honors</td>
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<td>H U M</td>
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<td>HWR</td>
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<td>Judaic studies</td>
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<tr>
<td>L A S</td>
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Nursing. The Department of Architecture in 1964 the school became the College of Liberal Arts, and in 1956 authorized the establishment of the College of Agriculture. In 1949 the Board of Regents reorganized the College of Mines, and became the College of Earth Sciences in 1971. In 1947 the College of Medicine, the College of Pharmacy and the Graduate College were established. In 1940 the College of Agriculture, the College of Fine Arts, including the College of Lib- eral Arts, and the College of Mines were organized as three colleges—the College of Letters, Arts, and Sciences (later Liberal Arts); the College of Mines and En- gineering; 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 establish- ment 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 Architec-
Nutrition and Food Science; Plant Pathology; Plant Sciences; Soil and Water Science; Undergraduate Program in Microbiology; Veterinary Science. University Departments of: Biochemistry, Molecular and Cellular Biology.

COLLEGE OF ARCHITECTURE

COLLEGE OF ARTS AND SCIENCES—Schools: School of Music; School of Library Science. Departments of: Anthropology; Art; Astronomy; Atmospheric Sciences; Chemistry; Classics; Communication; Computer Science; East Asian Studies, Ecology and Evolutionary Biology; English; French and Italian; Geography and Regional Development; Geosciences; German; History; Journalism; Linguistics; Mathematics; Media Arts; Near Eastern Studies; Philosophy; Physics; Planetary Sciences; Political Science; Psychology; Russian and Slavic Languages; Sociology; Spanish and Portuguese; Speech and Hearing Sciences; Statistics; Theatre Arts. University Departments of: Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology. Committees on: African-American Studies; Critical Languages; Dance; Judaic Studies; Mexican American Studies; Religious Studies; Russian and Soviet Studies; Women's Studies. Program: Humanities.

COLLEGE OF BUSINESS AND PUBLIC ADMINISTRATION—Schools: Karl Eller Graduate School of Management; School of Public Administration and Policy. Departments of: Accounting; Economics; Finance and Real Estate; Management and Policy; Management Information Systems; Marketing.

COLLEGE OF EDUCATION—Departments of: Educational Administration and Higher Education; Educational Psychology; Language, Reading, and Culture; Special Education and Rehabilitation; and Teaching and Teacher Education.

COLLEGE OF ENGINEERING AND MINES—Departments of: Aerospace and Mechanical Engineering; Chemical Engineering; Civil Engineering and Engineering Mechanics; Electrical and Computer Engineering; Hydrology and Water Resources; Materials Science and Engineering; Mining and Geological Engineering; Nuclear and Energy Engineering; Systems and Industrial Engineering. Committee on: Biomedical Engineering.

COLLEGE OF LAW

COLLEGE OF MEDICINE—Departments of: Anatomy; Anesthesiology; Family and Community Medicine; Internal Medicine; Neurology; Obstetrics-Gynecology; Ophthalmology; Pathology; Pediatrics; Pharmacology; Physiology; Psychiatry; Radiation Oncology; Radiology; Surgery. University Departments of: Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology.

COLLEGE OF NURSING

COLLEGE OF PHARMACY—Departments of: Pharmaceutical Sciences; Pharmacology and Toxicology; Pharmacy Practice.

SCHOOL OF HEALTH-RELATED PROFESSIONS—Department of: Exercise and Sport Sciences; Divisions of: Community and Environmental Health; Medical Technology.

GRADUATE COLLEGE—Committees on: American Indian Studies; Applied Mathematics; Arid Lands Resource Sciences; Biophysics; Cancer Biology; Cognitive Science; Comparative Cultural & Literary Studies; Environment and Behavior; Epidemiology; Genetics; Gerontology; History and Philosophy of Science; Latin American Studies; Medieval Studies; Neuroscience; Nutritional Sciences; Optical Sciences; Pharmacology and Toxicology; Physiological Sciences; Planning; Remote Sensing, Second Language Acquisition and Teaching.

GENERAL DEPARTMENTS—School of Military Science, Naval Science, and Military Aerospace Studies.

UNIVERSITY DEPARTMENTS—Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology.

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*Teaching majors only.
ADMISSION AND REGISTRATION

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 particularly well suited to their needs.

The University strives to create a campus environment which understands, fosters, and embraces the value of diversity among students, faculty and staff. Diversity encompasses differences in age, color, ethnicity, gender, national origin, disability or handicap, race, religion, sexual orientation or Vietnam era veteran status. This institution is committed to the belief that all persons are valued for their individual characteristics, talents and contributions.

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

Inquiries regarding admission policies and procedures for undergraduate programs should be directed to the Office of Admissions and New Student Enrollment. 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.

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.

Further, The University reserves the right to cancel the admission of any 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 or the institution.

APPLICATION FOR UNDERGRADUATE ADMISSION

Applications for undergraduate admission may be obtained by writing or calling:

Office of Admissions and New Student Enrollment
The University of Arizona
Robert L. Nugent Building
Tucson, AZ 85721
(602) 621-7783

ADMISSION POLICIES

FALL—Students interested in attending The University of Arizona should apply for admission and services for new students (financial aid, scholarships, residence hall space, orientation/registration and summer programs) based upon the time lines and in advance of all deadlines. Financial aid and scholarship deadlines are March 1. Residence hall and orientation/registration forms accompany the certificate of admission, and reservations for these services should be made shortly after the certificate of admission is received.

Early Action Deadlines:
Complete application received by November 1 will have a decision by December 1;
Complete application received by December 1 will have a decision by January 15.

Complete application received between December 2 and April 1 will have a decision approximately six weeks after the completed application is received.

The application deadline for freshman applicants for the fall semester is April 1.

SPRING AND SUMMER—Applications and supporting transcripts must be received by the deadlines below:
Spring Semester: December 1
Summer Session: April 1

Transfer Application Time Lines
FALL—The deadline for transfer applicants is June 1. However, applicants are encouraged to apply no later than March 1. Applications are reviewed on a continuing basis after all appropriate credentials are received.
SPRING AND SUMMER—Applications and supporting transcripts must be received by the deadlines below:
Spring Semester: December 1
Summer Session: June 1

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

Residency Classification
In Arizona, as in all other states, instruction fees at publicly supported universities are lower for resident students than for nonresident students. Through the payment of taxes, Arizona residents contribute to the general fund of the state from which the legislature appropriates funds comprising the major source of support for Arizona's universities.

A student enrolling at The University of Arizona for the first time, or a student returning after an absence of one or more semesters, must provide information which will allow classification as either a resident or nonresident of Arizona for tuition purposes. For new students, this information is requested on the application for admission; for returning students, a domicile affidavit is provided with the application for readmission. Because foreign students (non-immigrants) are classified nonresidents of Arizona while enrolled, a domicile affidavit is not required.

Health Verification Requirements
All students born after December 31, 1956, must submit proof of vaccination
for measles and rubella since 1980 before they will be allowed to register for classes. Additionally, it is recommended that recent (within six months) results of a TB test be submitted. If the skin test is positive, a chest x-ray is recommended. Medical or nursing students should defer the chest x-ray until arrival at the University.

Health Service requirements are subject to change. Affected students will be notified as appropriate.

ADMISSION AS A NONDEGREE STUDENT

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

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

Applications for nondegree admission may be obtained from the Office of Admissions and New Student Enrollment. Four classifications for nondegree students are available. They are:

NONDEGREE REGULAR STUDENT—for community members, age 19 or older, who wish to upgrade skills or complete course work for personal enrichment.

NONDEGREE SUMMER SESSION ONLY—for those who plan to attend the summer session only. Completion of a high school or equivalent program is required.

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

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

UNIVERSITY ADMISSION REQUIREMENTS FOR ENTERING FRESHMEN

Applicants presenting academic achievement according to the criteria indicated below are excellent candidates for admission. High school achievement above minimum requirements and an early application increase a candidate's likelihood for an offer of admission. Because admission for nonresident students is competitive, applicants may be selected on a basis which exceeds the stated requirements.

General Aptitude

The University has two types of admission for freshman and transfer students: unconditional and conditional. Conditional admission requires a student to participate in some form of academic assistance program such as Summer Bridge, special advising and freshman support groups, tutoring and study skills workshops, fall transition programs, reduced course load, and new student orientation programs. A limited number of students may be referred to community college programs of study in anticipation of future enrollment.

A. Resident applicants; unconditional:
1. Rank in the upper 25 percent of the high school graduating class; or
2. Achieve a cumulative high school grade-point average of at least 3.0 on a 4.0 scale; or
3. Obtain a combined score of at least 990 on the Scholastic Aptitude Test (SAT), or a composite score of at least 22 on the American College Test (ACT); and
4. Complete all competency requirements listed in the Basic Competencies section below.

B. Resident applicants; conditional:
1. Rank between the upper 25 to 50 percent of the high school graduating class; or
2. Achieve a cumulative high school grade-point average between 2.50 and 2.99 on a 4.0 scale; and
3. Have no more than one deficiency in a maximum of two competency areas as listed in the Basic Competencies section below.

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

Basic Competencies

Applicants must demonstrate academic competency in each of the subjects listed below. Students who choose to demonstrate their competency 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 (C average) 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 requirement must include literature and substantial emphasis on grammar and composition. Courses such as journalism, business communications, speech, and others that have an emphasis on grammar or composition may not be substituted for a regular English course.

MATHMATICS—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, Earth science 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 use 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 advised 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 other college preparatory subjects commonly offered for credit by secondary schools. A minimum of five credits of additional course work is desirable.
Applicants may meet the basic competency requirements in English, mathematics, laboratory science, and social studies by using any combination of the methods identified in the Basic Competency Requirements for Admission.

**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 course work may be admitted in this manner. There may be no more than one deficiency in any area. A grade-point average lower than 2.00 (on a 4.0 scale) in any of the academic areas will be considered as one deficiency.

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. Students who fail to remove deficiencies within one calendar year of the date of their first enrollment will not be permitted to register for future terms. Academic competency requirements may also be met by obtaining a specified score on the Scholastic Aptitude Test (SAT), the ATP Achievement Tests, or the American College Test (ACT).

**ADMISSION EXCEPTIONS**

Applicants age 22 or older 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. Decisions will be made based upon the space available in the college selected and evidence of the student's potential for success.

### BASIC COMPETENCY REQUIREMENTS FOR ADMISSION

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<th>SAT &amp; ACHIEVEMENT SCORES</th>
<th>ACT SCORES</th>
<th>COLLEGE COURSE WORK (Credits based on semester system)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>English</strong></td>
<td>English I</td>
<td>verbal sub score of 450 or above</td>
<td>English sub score of 21 or above</td>
<td>one transferable 3-credit English course</td>
</tr>
<tr>
<td>4 units</td>
<td>English II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Composition &amp; Literary Analysis only)</td>
<td>English III</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>English IV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mathematics</strong></td>
<td>Algebra I</td>
<td>mathematics sub score of 500 or above</td>
<td>mathematics sub score of 20 or above</td>
<td>two 3-credit pre-college math courses or one 3-credit algebra course</td>
</tr>
<tr>
<td>3 units</td>
<td>plane geometry</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Algebra II</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Laboratory Science</strong></td>
<td>one unit from any two of the following:</td>
<td>ATP Achievement Test Scores:</td>
<td>natural science</td>
<td></td>
</tr>
<tr>
<td>2 units</td>
<td>biology</td>
<td>chemistry: 575 or above</td>
<td>20 or above</td>
<td>two 4-credit transferable laboratory science courses</td>
</tr>
<tr>
<td></td>
<td>chemistry</td>
<td>biology: 550 or above</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>physics</td>
<td>physics: 590 or above</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>earth science</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Social Studies</strong></td>
<td>American history one additional unit from:</td>
<td>ATP Achievement Test Scores:</td>
<td>social studies competency equivalence</td>
<td></td>
</tr>
<tr>
<td>2 units</td>
<td>European/world history economics</td>
<td>American history/social studies: 510 or above</td>
<td>is not available.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>sociology</td>
<td>European hist/world culture: 545 or above</td>
<td></td>
<td>One 3-credit transferable American history course and one additional 3-credit transferable social studies course</td>
</tr>
<tr>
<td></td>
<td>geography</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>government</td>
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<td></td>
<td>psychology</td>
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<td></td>
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</tr>
<tr>
<td></td>
<td>anthropology</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Test Scores May Be Used To Satisfy Only One Laboratory Science Unit
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 and two units of laboratory science, one of which must be physics or chemistry. Three units of laboratory science, biology, chemistry, and physics are strongly recommended. Entering students are also strongly advised to include among their electives additional courses in mathematics such as trigonometry, advanced algebra and solid geometry; one or more studio art courses; and two or more years of foreign language. (Spanish is preferred, as the college offers exchange programs in Mexico and Spain.)

Arts and Sciences
Applicants are expected to complete patterns of study, with better than average grades, which offer a solid preparation for university academic areas. Each applicant is expected to demonstrate completion of the required college preparatory courses. Included are mathematical courses which include algebra, geometry, trigonometry, calculus, and mathematical analysis; study of second 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
Applicants should present credit in mathematics as follows: one unit of elementary algebra, 1/2 unit of intermediate algebra, and 1/2 unit of advanced algebra.

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

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

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

Health-Related Professions
Admission to the school is solely through acceptance into a specific program. Applicants are required to have completed 56-63 semester hours of college credit and to have maintained a minimum 2.2500 grade-point average on all collegiate work attempted. Applicants must meet the school's general prerequisites as well as the prerequisites and grade-point average established for the program of study to which the student is applying.

Pharmacy
Admission to the College of Pharmacy requires the completion of two years of a specified prepharmacy curriculum and formal application to the program. See the College of Pharmacy section of this catalog for further information.

ADVANCED PLACEMENT PROGRAMS

Advanced Placement (AP)
Students who have completed college-level courses in secondary schools and have taken the advanced placement examinations given by the College Entrance Examination Board will be considered for advanced placement and for the granting of college credit toward degree requirements.

The Advanced Placement Program recognizes that many students can complete college-level courses while they are still in high 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 grades, together with supporting materials, to the students' colleges. For University of Arizona credit policies, please see the section on advanced placement under "Proficiency and Exemption Examinations, Credit by Examination" in the chapter entitled Academic Policies and Graduation Requirements.

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

International Baccalaureate (IB)
Higher Level Examinations
Students enrolled in U.S. and international high school programs are encouraged to prepare for IB Higher Level Examinations. The IB curriculum is designed to motivate the academically talented student toward maximum achievement. The University of Arizona welcomes IB applicants, recognizing them as competitive candidates for increasingly selective admission. We offer university credit in transfer for IB Higher Level subjects passed at a high enough grade level.

College-Level Examination Program (CLEP)
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.

ADMISSION OF TRANSFER STUDENTS

Application for Admission
Applications for admission may be obtained by writing or calling:
Office of Admissions and
New Student Enrollment
The University of Arizona
Robert L. Nugent Building
Tucson, AZ 85721
(602) 621-7783

Students transferring from other colleges and universities are required to file official transcripts from all previously attended schools with the Office of Admissions and New Student Enrollment. Students may not 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 withholding of any degree received.

Admission Requirements for Transfer Students

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

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

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

All students transferring with less than 36 transferable semester units will be subject to the same requirements as regular admittees from high schools and must show evidence of having fulfilled the required high school subject units. Such units must be completed 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 colleges of architecture, business and public administration, education, engineering and mines, and pharmacy.

Transfer of Credits

The University of Arizona evaluates applicants from regionally accredited postsecondary institutions or postsecondary institutions which are candidates for accreditation based upon the individual merits of their academic achievements. Credit is not given for grades lower than a C. Grades from other institutions are not included in the calculation of the University of Arizona grade-point average. Remedial, vocational, technical, highly specialized, and personal development courses are not ordinarily accepted for credit. Applicability of transfer credit to a student's academic curriculum is determined by the academic advisor in the student's major department.

Inquiries concerning transfer credit from foreign institutions should be directed to the Office of Admissions and New Student Enrollment, Foreign Credentials.

Credits from Community Colleges

While there is no limit to the total number of units of course work acceptable for transfer credit that may be transferred from an accredited community college to The University of Arizona, only 72 of those units may be applied toward the requirements for a bachelor's degree. The choice of the 72 units is at the discretion of the student in consultation with an advisor. Transfer students are encouraged to complete freshman and sophomore level general education course work at their community college. Transferability of courses of independent study, internship, or practicum will be determined by the appropriate department or college at The University of Arizona and may be restricted both in number of units and in degree applicability. Students who have taken community college courses in these categories may petition for an exception.

While all courses offered for transfer will be accepted by the University according to these rules, the specific lower-division requirements of various curricula vary widely. In order to complete the baccalaureate program in the normal time span, the student should consult the appropriate Colleges section of this catalog and the head of the appropriate University department to determine requirements of a particular program.

Normally, a community college course 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 as the equivalent of The University of Arizona upper-division course.

The Transfer General Education Core Curriculum (TGECC)

The Arizona public community colleges and The University of Arizona have agreed upon a common structure for a general education core curriculum. This common agreement is called the Transfer General Education Core Curriculum (TGECC). The TGECC is composed of a minimum of 41 semester hours of lower-division general education course work in which a student may prepare for transfer. Students transferring from an Arizona community college to the University have the option of completing the lower-division general education requirements at the University or completing the TGECC. Completing the TGECC will fulfill lower-division general education requirements at the University. Students utilizing this option will still be required to fulfill lower-division program requirements and prerequisites within their college and major/minor area of study. In order to complete a degree program efficiently, students should select courses to meet the TGECC requirements that will also fulfill program requirements in the college and major they intend to pursue upon transfer. The requirements for the TGECC are available through the Arizona community college advising center.

The Community College Transfer Guide

The community college Transfer Guide presents the lower-division requirements of bachelor's degree programs at The University of Arizona in terms of the transferable courses available at Arizona community colleges, numbered in the community college notation. The Transfer Guide should be used in conjunction with the University of Arizona General Catalog and the Arizona Higher Education Course Equivalency Guide. Students should refer to the community college catalogs for descriptions of the courses listed in the Transfer Guides.

Transferability of community college courses not listed in the Transfer Guide or the Course Equivalency Guide must be approved by The University of Arizona ac-
admission requirements. Courses accepted for transfer in this way may be restricted both in number of units transferable and the manner in which they may be used to satisfy degree requirements.

While all courses offered for transfer will be accepted by the University subject to the above rules, the specific lower-division requirements of various curricula vary widely. In order to complete the baccalaureate program in a timely manner, the student should consult the section of the Transfer Guide that is appropriate for the student's curriculum.

ADMISSION OF FOREIGN STUDENTS

Students with non-immigrant visas should request application materials for undergraduate admission from the Office of Admissions and New Student Enrollment, Foreign Credentials, Robert L. Nugent Building. A $35 application fee is required. This payment must be in the form of a check or money order drawn on a U.S. banking affiliate, and made payable in U.S. dollars to The University of Arizona. The University does not accept International Postal Money Orders. Foreign students are expected to have above-average grades, proficiency in the English language, and adequate financial resources for each year of attendance. Foreign students are not required to take the American College Test (ACT) or the Scholastic Aptitude Test (SAT) unless they are graduating from a U.S. high school.

All foreign applicants whose native language is not English are required to take the Test of English as a Foreign Language (TOEFL), which is given at test centers worldwide under the direction of the Educational Testing Service. A minimum composite TOEFL score of 500 is required for full-time admission. For test registration information, write: TOEFL, Box 6154, Princeton, New Jersey 08541-6154. Results of the TOEFL are valid for two years. Applicants should request that TOEFL (Box 6153, Princeton, New Jersey 08541-6153) send their scores to The University of Arizona. The scores must be received before the application for admission can be considered. Newly admitted foreign students may also be required to take a math and English placement test and further study in English if 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 University's Center for English as a Second Language (CESL) offers full-time English language training. The full semester sessions carry no college credit, but satisfactory completion of CESL study (which includes taking the TOEFL examination) will meet the English proficiency requirement for admission. Request further information by writing to CESL, Room 100, CESL Building. For students seeking academic admission a statement of academic admissibility should be requested from the Office of Admissions and New Student Enrollment, Foreign Credentials, before applying to CESL. Admission to CESL does not guarantee admission to any full-time credit program at The University of Arizona.

Other non-immigrants may arrange to take the International TOEFL on The University of Arizona campus and should contact the testing office of Counseling and Testing Services, located in Old Main, Room 223, for registration information.

Foreign students on non-immigrant visas must submit proof of financial resources to support themselves while in residence at The University of Arizona. If sponsorship is through an organization or government agency, the Office of Admissions and New Student Enrollment, Foreign Credentials, should be notified directly by the sponsor of the terms of scholarship support. These must include instructions if The University of Arizona is to bill for tuition and fees. The address for billing must be an embassy or other agent in the United States; otherwise, the students must pay their own fees at registration.

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

International students and family members on nonimmigrant visas may be required to obtain health insurance through The University of Arizona. In addition, international students may be required to have a TB screening test at the UofA Student Health Service prior to registering for classes at the University. Information pertaining to insurance and TB screening will be forwarded to all international students upon admission to the University.

Application Deadlines

April 1 is the deadline for summer and fall and September 15 is the deadline for spring. To meet the deadlines, the application and all other credentials and statements must be received in the Office of Admissions and New Student Enrollment, Foreign Credentials, by the above dates.

ADMISSION OF STUDENTS WHOSE NATIVE LANGUAGE IS NOT ENGLISH

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

In Tucson, arrangements may be made to take the Institutional TOEFL at The University of Arizona by contacting the Center for English as a Second Language, Room 100, CESL Building. To take the International TOEFL, contact the testing office of Counseling and Testing Services 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.

Prospective students who are disabled are encouraged to write or call the Center for Disability Related Resources, The University of Arizona, Tucson, AZ 85721, (602) 621-3268 (voice or TDD), 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 approved for the training of students under several government education 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, Center for Veterans and Off-Campus Students, Student Union, Room 353, Tucson, AZ 85721 or call (602) 621-6454.

Veterans who are making an initial application for their GI 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 center.

Additional services offered by the center include application for all V.A. educational benefits, academic counseling, and tutorial and referral assistance.

Exemption of Certain Veterans from Effects of Failing Grades
According to Arizona statute, failing grades in college courses received at Arizona post-secondary institutions prior to military service may not be used to deny admission to a U.S. veteran who has served for at least two years and was honorably discharged. This policy applies to the admission decision only. Failing grades awarded at The University of Arizona remain on the record. The student admitted or readmitted to the University under this statute is subject to all academic regulations and standards in this catalog.

Credit for U.S. 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 armed forces training.

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. Military credit evaluation 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 armed forces, 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, 6 upper-division units of military science, naval science, or aerospace studies; and for a commission at the rank of second lieutenant or higher (in the Army, Air Force, or Marine Corps), or the rank of ensign in the Navy, 12 upper-division units in military science, naval science, or aerospace studies. For more information, contact the Office of Admissions and New Student Enrollment.

Programs of Study
All veterans receiving benefits must choose a program of study and may take only courses that fulfill degree requirements. Veterans and their dependents are not allowed to enroll in course repeats, course audits, or independent study courses without the approval of the Center for Veterans and Off-Campus Students.

Attendance
Veterans and their dependents are compensated for attending classes and completing course work. Benefits will be reduced if the Center for Veterans and Off-Campus Students finds that either is not occurring.

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 occurrence, or last day of class attendance. It is the veteran’s responsibility to notify the Center for Veterans and Off-Campus Students of any status changes.

Veterans’ Deferment of Tuition Payments
Veterans’ tuition deferments are available to many veterans and eligible dependent students. All deferments must be approved by the veterans’ coordinator.

READMISSION TO THE UNIVERSITY
Applying for Readmission
1. Students absent from the University for a semester or longer must reapply.
2. Students who have attended other institutions and all foreign students (non-immigrants), should contact the Office of Admissions and New Student Enrollment to reapply. Students who have not attended other institutions since their last University of Arizona enrollment should contact the Office of Student Information, Registration and Records to reapply.
3. Students who have attended other institutions since last attendance at the University must submit official transcripts of all courses completed prior to review of the readmission application. Transcripts should be sent to the Office of Admissions and New Student Enrollment.
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 and New Student Enrollment.

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 their re-enrollment or during their registration.

Readmission Requirements
1. Students seeking readmission who were not on academic probation or 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.
2. Students who have attempted 12 or more college-level units at other postsecondary institutions must submit an official transcript of all course work. A minimum cumulative grade-point average of 2.0 on a 4.0 scale is required for course work completed at other institutions. Otherwise, students must obtain written permission to re-enroll from the dean of the college in which they plan to enroll. The Office of Admissions and New Student Enrollment will process the application for readmission according to the written recommendation of the dean.
3. Students seeking readmission who left the University on academic probation or under disqualification must receive approval from the dean of the college they wish to enter prior to re-admission.

RESIDENCY (DOMICILE) CLASSIFICATION FOR TUITION PURPOSES
In Arizona, as in all other states, instruction fees at publicly supported universities are lower for resident students than for nonresident students. Through the payment of taxes, Arizona residents contribute to the general fund of the
The rules used in classifying resident status assure that only bona fide residents are assessed the resident fee. The rules allow only domiciled persons to be classified as residents for tuition fee purposes.

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

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

B. The general rule is that in order to obtain in-state status for tuition purposes a student must establish his/her domicile in Arizona by his/her presence or absence while a student at any institution of learning.

There are certain exceptions from the general rule. A student may also be eligible for in-state status if he or she can establish that, on or before the last day of regular registration for the semester in which the student proposes to attend the University, Arizona domicile occurs when a person is physically present in Arizona with the intention of making Arizona his or her permanent home.

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

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

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

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

4. Native American. The student is not domiciled in Arizona, but is a member of a Native American tribe whose reservation land lies partially in Arizona and another state and is a resident of such reservation.

C. Mere presence of a person in the State of Arizona for one year does not necessarily establish a domicile for classifying that person as an in-state resident. No person shall be deemed to have gained or lost a domicile by reason of his or her presence or absence while a student at any institution of learning.

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

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

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

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

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

ACCOMMODATION OF RELIGIOUS OBSERVANCE AND PRACTICE

In accordance 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 alternative of reasonable accommodation. Moreover, no administrator or faculty member shall retaliate or 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 Human Resources, as appropriate.

THE TRAVELING SCHOLARS PROGRAM

The Traveling Scholars Program is designed so students may take advantage of programs or special resources avail-
able at one of the three state universities which are not available at their own institution. Any undergraduate student with a 2,5000 grade-point average or any graduate student with a 3,0000 grade-point average enrolled at Arizona State University, Northern Arizona University, or The University of Arizona may be designated a Traveling Scholar by prior mutual agreement of the appropriate academic authorities at both the sponsoring and the hosting institution. Additional information and the application form may be obtained from the Office of Student Information, Registration and Records.

PROFESSIONAL STUDENT EXCHANGE PROGRAM

This program, sponsored by the Western Interstate Commission for Higher Education (WICHE) 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 in their behalf, including interest.

REGISTRATION INFORMATION AND POLICIES

All persons who make use of classroom or laboratory facilities and/or of faculty time must register and pay tuition and fees. 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.

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

NEW STUDENT ORIENTATION—All new students are encouraged to attend one of the orientation sessions held during the spring, summer and fall. These sessions provide placement examination testing, academic advising, an introduction to campus facilities and services as well as course registration. Detailed information regarding the programs is sent to new students after they have been admitted to the University.

REGISTRATION—All persons must register and pay tuition and fees in order to attend class. Registration periods, with published dates, are set aside for each semester and summer session. Complete registration instructions, procedures, and deadlines for which every student is fully responsible are detailed in the Schedule of Classes, available on campus prior to the registration periods. A student is officially registered and eligible to attend classes only when all procedures have been completed, including payment of tuition and fees. Actual course registration is accomplished using the touch-tone telephone registration system.

In addition to the basic information regarding registration, the Schedule of Classes is an essential source document for the current academic calendar, fee schedule, academic and other student regulations and procedures, and the final exam schedule, as well as for the listing of courses to be offered.

REGISTRATION DEADLINE—Students must be registered by the 7th calendar day. 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's 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 presently 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.

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

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 non-refundable late fee.

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

IDENTIFICATION CARDS—All students must have a current official photo identification card. These establish the student's identity as a University of Arizona student and authorize access to certain university facilities. The cards are obtained as part of the registration process for a fee of $5. Replacement cards cost $10.

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

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

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.

RETENTION OF STUDENT RECORDS—The Registrar's Office maintains a permanent record of academic work completed by each student. Support documents for the academic records are kept for three (3) years after the semester in which credits are earned.

Students are strongly advised to check carefully their academic records each
semester. Discrepancies in the academic records should be reported to the Registrar immediately. After three (3) years, it is assumed that the student accepts the accuracy of his/her academic record and supporting source documents are destroyed. When a degree has been certified by the Registrar's Office, a student's academic record may not be altered except in those cases where a procedural or clerical error has occurred. However, if the student or the University learns facts that were not known or would not reasonably have been known within the three (3) year period, the academic record may be altered and/or the degree may be revoked.

REGISTRATION CHANGES

CHANGE OF SCHEDULE (DROP/ADD)—Students may drop and/or add courses by following instructions and adhering to deadlines 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 Policies 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.

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

CHANGE OF MAJOR OR COLLEGE—A student may change his or her major by contacting his or her college dean and completing the appropriate forms. Students wishing to change colleges must consult the dean's office of the college to which they wish to transfer. Change from one college to another is established by filing a change of college form with the new college. The change of college will be effective for the current term if filed within the first four weeks of classes during a regular semester. If filed after that date, the change of college will be effective the following semester.
EXPENSES AND FEES

GENERAL POLICIES

All fees are payable prior to the due date for any semester or term. Payment of fees entitles students to many services, including instruction in university courses, use of university libraries, use of laboratory and course equipment, use of the recreation center, etc. No reduction is made for students who may choose not to use some of these university services or facilities.

The University accepts Visa, MasterCard, Discover and checks for the amount due but cannot advance cash on checks. The University cannot extend credit or accept installment payments; therefore, all fees for the semester must be paid in full at the time of registration. Students with past-due debts to The University of Arizona are considered financially ineligible to register until outstanding debts are paid in full. The registration of a student whose check is returned to the bank is considered incomplete and a late fee will be assessed. Collection fees are also assessed if payment for returned checks is not received in 12 calendar days.

Fees for the 1993-94 and 1994-95 academic years were not established at the time of the publication of this catalog. Fees cited in this catalog are those which were established for the 1992-93 academic year. The Arizona Board of Regents has the legal responsibility to establish fees and reserves the right to change all fees without notice. Current registration fees are published in the Schedule of Classes for each term. Also, current information on these and other fees may be obtained from the Bursar’s Office.

GENERAL FEES RELATED TO REGISTRATION

REGISTRATION AND TUITION FEES— Registration and specified fees are paid by all students enrolled at the University of Arizona; in addition, non-resident students pay tuition in lieu of the state legislative funding provided to the university through taxes paid by the state’s residents. Conditions determining residency are established by Arizona state law. For a summary of those conditions and the process for determining residency status, see the section of this catalog titled Residency (Domicile) Classification for Tuition Purposes, in the chapter titled Admission and Registration.

For further information, consult the Office of Domicile Classification.

THE ARIZONA FINANCIAL AID TRUST (AFAT)—The Arizona Legislature approved a program of student aid, the Arizona Financial Aid Trust, which became effective in the 1989-90 academic year. This program was enacted through the efforts of the student governments on state campuses, the Arizona Student Association, the Arizona Board of Regents and the State Legislature. The program enables currently enrolled students in Arizona universities to receive additional financial aid and provides for the creation of a long-term endowment to assist future generations of Arizona students. As a result of the authorizing legislation and action by the Arizona Board of Regents, an Arizona Financial Aid Trust fee is assessed to all students who register for any fall, spring and summer term, and is nonrefundable once class begins.

RECREATION CENTER FEE—In 1985, students adopted a referendum assessing themselves a mandatory $25 per semester fee to construct the Recreation Center. All students registering for four or more units of credit are charged the recreation center fee.

FEE FOR LATE PAYMENT OF REGISTRATION FEES—Students who don’t complete payment of all fees prior to the due date for any semester or term will be assessed a nonrefundable late fee of $25. The late fee is $50 after the 21st calendar day following the first day of class.

EXPENSES AND FEES PER SEMESTER FOR 1992-93 ACADEMIC YEAR1

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1Expenses and fees for 1993-94 were not available at the time the catalog was printed. All fees are subject to change.
### SPECIAL COURSE FEES AND DEPOSITS

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

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### OTHER FEES RELATED TO REGISTRATION AND SPECIAL SERVICES

#### ENGLISH PLACEMENT EXAMINATION FEE

- All freshmen are required to take the English Placement Examination. The fee for the examination is $10.

#### 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 $45 each for the Subject examinations and $45 for each General examination.

#### GRADUATE STUDENT FOREIGN LANGUAGE TEST (GSFLT)

- A fee of $15 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 Counseling and Testing Services in Old Main.
AUDIT FEE—Fees for audit units are the same as regular credit units, including the nonresident tuition, if applicable.

PHOTO ID FEE—The fee for the original student I.D. card is $5.00. The replacement fee for lost or stolen I.D. cards is $10. Students may obtain replacement cards at the Campus I.D. Center.

TRANSCRIPT FEE—Students may order copies of their official academic record (transcript) from the Office of the Registrar. The fee for regular transcript service is $3 per copy. The fee for immediate 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.

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.

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

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

STUDENT TEACHING FEE—For those exceptional circumstances when a student teaching placement is approved at a site outside of the Tucson area, the student may be assessed a fee to cover costs of supervision. The fee is dependent upon the requested site.

SEMESTER ACTIVITY FEE FOR PART-TIME STUDENTS—Undergraduate and graduate students enrolled in 6 units or less must pay $17.50 per semester fee in order to qualify for student discount rates to athletic events. This fee is non-refundable. The activity fee approximates the amount full-time students pay to the athletic department via registration fees each semester. Also, married students can pay the $17.50 fee each semester, which qualifies their spouse to receive the discount ticket rates.

BOARD (FOOD SERVICE)—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 $250 a month. Students and members of the University staff may deposit funds in an All Aboard account from which purchases can be made by presenting one's I.D. card, or may pay in cash at the time the meal is served. No credit, however, will be extended. Charges for dining services are a la carte and the University reserves the right to increase the cost to meet any increase in the prices of foodstuffs and service.

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.

REFUNDS OF TUITION AND FEES

APPLIED TO ENCUMBRANCES—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 by the last day of the semester.

REFUND SCHEDULE—The refund schedule begins with the first day of class and applies to weekdays (Mon.-Fri.). Sufficient time must be allowed for final clearance of registration fee payment checks before refunds will be made. Students who withdraw and who are entitled to a refund will be charged a $10 withdrawal fee. The Arizona Financial Aid Trust (AFAT) fee will not be refunded once classes begin. Students receiving financial aid will be refunded in compliance with federal regulations.

<table>
<thead>
<tr>
<th>REFUND SCHEDULE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Before semester starts</td>
</tr>
<tr>
<td>1-5 days</td>
</tr>
<tr>
<td>6-10 days</td>
</tr>
<tr>
<td>11-15 days</td>
</tr>
<tr>
<td>16-20 days</td>
</tr>
<tr>
<td>Thereafter</td>
</tr>
</tbody>
</table>

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

GRADUATION EXPENSES

DEGREE CANDIDACY APPLICATION FEE—Every candidate for a baccalaureate or graduate degree is required to pay a nonrefundable fee at the time of filing an application for degree candidacy. Additional fees will be charged for late filing for bachelor's-degree candidacy. Each senior is provided with an official check of remaining degree requirements. A fee will be charged for any additional degree check necessitated by a student's subsequently changing catalog or curriculum. A fee will be charged for duplicate copies. Late applications will not be accepted after the last official day to register for credit for the semester or term immediately preceding the semester or term in which the degree is to be awarded. A degree or diploma will not be issued to any student whose records indicate indebtedness to The University of Arizona.

THESIS OR DISSERTATION PROCESSING FEE—A fee of $15 is required of each graduate student at the time of submitting the thesis or dissertation.

MICROFILM FEE—A fee of $65 is charged for microfilming of doctoral dissertations or master's theses.

CAP AND GOWN FEE—Degree candidates participating in the commencement exercises are required to wear the prescribed academic attire, which may be purchased at the ASUA Bookstore.

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 assignment notification. Deposits on rooms will not be refunded for cancellations after June 1 preceding the fall semester, nor after December 15 for the second semester.

Rates for single rooms, when available, are 160% per person of the regular rental rate for most resident halls. Consult the Department of Residence Life for further information.
SUMMARY OF MINIMUM ANNUAL ESTIMATED EXPENSE FOR FULL-TIME CAMPUS STUDENTS, 1992-93

The Board of Regents reserves the right to change all fees and charges without notice, if necessary. Rates for 1993-94 and 1994-95 were not available at the time of printing of the catalog.

Arizona Residents:

<table>
<thead>
<tr>
<th>Registration fee</th>
<th>$1590.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residence halls, average rate</td>
<td>$1800.00</td>
</tr>
<tr>
<td>Meals in university cafeteria</td>
<td>$2000.00</td>
</tr>
<tr>
<td>Books and supplies</td>
<td>$600.00</td>
</tr>
<tr>
<td><strong>Total minimum annual expense</strong></td>
<td><strong>$6000.00</strong></td>
</tr>
</tbody>
</table>

Nonresidents:

<table>
<thead>
<tr>
<th>Registration fee &amp; tuition</th>
<th>$6996.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residence halls, average rate</td>
<td>$1804.00</td>
</tr>
<tr>
<td>Meals in university cafeteria</td>
<td>$2000.00</td>
</tr>
<tr>
<td>Books and supplies</td>
<td>$600.00</td>
</tr>
<tr>
<td><strong>Total minimum annual expense</strong></td>
<td><strong>$11,400.00</strong></td>
</tr>
</tbody>
</table>

All students should add to this list incidental personal expenses as needed. The residence hall reservation deposit is $150.

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.

SCHOLARSHIPS AND FINANCIAL AID GENERAL INFORMATION

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

In 1991-92, the Office of Student Financial Aid administered $122 million in aid, which assisted 21,529 students at the University. Many awards are competitive, so early application is urged. Students should apply as soon as possible after January 1 of each year in which they expect to receive financial aid. The application forms are widely available from high school counselors, community colleges, and the OSFA.

FEDERAL AID PROGRAMS

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

FEDERAL SUPPLEMENTAL EDUCATION OPPORTUNITY GRANTS—The Federal SEOG Program is a direct grant to undergraduate students demonstrating exceptional financial need. Eligibility is determined by the Office of Student Financial Aid.

FEDERAL COLLEGE WORK STUDY—The Federal 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.

FEDERAL PELL GRANTS—The Federal Pell Grant Program is funded by the

### RESIDENCE HALL RATES, EFFECTIVE 1992-93

<table>
<thead>
<tr>
<th>Residence Halls:</th>
<th>Entire Academic Year</th>
<th>Fall Semester Payment</th>
<th>Spring Semester Payment</th>
<th>Spring Semester ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hopi, Sierra</td>
<td>$1429.00</td>
<td>$860.00</td>
<td>$569.00</td>
<td>$860.00</td>
</tr>
<tr>
<td>Arizona-Sonora, Quad</td>
<td>$1679.00</td>
<td>$1015.00</td>
<td>$664.00</td>
<td>$1015.00</td>
</tr>
<tr>
<td>Arizona-Sonora, Db1</td>
<td>$2350.00</td>
<td>$1410.00</td>
<td>$940.00</td>
<td>$1410.00</td>
</tr>
<tr>
<td>Apache-Santa Cruz</td>
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<td>$1105.00</td>
<td>$724.00</td>
<td>$1105.00</td>
</tr>
<tr>
<td>Graham-Greenlee</td>
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<td>$724.00</td>
<td>$1105.00</td>
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<tr>
<td>Kaibab-Huachuca</td>
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<td>$1105.00</td>
<td>$724.00</td>
<td>$1105.00</td>
</tr>
<tr>
<td>Manzanita-Mohave</td>
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<td>$1135.00</td>
<td>$794.00</td>
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</tr>
<tr>
<td>Babcock, Std Db1</td>
<td>$1879.00</td>
<td>$1135.00</td>
<td>$744.00</td>
<td>$1135.00</td>
</tr>
<tr>
<td>Cocinino</td>
<td>$1929.00</td>
<td>$1165.00</td>
<td>$764.00</td>
<td>$1165.00</td>
</tr>
<tr>
<td>Yavapai</td>
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<td>$1165.00</td>
<td>$764.00</td>
<td>$1165.00</td>
</tr>
<tr>
<td>Navajo-Pinal</td>
<td>$1929.00</td>
<td>$1165.00</td>
<td>$764.00</td>
<td>$1165.00</td>
</tr>
<tr>
<td>Yuma, Maricopa</td>
<td>$1979.00</td>
<td>$1195.00</td>
<td>$784.00</td>
<td>$1195.00</td>
</tr>
<tr>
<td>Gila, Cochise</td>
<td>$1979.00</td>
<td>$1195.00</td>
<td>$784.00</td>
<td>$1195.00</td>
</tr>
<tr>
<td>Coronado</td>
<td>$2104.00</td>
<td>$1270.00</td>
<td>$834.00</td>
<td>$1270.00</td>
</tr>
<tr>
<td>Corleone Apts, 1 br</td>
<td>$2179.00</td>
<td>$1315.00</td>
<td>$864.00</td>
<td>$1315.00</td>
</tr>
<tr>
<td>Corleone Apts, 2 br</td>
<td>$1879.00</td>
<td>$1135.00</td>
<td>$744.00</td>
<td>$1135.00</td>
</tr>
</tbody>
</table>

**II. Summer Rates:**

Five-Week Session:
- Residence Hall, Db1: $237.00
- On-campus Apartment, Quad: $244.00

Conference Groups:
Daily and Weekly (over four weeks) rates available on request

**III. Christopher City Apartment Rates:**

Per month - includes utilities - Open year-round:
- Efficiency unfurnished: $265.00
- Efficiency furnished: $295.00
- One-bedroom unfurnished: $340.00
- One-bedroom furnished: $375.00
- Two-bedroom unfurnished: $410.00
- Two-bedroom furnished: $455.00
- Three-bedroom (regular) unfurnished: $495.00
- Three-bedroom (large) unfurnished: $555.00

1Subject to increase for 1993-94 and 1994-95 academic years.
2Rates for single rooms when available: 160% per person of the regular rental rate for most resident halls. Consult the Department of Residence Life for further information.
federal government in order to provide primary access for students for their undergraduate degrees. Eligibility is established by the federal government and students are funded appropriately to their dependency status, living accommodations, and enrollment.

FEDERAL STAFFORD LOANS—The Federal 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. For the unsubsidized loan, interest begins to accrue immediately after the loan is made. Repayment begins six months after the borrower is no longer enrolled in school. Various deferment provisions for community service, unemployment, or economic hardship are available.

FEDERAL SUPPLEMENTAL LOANS FOR STUDENTS AND PARENT LOANS FOR STUDENTS—The federal SLS and PLUS programs are available to undergraduate and graduate students. The interest rate is up to 12 percent and repayment begins 60 days after the loan is taken. For loans made after October 1, 1993, the SLS interest rate is capped at 11% and the PLUS is capped at 10%. 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

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 aid offers.

SHORT-TERM LOANS—The short-term loan program is intended to assist students with short-term funding problems or emergencies. The loans are small and must be repaid within the semester or session borrowed. The loans are usually for a period of 90 days or until the last day of class, whichever comes first. At the start of a semester the period is usually shortened to provide maximum assistance. Registration loans are provided during the fall and spring semesters for those students whose need has been determined but aid has not arrived.

All students are encouraged to apply for financial aid, regardless of their parents' financial status. The broad range of financial aid resources available to the Office of Student Financial Aid provides access on 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.
ACADEMIC POLICIES AND GRADUATION REQUIREMENTS

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</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>
</tbody>
</table>

Graduate students (any student registered in the Graduate College), work carried for graduate credit only | 3.000 |

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

Good Standing

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

University Credit

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

Definition of Unit of Credit

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

1. At least 15 contact hours of recitation, lecture, discussion, seminar, or colloquium, as well as a minimum of 30 hours of student homework are required for each unit of 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.

THE HONORS CENTER

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

Admission to Honors is limited to those students who have distinguished themselves academically. Incoming freshmen must rank in the top 5% of their class or achieve an ACT score of 30 or a combined SAT of 1300. Transfer students must have accumulated a 3.5 grade-point average on a 4.0 scale. Once admitted to the program, honors students are provided with a personalized educational opportunity that focuses attention on small classes, usually within the range of 12-25. Classroom sessions are structured such that there is heavy emphasis on the development of verbal skills, writing, and problem solving. A variety of honors seminars, colloquia, introductory departmental courses, studio workshops, and independent studies are available. There is ample opportunity for personalized research and laboratory work. In addition, students are able to participate in a program of faculty-student dialogues, peer-help sessions for incoming freshmen, tutoring, a semester abroad program, where students spend five months studying in London, Paris, or Seville, and a series of monthly honors forum luncheons designed to bring students and faculty together to interact informally and to listen to prominent scholars discuss some of their research. In most instances, a student's experience in the program culminates 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, Slonaker House, 621-6901.

ACADEMIC HONORS AND AWARDS

University Academic Honors

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

Dean's List

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

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

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

Academic Distinction
Two categories are awarded annually based on units completed for credit and letter grade (excluding all Pass/Fail and "S" grades). Also, all grades of "I" must be made up before the honor is bestowed.
1. Highest Academic Distinction is based on 30 units and a 4.000 grade-point average.
2. Academic Distinction is based on 30 units and a grade-point average of 3.500-3.999.

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

Graduation with Academic Distinction
Three categories are awarded for superior scholarship in work leading to the bachelor's degree. This honor, based upon graduation grade-point average, becomes part of the official record, is awarded upon graduation and appears on the transcript and diploma of the recipient.
1. Summa Cum Laude is awarded to candidates whose grade-point average is 3.900 or higher.
2. Magna Cum Laude is awarded to candidates whose grade-point average is 3.700-3.899.
3. Cum Laude is awarded to candidates whose grade-point average is 3.500-3.699.

To be eligible for distinction at graduation, bachelor's degree candidates must have completed at least 60 units in undergraduate residence at the University of Arizona, with letter grades that carry a grade-point value in a minimum of 45 units. Also, in computing the above grade-point averages, only work in residence is considered.

For Juris Doctor degrees, summa cum laude is awarded to candidates whose grade average is 3.5 or higher; magna cum laude, to candidates whose average is 3.499 to 3.2500; cum laude, to candidates whose average is 3.2499 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
Graduation with Honors is bestowed on students who have completed all requirements of the University-wide Honors Program. This academic recognition becomes part of the official record and is noted on the transcript and diploma of the recipient. Honors students also wear a special stole at graduation.

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

ACADEMIC PROGRESS, PROBATION AND DISQUALIFICATION

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

Academic Warning Status
Freshman students who have completed fewer than 14 units at the University with a University of Arizona cumulative grade-point average between 1.750 and 2.000, or who have completed 14 through 26 units at the University with a University of Arizona cumulative grade-point average of between 1840 and 2000 will be on academic warning status. Academic warning status invokes no academic penalties and will not be indicated on the student's permanent record, but will be indicated on the student's grade report. This status serves as a warning to students beginning their college careers that their performance is below the level required for successful completion of an academic program. Students in this status are strongly urged to seek academic counseling.

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

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

The student recommended for disqualification from a particular college may seek immediate admission to another college in the University. Permission for admission to another college must be obtained in writing from the dean of the college into which the student plans to transfer. The letter of permission should be presented to the Office of the Registrar. Ordinarily permission will be granted only if the student plans to pursue a modified program in a curriculum of the new college and has demonstrated ability warranting such action. Those who have been given college disqualification are strongly urged to seek thorough academic and vocational counseling and guidance. Failure to secure approval to transfer to another college in the University is tantamount to university disqualification and the rules governing this type of disqualification then will apply. A disqualified student may not attend the University as a nondegree student. A student disqualified from a particular college who may have secured subsequent permission to register in another college is automatically on scholastic probation in the new college. A student may be granted college disqualification only once in his or her academic career. Any later disqualification will be considered a university disqualification.
University Disqualification
A student who receives university disqualification is restricted from registering at The University of Arizona and may return to the University only on the basis of evidence that underlying conditions have materially improved and that he or she is now capable of academic success. Students seeking readmission who left the University on academic probation or under disqualification must receive approval from the dean of the college they wish to enter prior to readmission.

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

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

ENROLLMENT POLICIES

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

<table>
<thead>
<tr>
<th>College or School</th>
<th>Freshman</th>
<th>Sophomore</th>
<th>Junior</th>
<th>Senior</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>19</td>
<td>26-57</td>
<td>58-90</td>
<td>91+</td>
</tr>
<tr>
<td>Architecture</td>
<td>19</td>
<td>30-60</td>
<td>61-94</td>
<td>95+</td>
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<tr>
<td>Arts &amp; Sciences</td>
<td>19</td>
<td>25-55</td>
<td>56-86</td>
<td>87+</td>
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<tr>
<td>B.S. in Geos.</td>
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<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>Engineering &amp; Mines</td>
<td>19</td>
<td>34-69</td>
<td>70-103</td>
<td>104+</td>
</tr>
<tr>
<td>Health-Related Professions</td>
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<td>1st year</td>
<td>2nd year</td>
<td>3rd year</td>
</tr>
<tr>
<td>Nursing</td>
<td>19</td>
<td>22-49</td>
<td>50+</td>
<td></td>
</tr>
<tr>
<td>Law</td>
<td>1-21</td>
<td>1-27</td>
<td>1-28</td>
<td>1-30</td>
</tr>
<tr>
<td>Business &amp; Public Admin.</td>
<td>19</td>
<td>26-57</td>
<td>58-90</td>
<td>91+</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td>30-60</td>
<td>61-94</td>
<td>95+</td>
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<tr>
<td>Nursing</td>
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<td>87+</td>
</tr>
<tr>
<td>Pharmacy</td>
<td></td>
<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>College</td>
<td>1st year</td>
<td>2nd year</td>
<td>3rd year</td>
<td>4th year</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.

Full-Time Student Status
Full-time status for an undergraduate student varies with the college and study program, but ordinarily requires a load of 12 units per semester. For graduate students, full-time status 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 section of the catalog.

COMPLETION OF MAJOR
The academic experience at the University will be affected by each student's personal situation, academic abilities, and continued persistence toward an academic major. The University cannot guarantee enrollment in some classes because of changing student interest and enrollment fluctuations. In addition, some departments and colleges limit the number of majors they admit each year.

For these reasons the University cannot guarantee that each student will be able to complete requirements for the major of his or her first preference within a specific timeframe. Students who find a desired class closed should work with departmental faculty and advisors to explore alternative classes and academic options available at The University of Arizona.

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

Students may also petition for redress or exception to college policies or requirements. Petitions may address a change of program, approval for an overload, substitution of course work, transfer credit, modification in degree program, or in certain instances, eligibility for registration or enrollment in the college. The necessary forms, instructions and assistance may be obtained in the office of the college dean. The decision of the dean is final.

Graduate students should consult the Graduate College for information on submitting petitions.
GRADING SYSTEM

The grading system used by The University of Arizona follows:

- **A** - Excellent
- **B** - Good
- **C** - Fair
- **D** - Poor
- **E** - Failure
- **P** - Passing (Special S/P and P/F grade)
- **F** - Failure (Special P/F grade)
- **S** - Superior (Special S/P grade)
- **I** - Incomplete
- **K** - Course in progress
- **W** - Approved withdrawal
- **O** - Audit
- **CR** - Credit

*Included in calculation of the grade-point average.

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

Regular and Special Grades

A, B, C, D, and E constitute the regular grades used at the University of Arizona. All courses other than "house numbered" courses use these grades. All individual studies courses and some small group courses with S (superior) and P (pass) use special grades which replace A and B grades. For explanation of these grades, see the Departments and Courses of Instruction.

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

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. Students should make arrangements with the instructor to receive an incomplete grade before the end of the semester. After the course work is completed, the instructor will assign the appropriate grade on a Change of Grade form and submit it to the Office of the Registrar for processing. 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 the Registrar at the end of the semester, for courses which require more than one semester for completion. It is also awarded by the Office of the Registrar for all supplementary registrations (930).

Withdrawal Grade

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

Audit Grade

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

Averaging of Grades

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

Change of Grade

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

Academic Renewal

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

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

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

The petition shall specify the semester(s) or term(s) to be disregarded. If more than one semester or term is to be disregarded, these shall be consecutive, completed within a maximum of two calendar years, with no intervening enrollments at the University. The maximum of two 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.

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

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

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

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

If the college does not have a student council, the dean shall appoint the student members, selecting full-time, upper-division undergraduates or graduate students in good academic standing.

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

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

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

<table>
<thead>
<tr>
<th>TIME TABLE FOR GRADE APPEALS</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weeks 1-5:</strong></td>
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<tr>
<td><strong>Weeks 6-7:</strong></td>
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<tr>
<td><strong>Week 8:</strong></td>
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<tr>
<td><strong>Weeks 9-10:</strong></td>
</tr>
<tr>
<td><strong>Week 11:</strong></td>
</tr>
<tr>
<td><strong>Weeks 12-15:</strong></td>
</tr>
</tbody>
</table>

1. Establishment of Credit: Undergraduate students may repeat any course for which they have received an E or W. They may repeat this course as many times as necessary to establish credit, but may only be eligible for grade replacement once.

2. First and Second Attempt Averaging: Undergraduate students may repeat only once any course in which they have received original grades of C or D. Grade-point average will be computed by averaging grades earned in the first and second attempt. Original grades of A or B may not be repeated, except as specifically provided by departments on a course-by-course basis. Credit will be allowed only once unless the course is designated "repeatable for credit" by the department.

3. Grade Replacement: Undergraduate students may repeat once any course in which they have received original grades of C, D, P, or E. Grades earned in the first and second attempts will appear on academic transcripts. Only grades earned in the second attempt will be used in grade-point average computation. A second attempt grade of P or W will not replace the first grade. Three courses for a maximum of ten units will be allowed for replacement. Students selecting this op-
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 2.00 or better.

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

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

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

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

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

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

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

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

GENERAL EDUCATION REQUIREMENTS

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

General education requirements vary across colleges and departments. However, all general education programs at The University of Arizona share a common structure. Each requires courses in basic skills and competencies, including freshman composition, as well as courses in particular areas, such as biological and physical sciences, arts and literature, social sciences, and traditions and cultures. For specific details on general education requirements, see the College and General Divisions 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.

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.

First-Year Composition

All students working toward degrees must meet the first-year 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, ENGL 109H. There is no exemption from the first-year composition requirement; any substitutes must be approved by the Director of Composition, Department of English. The first-year composition requirement may not be satisfied by correspondence work.

Placement in first-year 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 composition, (2) the English section of the American College Test (ACT) or the Test of Standard Written English score on the Scholastic Aptitude Test (SAT). Both of these examinations require fees. Students with superior ratings based on the above examinations enroll initially in ENGL 109H; students whose scores indicate a need for more extensive instruction in writing initially enroll in ENGL 100 and pass this course before they enroll in ENGL 101. International students write a placement essay and submit a score on the Test of English as a Foreign Language. Students whose scores indicate a need for more extensive instruction in writing initially enroll in ENGL 106 and pass this course before they enroll in ENGL 107. Students who earn a score of 4 or 5 on the Advanced Placement Exam administered by the College Board have the option of enrolling in ENGL 109H and satisfying the requirement in one semester.

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 be-
have an appropriate score on the math prerequisite for 117R, 117S, 118, 119, 121, 123, 124, and 125a will be required to take the Upper-Division Writing-Proficiency Examination for admission to the College of Arts and Sciences, the results are valid for one year. Students must be registered for the course with their academic advisor. 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 departments' requirements.

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 the catalog. In order to receive credit for a writing-emphasis course, 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.

UNIVERSITY REQUIREMENTS IN MATHEMATICS

Mathematics Readiness Test

Prior to taking any mathematics course below the level of 125b at The University of Arizona, students must take the math readiness test. The test is administered by the University Testing Center in Old Main and the results are valid for one year. Students without university credit in the prerequisites for 117R, 117S, 118, 119, 121, 123, 124, 125a will be required to have an appropriate score on the math readiness test to be enrolled in those courses.

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.

Final Examinations

All courses offered for credit shall include a final examination given at the regularly scheduled examination time. No deviation from the exam schedule, once it is printed, is authorized. All forms of examinations (quizzes, take-homes, etc.) are prohibited on any scheduled class day during the week in which regularly scheduled final exams 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 under any of several modes. They are:

1. The Advanced Placement program administered by the College Board;
2. The Higher Level Examinations of the International Baccalaureate;
3. The College-Level Examination Program (CLEP) (also administered by the College Board);
4. Departmental exemption or proficiency examinations;
5. 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 applied toward an undergraduate degree. No graduate credit may be established in this manner.

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, granted college credit, or both, depending upon the area and the examination scores. Advanced placement without credit does not reduce the total units to be earned for the bachelor's degree, but allows the student to study at a higher level than otherwise possible. Advanced placement with credit reduces the units to be completed for a degree. Final decision regarding credit or placement is 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.

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

University policy encourages prospective students to avail themselves of Advanced Placement programs, because successful achievement will substantially increase flexibility in future course selection.

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>UA Courses</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMERICAN HISTORY</td>
<td>4 or 5</td>
<td>HIST 106 &amp; 107 .6 Units</td>
</tr>
<tr>
<td>ART (STUDIO)</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>ART HISTORY</td>
<td>3, 4 or 5</td>
<td>ARH 117 &amp; 118 .6 Units</td>
</tr>
<tr>
<td></td>
<td>1, 2</td>
<td>None</td>
</tr>
</tbody>
</table>
### BIOLOGY
- 4 or 5. ECOL-lower division credit...8 Units
- 3. ECOL-lower division credit...4 Units
- 2. Placement by department...None

### CHEMISTRY
- 4 or 5. CHEM 103a-103b, 104a-104b...8 Units
- 3. CHEM 103a & 104a...4 Units
- 1 or 2. None...None

### COMPUTER SCIENCE A
- 3, 4 or 5. C SC-lower or MIS III division credit...3 Units
- 1 or 2. None...None

### COMPUTER SCIENCE AB
- 5. C SC 227...3 Units
- 3 or 4. C SC-lower division credit...3 units

### ECONOMICS-MICROECONOMICS
- 4 or 5. ECON 201a...3 Units
- 1, 2 or 3. None...None

### MACROECONOMICS
- 4 or 5. ECON 201b...3 Units
- 1, 2 or 3. None...None

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

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

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

### LATIN: VERGIL
- 5. LAT 202...4 Units
- 3. Advanced Placement: Automatic satisfaction of the foreign language requirement...None
- 1 or 2. None...None

### MATHEMATICS AB
- 3, 4 or 5. MATH 125a or 123...3 Units
- 1 or 2. None...None

### MATHEMATICS BC
- 3, 4 or 5. MATH 125a-125b...6 Units
- 2. MATH 125a...3 Units
- 1. None...None

### MUSIC LITERATURE
- 5. MUS 130a-130b...4 Units
- 4. MUS 130a...2 Units
- 3. MUS 107...3 Units
- 1 or 2. None...None

### MUSIC THEORY
- 5. MUS 120a-120b...6 Units
- 3 or 4. MUS 120a...3 Units
- 2. MUS 100...3 Units
- 1. None...None

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

### AMERICAN GOVERNMENT AND POLITICS
- 3, 4 or 5. POL 102...3 Units
- 1 or 2. None...None

### COMPARATIVE GOVERNMENT AND POLITICS
- 3, 4 or 5. POL 140...3 Units
- 1 or 2. None...None

### PHYSICS B
- 3, 4 or 5. PHYS 102a-102b...6 Units
- 1 or 2. None...None

### PHYSICS C - Electricity and Magnetism
- 4 or 5. PHYS 116...4 Units
- 1, 2 or 3. None...None

### PHYSICS C - Mechanics
- 4 or 5. PHYS 110...4 Units
- 1, 2 or 3. None...None

### SPANISH LANGUAGE
- 5. SPAN 201, 202...14 Units
- 3 or 4. SPAN 201...11 Units
- 2. SPAN 201, 202...8 Units
- 1. None...None

### SPANISH LITERATURE
- 5. SPAN 201, 202...14 Units
- 3 or 4. SPAN 201...11 Units
- 2. SPAN 201, 202...8 Units
- 1. None...None

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**College-Level Examination Program (CLEP)**

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

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

All CLEP examinations are available through the Counseling and Testing Service (CTS) at the University of Arizona. A limited list of CLEP examinations is available also through the testing cen-
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.

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 satisfy language requirements in whole or in part by passing a non-credit 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: ARB 402; CHN 402 (Modern Chinese); FREN 202; GER 202; GRK 202; JUS 403b (Hebrew); ITAL 202; JPN 202 (Japanese); LAT 202; PRS 405; PORT 206; RUSS 201a or 201b; SPAN 202, 206.

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 the Registrar, with a copy to the student.
8. The student's academic record will be annotated with a statement indicating the student passed the proficiency examination at the appropriate level.
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 preparatory study for these examinations rests entirely with the student; faculty members are under no obligation to assist with such preparation.

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

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. Other courses generally have been excluded from this option; at department discretion, however, any course may be made available for grade by examination or credit by examination.

Options

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

Limitations

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

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 return is applied 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.

ABSENCES—ADMINISTRATIVE DROP

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 sufficient reason for the instructor to recommend 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 in the Registrar’s Office 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—CODE OF INTEGRITY

Integrity is expected of every student in all academic work. The guiding principle of academic integrity is that a student’s submitted work must be the student’s own. Students engaging in academic dishonesty diminish their education and bring discredit to the academic community. Students shall not violate the Code of Academic Integrity and shall avoid situations likely to compromise academic integrity. Students shall observe the provisions of the Code whether or not faculty members establish special rules of academic integrity for particular classes. Failure of faculty to prevent cheating does not excuse students from compliance with the Code.

Conduct prohibited by the Code consists of all forms of academic dishonesty, including, but not limited to: cheating, fabrication, facilitating academic dishonesty, and plagiarism as set out and defined in the Code of Conduct, modifying any academic work for the purpose of obtaining additional credit after such work has been submitted to the supervising faculty member unless the supervising faculty member approves such alterations; failure to observe rules of
academic integrity established by a faculty member for a particular course; and attempting to commit any act prohibited by the Code. Any attempt to commit an act prohibited by these rules shall be subject to sanctions to the same extent as completed acts. The procedures for reviewing a suspected violation follow.

FACULTY-STUDENT CONFERENCE. The faculty member must confer with the student within 15 working days of the student's being informed of a suspected violation.

APPEAL TO DEPARTMENT HEAD. The student must appeal to the Department Head within ten working days of notification of the imposition of sanctions and recommendations for suspension or expulsion. The Department Head shall render a decision within 15 working days.

UNIVERSITY HEARING BOARD. The student must appeal to the University Hearing Board within ten working days of notification that the Department Head has upheld the sanction or that the faculty member refuses to accept the Department Head's recommendation that sanction(s) be rescinded. The University Hearing Board shall convene within 30 working days of the time the student files the appeal.

For a more complete outline of procedures, see the complete Code of Academic Integrity. Copies are available in the Dean of Students office or from the Committee on Academic Integrity.

LEAVING THE UNIVERSITY

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

Dismissal from Courses or from the University

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

Medical Withdrawal

Medical withdrawal is initiated from the Student Health Service. Adequate medical documentation must be supplied by the student. Students who withdraw from the University for medical reasons and who are medically encumbered must have their 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 during that semester or term. This petition must be accompanied by adequate documentation and filed with the dean of the student's college.

Transcripts

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

GENERAL GRADUATION REQUIREMENT INFORMATION

Choice Of Catalog

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

Time Limit For Obsolete Course Work

In areas of study in which the subject matter changes rapidly, material in courses taken long before graduation may become obsolete or irrelevant. A student's major department has the authority to refuse to accept, for the purpose of satisfying graduation requirements, any course completed earlier than 10 years before the date of graduation. Students whose programs include courses that will be more than 10 years old when 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 University Credit.

Major Average

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

University Credit Requirement

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

Upper-Division Unit Requirement

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

**Correspondence And Credit By Examination Credit Maximums**

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

**Application For Bachelor's Degree Candidacy**

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

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

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

For information regarding fees for filing an application for degree candidacy, see Expenses, Fees, Scholarships and Financial Aid.

**Changes In Degree-Application Information**

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

**Completion of Degree Requirements In Absentia**

Degree candidates who find it necessary to leave The University of Arizona and complete final course requirements through correspondence or transfer work are required to notify the degree-certification section of such plans, before leaving the University.

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**GRADUATION REQUIREMENTS**

**Minimum Units Required for Baccalaureate Degrees**

Colleges, faculties, or schools with the approval of the university faculty, establish the minimum number of units needed to receive a bachelor's degree. The major which a student selects determines the degree which the student will receive. Requirements for various bachelor's degrees are described in the college sections of this catalog. The minimum number of units required for degrees is listed below according to the college in which the degree is offered.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Units Required</th>
<th>Degree</th>
<th>Units Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>College of Agriculture</td>
<td></td>
<td>Bachelor of Science in Public Administration</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Landscape Architecture</td>
<td>130</td>
<td>College of Education</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Science in Agriculture</td>
<td></td>
<td>Bachelor of Arts in Education</td>
<td>125</td>
</tr>
<tr>
<td>and Consumer Resources</td>
<td>130</td>
<td>Bachelor of Science in Education</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Science in Renewable Natural Resources</td>
<td>130</td>
<td>Bachelor of Science in Agricultural</td>
<td>136</td>
</tr>
<tr>
<td>College of Architecture</td>
<td>166</td>
<td>and Biosystems Engineering</td>
<td>134</td>
</tr>
<tr>
<td>Bachelor of Architecture</td>
<td></td>
<td>Bachelor of Science in Chemical</td>
<td>136</td>
</tr>
<tr>
<td>Faculty of Fine Arts</td>
<td></td>
<td>Engineering</td>
<td>136</td>
</tr>
<tr>
<td>Bachelor of Arts in Art</td>
<td>125</td>
<td>Bachelor of Science in Civil</td>
<td>136</td>
</tr>
<tr>
<td>Bachelor of Arts in Media Arts</td>
<td>125</td>
<td>Bachelor of Science in Computer</td>
<td>134</td>
</tr>
<tr>
<td>Bachelor of Arts in Music</td>
<td>128</td>
<td>Bachelor of Science in Electrical</td>
<td>131</td>
</tr>
<tr>
<td>Bachelor of Arts in Theatre Arts</td>
<td>125</td>
<td>Bachelor of Science in Engineering</td>
<td>130</td>
</tr>
<tr>
<td>Bachelor of Fine Arts</td>
<td>125</td>
<td>Bachelor of Science in Mathematics</td>
<td></td>
</tr>
<tr>
<td>with major in Art Education</td>
<td>127</td>
<td>Bachelor of Science in Engineering</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Music</td>
<td></td>
<td>College of Science in Engineering</td>
<td></td>
</tr>
<tr>
<td>with major in Performance</td>
<td>130</td>
<td>Bachelor of Science in Physics</td>
<td>136</td>
</tr>
<tr>
<td>(Guitar)</td>
<td></td>
<td>Bachelor of Science in Geological</td>
<td>136</td>
</tr>
<tr>
<td>with major in Performance</td>
<td>131</td>
<td>Engineering</td>
<td>136</td>
</tr>
<tr>
<td>(Keyboard)</td>
<td></td>
<td>Bachelor of Science in Hydrology</td>
<td>137</td>
</tr>
<tr>
<td>with major in Performance</td>
<td>130</td>
<td>Bachelor of Science in Industrial</td>
<td>131</td>
</tr>
<tr>
<td>(String Instrument)</td>
<td></td>
<td>Engineering</td>
<td>131</td>
</tr>
<tr>
<td>with major in Performance</td>
<td>129</td>
<td>Bachelor of Science in Materials</td>
<td>127</td>
</tr>
<tr>
<td>(Harp)</td>
<td></td>
<td>Science and Engineering</td>
<td></td>
</tr>
<tr>
<td>with major in Performance</td>
<td>130</td>
<td>Bachelor of Science in Mechanical</td>
<td>134</td>
</tr>
<tr>
<td>(Wind Instrument/Percussion)</td>
<td>130</td>
<td>Bachelor of Science in Mining</td>
<td>134</td>
</tr>
<tr>
<td>with major in Jazz Studies</td>
<td>128</td>
<td>Bachelor of Science in Nuclear</td>
<td>131</td>
</tr>
<tr>
<td>with major in Music Education</td>
<td>132</td>
<td>Bachelor of Science in Optical</td>
<td>132</td>
</tr>
<tr>
<td>(Choral)</td>
<td></td>
<td>Bachelor of Science in Systems</td>
<td>131</td>
</tr>
<tr>
<td>with major in Music Education</td>
<td>133</td>
<td>School of Health-Related</td>
<td></td>
</tr>
<tr>
<td>(Instrumental)</td>
<td></td>
<td>Professions</td>
<td></td>
</tr>
<tr>
<td>with major in Composition</td>
<td>132</td>
<td>Bachelor of Science in Exercise Sciences</td>
<td>125</td>
</tr>
<tr>
<td>Faculty of Humanities</td>
<td></td>
<td>with major in Health Education</td>
<td>128</td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
<td>with major in Medical Technology</td>
<td>129</td>
</tr>
<tr>
<td>Bachelor of Science</td>
<td></td>
<td>with major in Occupational Safety and Health</td>
<td>128</td>
</tr>
<tr>
<td>Bachelor of Science in Geosciences</td>
<td>131</td>
<td>with major in Physical Education</td>
<td>126</td>
</tr>
<tr>
<td>Bachelor of Science in Speech and Hearing</td>
<td>125</td>
<td>College of Nursing</td>
<td>129</td>
</tr>
<tr>
<td>Sciences</td>
<td></td>
<td>Bachelor of Science in Nursing</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
<td>Bachelor of Science in Nursing</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Science in Business Administration</td>
<td>125</td>
<td>Bachelor of Science in Nursing</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Science in Business Administration</td>
<td>125</td>
<td>Bachelor of Science in Nursing</td>
<td></td>
</tr>
</tbody>
</table>
Second Bachelor's Degree
Candidates for a second bachelor's degree at The University of Arizona must offer no fewer than 30 units in addition to the units required for the first degree, and must meet all requirements for the second degree. The additional units may be completed concurrently with those applying on the first degree; however, at least 30 units of University of Arizona credit must be completed for each degree.

Averaging Of Grade For Final Non-University Credit Course
Students who lack not more than a one-semester course toward the fulfillment of curriculum and minimum-graduation-average 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 2.0000 in the major field if prior permission is obtained from the major professor and the academic dean.

Clearance Of Accounts
Degree candidates are required to clear any indebtedness to the University before completion of degree requirements will be officially certified or the diploma released.
STUDENT SERVICES, HOUSING AND CAMPUS LIFE

ACADEMIC ADVISING

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

Agriculture
Office of Instruction and Student Advising Center
Forbes 211
(602) 621-1374

Architecture
Office of the Dean
Architecture 104
(602) 621-6751

Business and Public Administration
Undergraduate Programs
McClelland Hall 103
(602) 621-2905

Education
Office of Student Services
Education 247
(602) 621-7865

Engineering and Mines
Office of Academic Affairs
Geology 134
(602) 621-6032

Fine Arts
Office of the Dean
Music 111
(602) 621-1301

Health-Related Professions
Office of the Director
Gittings 101, (602) 621-6989

Humanities, Science, and Social and Behavioral Sciences
Office of Academic Services
Modern Languages 347
(602) 621-3336

College of Nursing
Office of Student Affairs
Nursing 103
(602) 626-6161

College of Pharmacy
Office of the Dean
Pharmacy 344
(602) 626-1427

For undeclared and undecided students, the Advising Center for Exploratory Students (ACES) offers special assistance. It is located in Modern Languages 347; the phone number (602) 621-3336.

DEAN OF STUDENTS OFFICE

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

Additionally, the Dean of Students Office is responsible for the enforcement of university policies and procedures, including the Student Code of Conduct, the Code of Academic Integrity, and the Policy on the Use of the Campus and First Amendment Rights. Students seeking to withdraw from the University may consult the Dean of Students Office. The Dean of Students also has administrative and fiscal oversight of Associated Students of The University of Arizona (ASUA).

The mission of the University Learning Center is to enhance the ability of all students including those from disadvantaged backgrounds to assume responsibility for their own learning and to make their educational experience personally relevant. There is a strong commitment to providing quality programs, services, and resources that are critical to the learning process and student success. Four service units provide this support.

First Year Programs

SUMMER PROGRAMS—The New Start Summer Bridge Program is designed for graduating high school seniors intending to enroll as freshmen at the UA. Through a variety of activities, including a University course, 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. For further information, contact the Assistant Director of Summer Programs located in R. L. Nugent, Room 9.

FALL TRANSITION PROGRAM—This program is designed to assist new University of Arizona students during their first fall semester with the transition from high school to college. Students accepted into FTP enroll in LRC 197a: Investigating Learning Strategies, work closely with an upper-division student mentor, and participate in various social, educational, and cultural activities.

Learning Assistance

Many students who meet University admissions standards find it difficult to make a smooth academic transition from high school to college or from a community college to a major university. The volume of material assigned and the critical level of thinking demanded on tests and papers can initially be overwhelming. For this reason, the ULC offers academic counseling, free learning strategies workshops, a 3-unit learning strategies course, and a variety of group and private tutoring services in support of student achievement.

Learning Disability Programs

Students with documented learning disabilities can choose to use mandated free
services and/or the S.A.L.T. (Strategic Alternative Learning Techniques) Programs. Provided free of charge, mandated services include: (1) advocacy with faculty and staff, (2) use of auxiliary aids to implement classroom accommodation, and (3) special test accommodation. S.A.L.T.'s fee-based services are more comprehensive and include tutors, computer-assisted learning, and academic counselors.

Minority Student Services
The emphasis of Minority Student Services is to support a significant increase in the number of minority students who persist and graduate from the University. Services include group and drop-in tutoring, a computer lab, test files, peer advising, career resources, information on scholarships and financial assistance, emergency-only book loans, and student advocacy and referral. These services are available to students who are ethnic minority or who qualify for need-based financial aid. Students must also be U.S. citizens or permanent residents.

Counseling and Testing Services
The mission of Counseling and Testing Services (CTS) is to help students successfully achieve their educational goals by helping them resolve personal problems that get in the way of school success, cope with and adjust to college life pressures, deal with crises that interfere with their academic performance, and learn skills to optimize their academic productivity and decision making. CTS further supports The University of Arizona academic mission by providing entrance and other out-of-classroom testing to students and to community persons seeking further education.

Counseling is free, confidential and available to all currently-enrolled students at the University. Services are provided by licensed psychologists and include individual counseling, couples counseling, group counseling, skill-building workshops, consultation with faculty and staff regarding students experiencing emotional difficulties, and a Self-Help Library. For further information or for an intake appointment, students can call (602) 621-7591. On campus, the Center is located in Old Main 200W. Students can also use walk-in services if they have an emergency or an urgent concern.

The Testing Center provides out-of-class testing services for students. These services include the Math Readiness Exam for math placement, the Scholastic Aptitude Test (SAT) for freshmen who did not take the test prior to admission, and a credit-by-exam program (CLEP), which can give students college credit in various areas of study once they demonstrate college-level proficiency in those areas. The center also administers qualifying exams, such as the Law School Admissions Test (LSAT), the Graduate Record Exam (GRE), and the Medical College Admissions Test (MCAT), as well as preparation classes for some of these tests. For more information contact the Testing Center at (602) 621-7589.

Career Services
Career Services is located in the lower level of Old Main with satellite offices in Room 229 of the College of Education and Room 210 of McClelland Hall, and offers a variety of programs designed to assist students and alumni develop and implement career plans, gain work related experience, seek part-time work while enrolled in school and gain professional employment after graduation. Old Main, Room 102 (621-2719).

The Career Development Unit is designed to assist students and new alumni in their job search. Services provided include: Job Search Workshops; job search counseling; a computerized career planning tool, Discover; career and employer library; a class, Self and the World of Work—FCR 297A; resume critiques and mock interviews.

The Job Center has hundreds of part-time and seasonal opportunities for students, their spouses, and alumni. Over 140 employers list on- and off-campus positions annually.

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

The Placement Office assists students who are 9–12 months from graduation as well as recent alumni with their search for permanent, full-time employment. The primary function of this office is to provide students the opportunity to interview with company representatives from major local and national employers. The on-campus interviewing program generally attracts employers from business, industry and government. Other Placement services include job vacancy books, and computerized job listings.

Career Week is a three day program offered once a year during the last week of September. It consists of three days of extensive Career Job Search presentations and two days of Career Fairs where employers come to campus to speak with students. Recent years have seen up to 150 employers.

Old Main 106, 621-2719.

THE OFFICE OF MINORITY STUDENT AFFAIRS (OMSA)

The purpose of the Office of Minority Student Affairs is to increase significantly the number of minority students who persist and graduate from the University. The components of OMSA are the Assistant Vice President for Minority Student Affairs, Administration 401, phone 621-3774; the Assistant Deans for African American, Hispanic, and Native American Student Affairs and the respective resource centers.

AFRICAN AMERICAN STUDENT AFFAIRS—The African American Student Affairs mission is to serve as an advocate for African American students on campus and in the community. We develop and maintain an academic support structure that assists African American students' retention and graduation. The Office of African American Student Affairs includes the African American Cultural Resource Center as well as the Dr. Martin Luther King, Jr. Student Center. For more information call 621-3419.

NATIVE AMERICAN STUDENT AFFAIRS—The Native American Resource Center assists with the retention of Native American students through graduation. The center provides personal and academic counseling, UA and tribal financial aid, scholarships, and financial aid information and referrals, and workshops that cover a variety of topics including: budgeting, career placement, academic learning strategies, and cultural enrichment. The center provides short-term loans and subscriptions to newspapers from the UA campus, tribal and national Indian organizations. A personal message and ride board for students, announcements of social and cultural events and internships and job announcements (campus, local, state, national). For more information call 621-3835.

HISPANIC STUDENT AFFAIRS—Numerous academic support services and programs are available for Chicano/Hispanic students through the Office of the Assistant Dean for Chicano/Hispanic Student Affairs. These services include advocacy, counseling, referral, information on Chicano/Hispanic related clubs, organizations and activities, and other.
assistance. The Assistant Dean's Office is located at Bear Down 103; (602) 621-5627.

The Chicano/Hispanic Student Resource Center is open in Room 200, on the second floor of Bear Down Gym. Already established as an excellent area to study, the center also sponsors social, academic and cultural activities, as well as providing a meeting place for Hispanic clubs and organizations.

SPECIALIZED SUPPORT SERVICES

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 various campus resources that will offer them skills assessment, academic and career information, and needed support in their endeavor to choose a major. For additional information, see the College of Arts and Sciences in the Colleges and General Division section of the catalog.

Early Outreach Programs

APEX—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 APEX office is located at 1227 N. Santa Rita.

MESA—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 African Americans, Hispanics 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. The MESA office can be contacted at Old Main, Room 235.

International Student Center

The International Student Center provides specialized services to international students and scholars. These services include personal counseling and academic advising; screening and referral to academic departments and support services on campus; orientation programs each semester for newly-arriving international students; assistance in complying with federal, state, and local laws and regulations affecting non-immigrant students and scholars; liaison and support to over 40 sponsoring agencies and governments in the United States and abroad; extracurricular field trips; community interaction through the International Friends organization; co-curricular educational programs on topical international issues; and periodic workshops and seminars on topics affecting the international student and scholar population. The International Student Center is located at 915 North Tyndall Avenue. The Center can be reached by telephone at (602) 621-4627 or by fax at (602) 621-4069.

Sponsored Program Fees—The Sponsored Programs section of the International Student Center assesses an administrative management fee for international students supported under contractual arrangements with sponsoring agencies and governments. The following fees are billed directly to the sponsor on a per student basis.

Fall semester $250
Spring semester $250
Summer term $100

Specific information with regard to services provided may be obtained by contacting the Sponsored Programs section of the International Student Center.

Center for Disability Related Resources (CeDRR)

Through its support services, this program seeks to expand opportunities for students with disabilities to participate fully in the educational process and broaden campus life. Individualized services promote independence and responsibility. Ongoing programs provide the campus and the community with opportunities for increased understanding of disabling conditions. The center is located at Second Street and Cherry Avenue (602) 621-3268 (voice or TDD).

Center for Veterans and Off-Campus Students

This center provides advocacy and programs for traditional-age commuter students, undergraduates 25 years or older (New-Traditional Students), and Veteran students. Services focus on promoting student success. Academic, social, cultural, and recreational programs are sponsored by students for students. The office is a bridge linking off-campus students to the many on-campus student service resources. Location: Student Union 353 and 350.

Helpline

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

CLINICAL SERVICES

The Student Health Service

The Student Health Service helps students maintain their physical and mental health, and is a campus resource for counseling on health problems. Regularly enrolled students become eligible for care at the beginning of the semester for which registration fees have been paid. Continuing students 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 submit proof of having been administered measles and rubella vaccines since 1980. These vaccines are available at the Student Health Center for a charge.

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

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

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

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

INSURANCE—A supplemental health insurance plan for students is available to those regularly enrolled at the University who meet eligibility requirements. Since these requirements are subject to change, check with the Student Health Service to verify your eligibility. This insurance is not required for services at the Student Health Center. The insurance option is an HMO plan using the Student Health Service as the primary care provider for students.

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

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

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

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

For information regarding fees, consult the Speech-Language and Hearing Clinics. The clinics may be reached at 621-7070 for Hearing and 621-1823 for Speech.

STUDENT UNION MAIL ROOM
The Student Union Mail Room offers a limited number of private rental mail boxes in various sizes for departments, groups, organizations, faculty, staff, and students. To rent a mail box apply at the Student Union Mail Room.

THE UNIVERSITY LIBRARIES
The University Library system contains almost 9,000,000 items, including books, periodicals, microforms, maps, government publications, manuscripts, and nonbook media. Basic holdings cover all fields of instruction, and there are especially strong collections in anthropology, geology, arid lands, Spanish and Latin American language and literature, American agriculture, Southwestern American, Arizona, 20th century photography, history of science, science fiction, and 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 services, online searching of computerized databases, and bibliographic course-related instruction. The library is in the process of bringing up a Campus Information System called SABIO, which includes an online catalog.

The University Library system consists of the Main Library, which houses the Central Reference Department, the Media Center, the Map Collection, the Current Periodicals and the Reserve Book Room, Newspapers and Microforms Collection; the Science-Engineering Library; and the following branch collections: the Oriental Studies Collection, the Music Collection, the Center for Creative Photography, the Southwest Folklore Center, Special Collections, and the Architecture Library. Three large but separate library facilities are the College of Law 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, humanities, business, and government documents.

MEDIA CENTER—Houses all the library’s nonbook materials except microforms and music tapes and records. The Film Department was added in 1988.

MAP COLLECTION—A depository for USGS maps, houses a fully cataloged collection of more than 200,000 maps on every subject.

CURRENT PERIODICALS/RESERVE BOOK ROOM—Displays current issues of the 5200-plus periodicals received in the Main Library, and manages the reading materials put on reserve for class use.

NEWSPAPERS AND MICROFORMS COLLECTION—Displays current issues of more than 150 newspapers to which the library has a collection of microforms which numbers nearly 2 million.

SCIENCE-ENGINEERING LIBRARY—Houses all materials on science and technology; has more than 500,000 volumes, almost 1,500,000 microforms, and displays current issues of its 4500-plus periodicals.
MUSIC LIBRARY—Houses the library's collection of music-related books, periodicals, and indexes, as well as 50,000 scores, 15,000 pieces of sheet music and 25,000 recordings. Facilities for listening are provided.

CENTER FOR CREATIVE PHOTOGRAPHY—Houses the library's archive of over 100 famous 20th century photographers. The center's collections are internationally known.

SOUTHWEST FOLKLORE CENTER—Houses musical tapes and manuscript archives of Southwest music and folklore.

SPECIAL COLLECTIONS—Houses the library's collections of Arizoniana and Southern Arizona, special subject collections, rare books, fine printing, manuscripts and The University of Arizona archives.

ORIENTAL STUDIES COLLECTION—Houses materials in the Chinese, Japanese, Arabic, Persian, Turkish and other oriental languages; has over 160,000 items.

LAW LIBRARY—This library now contains more than 194,000 volumes, including the reported cases of all the jurisdictions in the United States and substantially all the English reported cases; American and English statutory law; decisions of federal administrative agencies; complete sets of leading legal periodicals; a carefully selected collection of legal encyclopedias, digests, treatises, and textbooks; and a developing collection of civil law with emphasis on Latin America.

HEALTH SCIENCES CENTER LIBRARY—This specialized library, which serves the University Hospital as well as the colleges of Medicine, Nursing and Pharmacy, contains almost 170,000 cataloged volumes and receives approximately 3,600 serial titles. The collection includes books, journals, and nonprint materials in the health sciences.

ARCHITECTURE LIBRARY—Houses a collection with emphasis on the topics of design, architectural history and theory, building technology, and desert architecture and design communications, including over 14,000 cataloged volumes, 120 periodicals and over 27,000 slides for architecture faculty use.

HOUSING FACILITIES

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

Sixteen residence halls are clustered in three separate residential communities on campus and offer a variety of living options to approximately 4,500 students. The options include both single-sex halls and co-ed halls; various locations; a range of rental rates and a variety of architectural styles.

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

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

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

The rental rate does not cover occupancy during the December/January recess. All halls are closed during the December/January recess. 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 year 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. The room deposit, in addition to being a guarantee against cancellation of housing application, applies against damage or loss to university property or to other debts to the University. It does not apply to the rent. The deposit is refunded when a student leaves the residence hall, if all charges for loss or damage and debts to the University have been paid.

Notification of residence hall assignments for the fall is mailed to applicants beginning mid-April. Failure to provide required rent confirmation payment within two weeks of assignment notification will result in cancellation of res-
Pets are not permitted in the complex.

Specific apartment types, please contact

For an application or further information about Christopher City, contact: Christopher City Apartments, 3401 N. Columbus Blvd., Tucson, Arizona, 85712, (602) 327-5918. Fax: (602) 322-5881.

**Housing Off the Campus**

Listings of off-campus housing are available in the Center for Veterans and Off-Campus Students, Student Union 353. A renter's guide for students is available. It contains information about Tucson utilities, apartment listings, and legal resources.

**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.

**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.

The Office of the Registrar enforces a financial records hold or an administrative hold on the records of a student when an outstanding financial obligation or disciplinary action has been reported.

When a hold is placed on a record, the following results may occur: 1) No official or unofficial transcript is issued. 2) Registration privileges are suspended. 3) Other student services may be revoked.

The hold remains effective until removed by the issuing office. It is the student's responsibility to clear the conditions causing the hold.

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

**Use of Narcotic Drugs**

The University provides information required under the Drug Free Schools and Communities Act of 1989. This information appears each semester in the Schedule of Classes. The use by a student, or the sale, possession, or giving as a gift by him or her of narcotic drugs, sedatives, stimulants, psychotherapeutic drugs, 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.

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

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

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

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

CAMPUS LIFE

PARKING AND TRANSPORTATION

PARKING AND TRANSPORTATION SERVICES

Parking and Transportation Services (PTS) is committed to helping the Uni-
versity community by offering a comprehen-
sive program of transportation services. PTS strongly encourages the
use of transportation alternatives, such as buses and bicycles, to preserve the
community environment and to improve air 
quality in Tucson. PTS also encourages
prospective students to contact its office 
 prior to enrollment so it can provide
assistance on transportation alternatives 
available to students. For information on
the following programs, write or call:

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

BICYCLES—Parking and Transportation 
encourages safe, courteous bicycling. Its 
programs are designed to emphasize safety and education. Designated bicycle 
parking areas are provided around resi-
dence halls and all other campus build-
ings. Additionally, paths are provided 
for bicyclists. Bicycle riding is prohibited 
on sidewalks and at other signed areas.
Free bicycle registration is available 
Monday through Friday (excluding Uni-
viersity holidays) at Parking and Trans-
portation Services. Registering a bicycle 
is a proven deterrent to theft by pro-
moting a means of identification. Registra-
tion also helps to identify lost or stolen 
bicycles and is necessary for some insur-
ance claims.

CITY BUSES—The bus pass program is 
designed to encourage public transit in-
stead of automobile usage. Parking and
Transportation Services offers special
discounted semester or annual bus
passes during the months of January
and August (some restrictions apply). If
the sales campaign has ended before
your arrival on campus, monthly and
twenty-rider bus passes are available
year round at several nearby outlets as
well as elsewhere in the city. Take ad-
vantage of this inexpensive and conve-
ient alternative to parking problems.

MOTORCYCLES/MOPEDS/MOTOR-
BIKES—Parking and Transportation
encourages you to use this mode of
transportation by providing convenient
parking locations around campus. Park-
ing permits are required.

MOTORIZED VEHICLES—Students are
permitted to bring motor vehicles to the
University but parking is not guar-
teed. Because campus parking permits
are limited, it is recommended that new
students apply for a permit as soon as
they have received notification of admis-
sion. Failure to do so may result in a
delay in obtaining a permit for campus
parking lots. (Preference in assignments
is given to continuing permit holders.
Remaining permits are issued to new
students and employees on a first come,
first served basis.) There are several categori-
es of parking permits offered on this
campus. Fees vary based on the level of
service.

PARKING PERMITS ARE REQUIRED YEAR
ROUND (including academic recess periods, be-
tween semesters and summer sessions)
from 7:00 a.m. to 5:00 p.m., Monday
through Friday, unless the lot is posted
otherwise. Parking and traffic limitations
may be imposed when campus parking
facilities are used for special events. On
these occasions notice is posted at
lot entrances and informational fliers
may be placed on vehicles in the affected
lot. (Example: Vehicles parked near
the football stadium on game days must be
relocated to perimeter lots on the west
side of the campus.)

Application materials may be picked up
at Parking and Transportation Services,
Permit Division.

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

SHUTTLE SERVICE FROM DESIGN-
ATED PARKING LOTS—The University
offers a free campus shuttle as a di-
rect link from many of the outlying
parking areas on to campus.

To obtain informational materials on any
of these programs, please send a
stamped, self-addressed envelope to
Parking and Transportation Services.

ELIGIBILITY FOR COCURRICULAR
ACTIVITIES

Cocurricular activities relate directly to
and encompass membership in
university-recognized student organiza-
tions and groups, professional honor-
aries, coordinating councils, service
groups, and special events and projects.
Intercollegiate athletics for men and
women (NCAA and PAC-10) are gov-
erned by their own standards of eligi-
bility for participation.

UNIT REQUIREMENT—Any under-
graduate student who is currently en-
rolled in the University, may participate
in these activities. However, where spec-
ified in these activities, a student may be
required to meet additional qualifica-
tions and criteria for membership or par-
ticipation.

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 cumulative grade point aver-
age of 2.0. Graduate students, work car-
ried for graduate credit only, cumulative
3.0. To participate in cocurricular ac-
tivities, 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 mini-
num of 7 units the previous semester.
Graduate students must be enrolled in
the University for a minimum of 3 units
throughout their term of office, and
must have successfully completed 3
units the previous semester to continue
in office from one semester to the next.

For the purposes of this paragraph,
satisfactory completion in the case of a
course taken for undergraduate credit
requires the earning of A, B, C, D, S, or
P. Monitoring of academic eligibility of
presidents is coordinated by the Dean of
Students Office; each president is re-
sponsible for monitoring eligibility of
other organization officers.

Exclusions 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 Presi-
dent for Student Affairs. More specific
details regarding eligibility are found in
the Student Handbook.

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

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

Scholarships awarded to properly qualified students who participate in athletics are administered by a committee of the Office of Student Financial Aid under standards applying to all such awards. All funds for the support of the athletic program, regardless of source, are 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 (ASUA). The purpose is to enable students to assume the privileges and responsibilities of self-government. Governing authority of ASUA is vested in the elected officials (the Executive officers and the senate) and the ASUA Supreme Court. ASUA provides a number of services to the student body through such programs as Legal Services, Helpline, Escort Service, and Academic Services. The Associated Students also strives to incorporate traditionally underrepresented groups through its constituency based services that include the Minority Action Council, Graduate Student Association, International Student Association, and the Bisexual, Gay and Lesbian Association. Additionally, the Appropriations Board provides financial support for university clubs and organizations. As part of its role of serving students, ASUA organizes a number of activities throughout the year by a variety of ASUA programs including Concerts, Speaker's Board, and Spring Fling.

ASUA also acts to improve the lives of students and the quality of education on the parochial, local, state, and national levels. This is done through the advocacy positions within ASUA. These positions include the University Budget Review Committee, Arizona Students' Association, Federal Relations and the National Representatives Office.

Furthermore, the ASUA president, with the confirmation of the ASUA Senate, appoints students to many different university organizations such as Cultural Events, Faculty Senate, Parking and Transportation and Student Publications.

ASUA encourages all students to get involved in any of its programs, services, or activities.

Office of Student Activities and Organizations

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

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

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

Fraternities and Sororities

Fraternity and sorority membership offers 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. It is an experience in living together and sharing maintenance, self-government, and personal relations in a community that profits socially and intellectually. 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 commitment to organized activities such as social fraternities and sororities. These groups are considered university-recognized student organizations and, therefore, are subject to policies and regulations set by the University for recognized clubs and organizations.

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

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

Honor Societies, Professional and Other Organizations

SCHOLASTIC HONOR SOCIETIES

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

PROFESSIONAL ORGANIZATIONS

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

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

STUDENT LEADERSHIP AND SERVICE SOCIETIES
Arizona Allegiance
Arizona Ambassadors
Blue Key - Seniors
Bobcats - Seniors
Chain Gang - Juniors
Chimes - Juniors
Circle K Club
Hosts and Hostesses
Mortar Board - Seniors
Optimi
Order of Omega - Fraternity/Sorority
members
Phi Lambda Phrateres
Preludes - Freshman
Primus - Freshman
Sophos - Sophomores
Spites - Sophomores
Student Alumni Association
Wranglers - Undergraduates

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

Special Cultural Opportunities
UNIVERSITY ARTIST SERIES—The University of Arizona Artist Series has become the pacesetter for diversified programs in music, dance, and theatre with outstanding national and international artists and companies. The programs provide a unique opportunity for the entire student body to experience world-class performing arts events and to learn more about these art forms. These programs, presented by the Office of Cultural Affairs, also serve as a cultural outreach to the Tucson community and surrounding area, often providing master classes and open rehearsals, lectures and workshops in addition to the performances.

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

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

ARIZONA STATE MUSEUM—Open to students and the public. Prehistoric and recent Indian cultures of Arizona and the Southwest are interpreted through permanent exhibitions. Special temporary 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 27,000 items, has an extensive collection of literary magazines and poetry readings on tape, and is available daily for use by students, faculty and the community. The collection includes poetry of all ages and various nations, with emphasis on contemporary poetry in English. It also includes books about poetry and poets. The Poetry Center regularly sponsors campus readings by nationally known poets and writers.

THEATRE ARTS SERIES—The University’s nationally recognized Department of Theatre Arts offers outstanding theatre productions through its Theatre Series as an extension of its professional theatre training programs in acting, design/technology and dramatic writing. Each year the Theatre Series presents an eclectic season of seven to eight de-
manding plays selected from classical, contemporary and musical theatre repertoires, and new plays. Productions are held in the Peter Marroney Theatre in the Drama Building, and the newly constructed Laboratory Theatre in the Fine Arts Complex. Tickets are offered to students and faculty/staff at a significant discount. The department's professional company, UA Resident Theatre, presents a season of plays in the summer months.

Theatre Arts also produces a series of workshop productions, including the new play development series, the Playwrights Project, and a new series, the Directors Project, in the Sixth Street Theatre which are free to the public. The department serves the greater Tucson community and schools through the outreach efforts of its educational and entertainment touring productions, The Entertainers, Encore, and Touring Shakespeare, and occasional Adventure Matinees.

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 Holsclaw Hall and Crowder Hall. Selected concerts by guest artists and opera productions by the School of Music's Opera Theatre are offered at a nominal cost to all students and faculty.

Through special arrangements with the University, the following organizations offer programs of interest to faculty and students periodically throughout the year:

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

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

Campus Recreation

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

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

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

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

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

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

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

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

Intercollegiate Athletics

The Intercollegiate Athletics Department 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. In the USA Today June 1992 competitive analysis, The University of Arizona was ranked 3rd nationally in overall strength of its men's and women's programs.

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

The President of the University appoints an advisory committee on intercollegiate athletics, which consists of the Director of Athletics, the faculty representative to the NCAA, members of the faculty, alumni members, and students.
COLLEGES AND GENERAL DIVISIONS

The College of Agriculture building as it looked from 1918-1920.
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 agribusiness, government, public service agencies, retail and service industries, human health institutions, the food service and processing industry, financial institutions, youth development agencies, conservation and environmental organizations, farming and ranching, research, extension, communications and education. A broad education in a professional knowledge area is combined with foundation courses in the natural and social sciences, communications and the humanities to develop a well-rounded academic experience.

College responsibilities include instruction, research and extension. The academic units of the college include ten departments and two schools. The departments are Agricultural and Resource Economics, Agricultural Education, Agricultural and Biosystems Engineering, Animal Sciences, Entomology, Nutrition and Food Science, Plant Pathology, Plant Sciences, Soil and Water Science, and Veterinary Science. The School of Renewable Natural Resources is organized into four programs: Watershed Resources, Landscape Resources, Range Resources, and Wildlife and Fisheries Resources. The School of Family and Consumer Resources is organized into the divisions of Family Studies and Merchandising and Consumer Studies, and the program areas of Counseling and Guidance. The college administers the undergraduate program in microbiology under the curriculum guidance of a multi-disciplinary faculty committee. The college also participates in the management of the university departments of Biochemistry, and Molecular and Cellular Biology where several college faculty hold joint appointments.

DEGREES

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

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

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

UNDERGRADUATE MAJORS

<table>
<thead>
<tr>
<th>Agricultural and Resource Economics</th>
<th>Agricultural Technology Management</th>
</tr>
</thead>
<tbody>
<tr>
<td>Landscape Architecture</td>
<td>Microbiology</td>
</tr>
<tr>
<td>Merchandising &amp; Consumer Studies</td>
<td>Nutritional Sciences</td>
</tr>
</tbody>
</table>

Animal Sciences
Biochemistry
Environmental Sciences
Family and Consumer Resources
Family Studies
Home Economics
Education

Plant Sciences
Range Management
Soil & Water Science
Veterinary Science
Watershed Management
Wildlife & Fisheries
Science

UNDERGRADUATE MINORS

Minor programs of study are available for interested undergraduates. Completion of a minor is not required for graduation in the College of Agriculture. A minimum of 20 units of course work must be completed with a grade point average of 2.00 or better to successfully complete a minor. A minimum of 12 units must be upper-division course work. Twelve credit hours of course work must be University credit.

The list of approved minors in the College of Agriculture are:

Agricultural and Resource Economics
Nutritional Sciences
Plant Sciences
Animal Sciences
Range Management
Entomology
Soil & Water Science
Family Studies
Watershed Management
Microbiology
Wildlife & Fisheries Science

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

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

Course requirements for business and public administration minors are:

**GENERAL BUSINESS ADMINISTRATION**—ACCT 200, 210; MIS 111; 12 units from the following: STAT 275, MAP 305, 320, ECON 300, 330, FIN 311, MKTG 361.

**FINANCE**—ACCT 200, 210; FIN 311; ECON 330; 9 units from the following: FIN 412, 421, 431; ECON 442.

**MARKETING**—ACCT 200; MKTG 361; 15 units from the following: MKTG 370, 450, 454, 455, 456, 458, 470.

**HUMAN RESOURCES MANAGEMENT**—ACCT 200; STAT 275; MAP 330; 12 units from the following: MAP 305, 430, 432, 480; SOC 326; PSYC 385; COMM 412.

**PUBLIC MANAGEMENT**—ACCT 200, 272; STAT 275; MAP 305; 9 units from the following: MAP 330, 432, 480; PA 405, 410.

Consult the appropriate school or department listings in this catalog for additional information about minors.
SPECIAL UNDERGRADUATE ACADEMIC PROGRAMS

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

Agricultural Technology Management
This study area is designed to prepare students to become skilled in the many aspects of agricultural technology, environmental protection, communication, business and economics. Graduates will be prepared for positions in small to large-scale operations where 1) an understanding of environmental complexities, 2) an ability to communicate, and 3) technical competence are important. Employment opportunities include: production/management/sales positions, certified plant/animal protection specialists, and many agricultural service-oriented positions. For details, consult the Department of Agricultural Education.

Biochemistry
The College of Agriculture offers a major in biochemistry in conjunction with the Department of Biochemistry. This program provides undergraduates the fundamentals to study the molecular principles in the agricultural sciences, biology, and the environmental sciences. The major provides an excellent scientific background for graduate study in biochemistry, plant science, animal science, veterinary science, pathobiology, plant pathology, entomology, soil and water science, and the environmental sciences. (For further details, consult the Department of Biochemistry.)

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

Microbiology
The undergraduate program in microbiology is administered by the College of Agriculture under the guidance of a faculty advisory committee representing the fields of plant pathology, soil and water science, plant sciences, molecular and cellular biology, veterinary science, and civil engineering. Students may select a plan of study that leads to a Bachelor of Science in Agriculture degree (College of Agriculture) or a Bachelor of Science degree (Faculty of Science, College of Arts and Sciences). The microbiology program offers undergraduates a core curriculum complemented by specialty areas such as the applied sciences in agricultural, biotechnology, allied health, and medicine. (For further details, consult Microbiology: Undergraduate Program.)

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

GENERAL CURRICULUM

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

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

GROUP
UNITS

I. Basic Skills and Proficiencies
A. First-Year Composition ........................................... 6-9
B. Communication 1 .................................................. 6
C. Mathematics .......................................................... 3
D. Computer Skills 1 .................................................... 3
Upper-Division Writing-Proficiency Examination 2 ............... 18-21
II. Study Areas 3
A. Western Civilization 1 ............................................... 6-9
B. Biological and Life Sciences 3, 4 ................................ 8
C. Physical and Environmental Sciences 1 ......................... 8
D. Individuals, Societies and Institutions 1 ....................... 6-9
E. Non-Western Civilization 1 .......................................... 3
F. Arts, Literature and Language 1 ................................... 6
(Minimum) 32

III. Major 5 ..................................................................... 16-53

IV. Electives and/or Minor .................................................. 21-64

1 Approved courses listed on the Curriculum Guidelines. 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. Activities include projects in Cape Verde, Brazil, Morocco, Mexico, Senegal, Lesotho, Mauritania, and Egypt. Interaction with Peace Corps, the Agency for International Development, and the U.S. State Department through the Office of International Programs provides unique opportunities for student and faculty evaluation of world resource problems.


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

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

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

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

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

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

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

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

SCHOOL OF FAMILY AND CONSUMER RESOURCES

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

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

The school is organized into the division of Family Studies and Merchandising and Consumer Studies, and the program areas of Interior Design and Counseling and Guidance. Interior Design is being phased out. No new majors are being accepted. Faculty and some element of the interior design
program have been transferred to Architecture. Students interested in the area should contact the College of Architecture.

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

Students enrolled in majors in the School of Family and Consumer Resources may elect to choose a minor subject area with the approval of the student’s advisor. For information on minors in the College of Business and Public Administration, see “Undergraduate Minors” elsewhere in the College of Agriculture section.

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

General Requirements
Bachelor of Science in Family and Consumer Resources

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Basic Skills and Proficiencies¹</td>
<td>6-9</td>
</tr>
<tr>
<td>First-Year 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>
<td></td>
</tr>
<tr>
<td>II. Study Areas (Complete five study areas.)³</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>
</tr>
<tr>
<td>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.
³The mathematics or statistics requirement may be fulfilled by STAT 160, 263, 275, or by any mathematics department course except 101, 116, 202, or 405. MATH 101, 116, 202, or 405 may be listed in Group IV.

Family and Consumer Resources Organizations
Family and Consumer Resources student organizations are The University of Arizona Student Chapter of The American Society of Interior Designers; Fashion Dimensions Club; Arizona Association of Marriage and Family Therapists; and Kappa Omicron Nu.

SCHOOL OF RENEWABLE NATURAL RESOURCES

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

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

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

Specific requirements for the various curricula appear with the majors listed under Renewable Natural Resources (see Departments and Courses of Instruction section).

General Requirements
Bachelor of Science in Renewable Natural Resources and Bachelor of Landscape Architecture

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UNITS</th>
<th>B.S. in R.N.R</th>
<th>UNITS</th>
<th>B.L.A.</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Basic Skills and Proficiencies¹</td>
<td>6-9</td>
<td>6-9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-Year Composition</td>
<td>6-9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMM 100, 102</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>COMM Elective (oral or writ. Engl.)</td>
<td>3</td>
<td>3</td>
<td></td>
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</tr>
<tr>
<td>Mathematics or Statistics²</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Computer Science Elective³</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper-division writing-proficiency examination⁴</td>
<td></td>
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<tr>
<td>II. Study Areas (Complete five of six areas.)⁵</td>
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<tr>
<td>Western Civilization</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biological and Life Sciences (incl. lab)</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical and Environmental Sciences</td>
<td>8</td>
<td>8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Individuals, Societies and Institutions</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Western Civilization</td>
<td>3</td>
<td>3</td>
<td></td>
<td></td>
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<tr>
<td>Arts, Literature and Language</td>
<td>6</td>
<td>6</td>
<td></td>
<td></td>
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<tr>
<td>III. Major and College</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major &amp; RNR subjects</td>
<td>42</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SW 200, 201</td>
<td>4</td>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Electives⁶</td>
<td>3</td>
<td>15</td>
<td></td>
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</tr>
<tr>
<td>IV. Electives—At least 9 units must be outside the College of Agriculture.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Total Required for Graduation</td>
<td>130</td>
<td>155</td>
<td></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 160, 263, 275, or by any mathematics department course except 101, 116, 202, or 405. MATH 101, 116, 202, or 405 may be listed in Group IV.
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, ECON 201a, and 6 units of biological or physical science as part of the Study Areas. B.L.A. students must complete a minimum of 4 units of chemistry, 3 units of ecology or molecular and cellular biology, ECON 201a, 3 units of biological or physical science, and 2 additional units of mathematics as part of the Study Areas.
⁶Must be from any program of RNR or FCR or from any department in the College of Agriculture.
Honors Information
The school encourages outstanding students to participate in the University-wide Honors Program.

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

Active student chapters of the Society for Range Management, the Wildlife Society, the American Fisheries Society, and the American Society of Landscape Architects are available to students in the school. The Natural Resource Student Association is an organization open to graduate and undergraduate students with an interest in natural resources. This group is active in many activities associated with the school's programs.
Architecture
Architecture is the art and science of building. As a meeting place of the arts and sciences, it is innately interdisciplinary and has continuing vitality as a field of study or a life career. Students of architecture investigate both the broad relationships between human and natural forces and the relationships between materials and technologies required to realize architecture as built form. The college program is organized with the design studio as the element of focus.

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

Most states require that an individual intending to become an architect hold an accredited degree. There are two types of degrees that are accredited by the National Architectural Accrediting Board (NAAB): (1) The Bachelor of Architecture, which requires a minimum of five years of study, and (2) The Master of Architecture, which requires a minimum of three years of study following an unrelated bachelor's degree or two years following a related preprofessional bachelor's degree. These professional degrees are structured to educate those who aspire to registration/licensure as architects.

The four-year, preprofessional degree, where offered, is not accredited by NAAB. The preprofessional degree is useful for those wishing a foundation in the field of architecture, as preparation for either continued education in a professional degree program or for employment options in architecturally related areas.

The College of Architecture has an NAAB accredited five-year program.

**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. Fourth- and fifth-year design studio options are offered in desert architecture, preservation, community design, computer-aided design, building design, entrepreneurial architecture, design competitions, and energy-conscious design. Offerings are limited by faculty availability and vary each year. New options may be introduced.

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

**REQUIREMENTS**

**Admissions**

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

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

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, have submitted an "architect" of creative work, and have filed an application with the college.

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

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

TRANSFER STUDENTS—Applicants who are applying for transfer from other colleges or universities must present the same high school units as required for admission to the preprofessional year and also must meet the general university and college admission requirements as stated in this catalog. Exception 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 Office of Admissions. 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 apply to the Office of Admissions and New Student Enrollment. Applications received by November 1 receive priority service. April 1 is the deadline for out-of-state freshman applicants. Students seeking advanced placement or admission to the professional phase should also correspond directly with the college for additional deadlines, information and applications.

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

**Preprofessional Year Required Curriculum (Recommended Sequence)**

<table>
<thead>
<tr>
<th>FIRST YEAR</th>
<th>Subject</th>
<th>Units</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td><strong>ENGL 101</strong></td>
<td>3</td>
<td><strong>ENGL 102</strong></td>
<td>3</td>
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<tr>
<td></td>
<td><strong>MATH 117/R5</strong></td>
<td>3</td>
<td><strong>PHYS 102a</strong></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>MATH 118</strong></td>
<td>2</td>
<td><strong>PHYS 108a</strong></td>
<td>1</td>
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<tr>
<td></td>
<td><strong>ARCH 118 or 112</strong></td>
<td>3 or 2</td>
<td><strong>ARCH 112 or 118</strong></td>
<td>2 or 3</td>
</tr>
<tr>
<td></td>
<td><strong>Elective</strong> or <strong>ARCH 114</strong></td>
<td>3</td>
<td><strong>ARCH 114 or Elective</strong></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>14 or 13</strong></td>
<td><strong>Elective</strong></td>
<td><strong>3</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
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### FIRST YEAR

<table>
<thead>
<tr>
<th>Subject</th>
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<th>Subject</th>
<th>Units</th>
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<tr>
<td><strong>ARCH 201</strong></td>
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<td><strong>ARCH 202</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>ARCH 212</strong></td>
<td>3</td>
<td><strong>ARCH 223</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>ARCH 226</strong></td>
<td>2</td>
<td><strong>ARCH 270</strong></td>
<td>2</td>
</tr>
<tr>
<td><strong>ARCH 235</strong></td>
<td>3</td>
<td><strong>ARCH 236</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Elective</strong> or <strong>ARCH 270</strong></td>
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<td><strong>ARCH 270 or Elective</strong></td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>Total</strong></td>
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### THIRD YEAR

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<tr>
<th>Subject</th>
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<td><strong>ARCH 301</strong></td>
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<td><strong>ARCH 302</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>ARCH 318</strong></td>
<td>3</td>
<td><strong>ARCH 328</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>ARCH 336</strong></td>
<td>3</td>
<td><strong>ARCH 335</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>ARCH 324</strong></td>
<td>4</td>
<td><strong>ARCH 334</strong></td>
<td>4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16</strong></td>
<td><strong>Total</strong></td>
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</table>

### FOURTH YEAR

<table>
<thead>
<tr>
<th>Subject</th>
<th>Units</th>
<th>Subject</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ARCH 401</strong></td>
<td>6</td>
<td><strong>ARCH 402</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>ARCH 418</strong></td>
<td>3</td>
<td><strong>ARCH 428</strong></td>
<td>3</td>
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<tr>
<td><strong>ARCH 439</strong></td>
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<td><strong>Elective</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Arch Hist. Option</strong></td>
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<td><strong>Arch Hist. Option</strong></td>
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<tr>
<td><strong>Elective</strong></td>
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<td><strong>Elective</strong></td>
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</tr>
<tr>
<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
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### FIFTH YEAR

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<th>Units</th>
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<th>Units</th>
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</thead>
<tbody>
<tr>
<td><strong>ARCH 451</strong></td>
<td>6</td>
<td><strong>ARCH 452</strong></td>
<td>6</td>
</tr>
<tr>
<td><strong>ARCH 459</strong></td>
<td>3</td>
<td><strong>Elective</strong></td>
<td>3</td>
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<tr>
<td><strong>ARCH 484</strong></td>
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<td><strong>Elective</strong></td>
<td>2</td>
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<tr>
<td><strong>Elective</strong></td>
<td>3</td>
<td><strong>Elective</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Elective</strong></td>
<td>3</td>
<td><strong>Elective</strong></td>
<td>3</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>17</strong></td>
<td><strong>Total</strong></td>
<td><strong>18</strong></td>
</tr>
</tbody>
</table>

1. One 3-unit calculus course may be used to meet the algebra and trigonometry requirement. High school courses may not be used to meet the math requirement except AP calculus with college credit.
2. Electives are not required for admission to the Professional Phase.
3. Course may be taken in another year but must be completed prior to entrance to the fifth year.
4. A total of 36 units of electives are required and must be selected from the following: (Fine Arts, Humanities, Science, Business) plus open and architecture electives. Refer to the Elective Group List, available from the college, for guidance.
5. Architectural History Options include the following: ARCH 404, 414, 424, 434, 464.

### RESOURCES AND ACTIVITIES

**Facilities**

The activities of the college are housed in the Architecture Building, which was constructed in 1966 and expanded in 1970 and 1978. It is a three-story facility that houses the majority of the design studios, classrooms and seminar rooms, a large and completely equipped audio-visual lecture hall, model shop, faculty offices, exhibition areas, archives and the college library. The library has an extensive collection of books and periodicals about architecture and related environmental design fields. An important and active part of this resource is the 35mm slide collection covering the historical and contemporary architecture of the world.
Accreditation and Affiliations
The program is fully accredited by the National Architectural Accrediting Board. The Bachelor of Architecture degree is recognized and accepted by licensing agencies as the first professional degree leading to architectural licensing as recommended by the National Council of Architectural Registration Boards. The College of Architecture is affiliated with the Association of Collegiate Schools of Architecture and recognizes a student chapter of the American Institute of Architecture Students. There is a regular liaison with the Southern Arizona Chapter of the American Institute of Architects and the Arizona Society of Architects, both of which lend support to the college.

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

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

Awards and Honors
Outstanding student accomplishments are recognized each year through the presentation of a number of awards, including the Outstanding Graduating Senior Award, the National School Medal of the American Institute of Architects, the Henry Adams Fund Award, the National 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.

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.
The Douglas Building — home to the dean of Social and Behavioral Sciences and three other SBS units, located in the heart of the campus historic district.
The College of Arts and Sciences is the most comprehensive academic unit in the University of Arizona, comprising 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 is administered by a dean. The administrative structure of the college includes the four deans of the faculties, the vice provost of the college, and an associate and an assistant dean of the college. The associate dean and assistant dean of the college oversee curriculum and advising in the Faculties of Humanities, Science, and Social and Behavioral Science. The Faculty of Fine Arts has its own curriculum and advising structure.

FACULTY OF FINE ARTS
Music Building, Room 111L
(602) 621-1301

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.

SCHOOL: School of Music
DEPARTMENTS: Art, Media Arts, Theatre Arts
COMMITTEE: Committee on Dance

MAJORS AND DEGREES:
- Art Education (B.F.A.)
- Art History (B.A. in Art)
- Composition (B.M.)
- Dance (B.F.A.)
- 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.)
- Musical Theatre (B.F.A.)
- Performance (B.M.)
- Studio Art (B.F.A.)
- Theatre Arts (B.A. in Theatre Arts)
- Theatre Arts Education (B.F.A.)
- Theatre Production (B.F.A.)

HONOR SOCIETIES, PROFESSIONAL AND HONORARY ASSOCIATIONS:
- American Guild of Organists—Student Chapter
- American Musicological 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
- Tau Beta Sigma—Band Fraternity for Women
- Theta Alpha Phi—Honorary Fraternity for Theatre Arts

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

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

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

COMMITTEES: Religious Studies, Critical Languages, Humanities

GRADUATE COLLEGE INTERDISCIPLINARY COMMITTEES:
- Comparative Cultural and Literary Studies, Second Language Acquisition and Teaching

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

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

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

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

DEPARTMENTS: Astronomy, Atmospheric Sciences, Biochemistry, Chemistry, Computer Science, Ecology and Evolutionary Biology, Geosciences, Mathematics, 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.)
Molecular and Cellular Biology (B.S.)
Physics (B.S.)
Speech and Hearing Sciences (B.S. in Speech and Hearing Sciences)

HONOR SOCIETIES, PROFESSIONAL AND HONORARY ASSOCIATIONS:
Alpha Chi Sigma—Chemistry
American Geophysical Union—Atmospheric Sciences
American Meteorological Society—Atmospheric Sciences
National Student Speech-Language-Hearing Association—Speech and Hearing Sciences
Phi 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
Douglass Building, Room 200W
(602) 621-1112

The study of human beings, individually and in social groups, unites the departments and programs of the Faculty of Social and Behavioral Sciences. The departments and programs provide both disciplinary degrees and majors and minors in a number of interdisciplinary areas. 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.

SCHOOL: Graduate Library School

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

COMMITTEES: African American Studies*, American Indian Studies*, Judaic Studies, Russian and Soviet Studies, Women's Studies

*Only a minor is available.

GRADUATE COLLEGE INTERDISCIPLINARY COMMITTEES: Cognitive Science, Latin American 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.)
Judaic Studies (B.A.)
Latin American Studies (B.A.)
Linguistics (B.A.)
Mexican American Studies (B.A.)
Near Eastern 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.)

* 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.

HONOR SOCIETIES, PROFESSIONAL AND HONORARY ASSOCIATIONS:
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

THE COLLEGE

Office of the Vice Provost for Arts and Sciences
Administration Building 501
(602) 621-3318
The Office of the Vice Provost for Arts and Sciences oversees and coordinates the Faculties of Fine Arts, Humanities, Science, and Social and Behavioral Sciences and provides leadership for the college’s direction and development.

Office of the Associate Dean
Nugent 210
(602) 621-8257
The Office of the Associate Dean is the administrative unit charged with developing and overseeing the college’s undergraduate curriculum for Bachelor of Arts and Bachelor of Science degrees. As such, this office coordinates and supports those activities of the College Curriculum Review Committee and the College General Education Committee. An important component of the undergraduate curriculum is the general education program, encompassing six areas of learning that ensure breadth of undergraduate study. (See Degrees and Degree Requirements section below.) The office also handles grade appeals for the Faculties of Humanities, Science, and Social and Behavioral Sciences.

Office of Academic Services
Modern Languages Building, Room 347
(602) 621-3336
The Office of Academic Services (OAS) is administered by the assistant dean. It provides academic advising for students in the College of Arts and Sciences, Faculties of Humanities, Science, and Social and Behavioral Sciences. In addition, the OAS serves all students in the university who wish to explore majors offered by the college and those interested in the professions of law and medicine. The professional advising staff includes six full-time advisors, one part-time advisor, several adjunct advisors, the director of the Advising Center for Exploratory Students (ACES), the coordinator of advising, and the assistant dean for the College of Arts and Sciences.

The OAS serves:
* Incoming freshmen
* Incoming transfer students
* Continuing students
* Prospective students
* Undecided and undeclared students
* Students with majors in the Faculties of Humanities, Science, and Social and Behavioral Sciences

The OAS provides advising concerning:
* Colleges of Arts and Sciences General Education Program
* Interdisciplinary Studies Major
* University graduation requirements
* University and college policies and procedures
* Preprofessional programs: prelaw and prehealth

* Admission deficiencies
* Readmission to the college
* Transfer courses that apply toward the General Education Program
* Choice of major and minor
* Academic Probation and Disqualification

Other Services
* Information sessions for prospective students
* New student orientations
* Minority student academic support programs
* Academic probation workshops
* Community college visits
* Referrals to other campus and community resources
* Training for faculty advisors who provide information on majors, minors, career options and graduate programs in their disciplines

Office Hours
* 7:00 am-7:00 pm, Monday-Thursday
* 7:00 am-6:00 pm, Fridays

Advising Appointments
* Same-day appointments are made on a first-come, first-served basis, 9:00 am-4:00 pm.
* Advance appointments may be made by phone for early (8:00-8:30 am) or late (4:30-6:30) times.

Quick Advising
* An advisor is available to answer quick questions on a walk-in basis, 9:00 am-3:00 pm.
* For students who are unable to come to campus, an advisor is available to answer quick questions over the phone from 3:30-5:00 pm.

SPECIAL PROGRAMS AVAILABLE THROUGH THE COLLEGE OF ARTS & SCIENCES

3/2 Program
This is a cooperative academic plan developed by the College of Arts and Sciences and the College of Business, and approved by the Graduate College.

The 3/2 Program offers highly qualified Arts and Sciences students the opportunity to earn both an undergraduate and Master of Business Administration degree in 5 years. The student first completes 3 years of coursework, meeting general education requirements, selected pre-requisite courses, and the requirements of the major field of study. The Graduate Management Admissions Test (GMAT) is taken, and application to the 3/2 Program is made during the second semester of the junior year. Qualified students are accepted for the senior year with continued study in 30 units of designated MBA courses. The 30 MBA units are used within the undergraduate degree program as the minor, as elective units, or as excess units. Upon completion of all degree requirements, the baccalaureate degree is awarded. Admission to the Graduate College to complete the MBA is based upon compliance with Graduate College requirements and procedures, and a minimum grade-point average of 3.00 in the 30 units of completed MBA classes.

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

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

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

In recent years, from 60 to 70 percent of the UA graduates who applied to law school have been accepted.

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 assists students in their individual exploration of self, prospective majors, and possible careers. ACES is designed to guide students to various campus resources that will offer them skills assessment, academic and career information, and needed support in their endeavor to choose a major.

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 a peer advisor, an academic advisor, or a faculty advisor; it is ongoing, multifaceted, and the responsibility of both student and advisor.

MAJOR AND CAREER EXPLORATION—ACES helps students explore their own interests, skills, and abilities, and 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 freshman year. Major and career 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 personality, interests, and lifestyle requirements: a choice that is translatable into clearly defined career goals.

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 the student, 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.

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, Greek houses, and the minority student centers. Peer advisors are available in the ACES office. Students are welcome to drop in and meet with a peer advisor 5 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) 621-7763

Prehealth Program

The Prehealth Professions Program assists students from all colleges of the university who are interested in the fields of medicine, dentistry, optometry, and podiatry. Services are available for all students, from entering freshmen to seniors, including graduate students and returning students who have a degree and are completing professional program admission requirements.

Premedicine is not a formal major. While most premeds major in the sciences, particularly biochemistry or molecular and cellular biology, a science major is not a prerequisite for admission to medical school. Students are encouraged to major in any area of interest, as medical schools are seeking applicants with a broad liberal arts background. Non-science majors, however, are advised to minor in a science as the nine upper division science units, when added to the core prerequisites, will better prepare them for medical school.

All U.S. medical, dental, osteopathy, and podiatry schools require for admission: 1 year of general biology (MCB 181-182); 1 year of general chemistry (CHEM 103a/b and 104a/b); 1 year of organic chemistry (CHEM 241a/b and 243a/b); 1 year of physics (PHYS 102a/b or 104a/b and 180a/b or PHYS 110 and 116). A few of these schools also require a semester of calculus (MATH 124 or 125a). Schools of optometry have several additional requirements. Information is available in the Prehealth Professions Office, Modern Languages Building, Room 347.
When evaluating an applicant, health professions schools seriously consider the cumulative grade-point average. The average GPA of UA graduates accepted to medical school is 3.5; to dental and optometry schools, 3.2; and to podiatry schools it is 3.0. Overall trends, such as a rising GPA after a poor freshman year, are taken into consideration.

A second major factor in selection is the score acquired on the Medical College Admission Test (MCAT), Dental Admission Test (DAT), or the Optometry Admission Test (OAT). These exams are taken in spring of the junior year or in the fall of the senior year.

Clinical experience, letters of recommendation, community service, extracurricular activities, and interviews are also factors in the selection process.

The prehealth professional advisor is available by appointment. In addition, general information meetings are held each semester for freshmen and sophomores so that they can be apprised of what they should be doing. In November, a registration meeting is held for all juniors interested in the health professions. Following this meeting, registered students are notified about a series of seminars, approximately one per month, on various professional application issues. Students are assisted in such issues as writing their personal statements, preparing for interviews, and filling out the application forms. The Prehealth Professions Committee, composed of University faculty, staff, and administrators, interviews each applicant and writes a composite recommendation which, in conjunction with individual letters solicited by the student, form the student’s recommendation file. These recommendations are sent to the schools when requested by the student.

The prehealth professions advisor is assisted by a team of peer advisors. They are seniors currently applying to health professions schools, and are available to all students daily on a walk-in basis.

Underrepresented minority students, including Native Americans, Hispanics, and African Americans, are actively recruited by health professions schools. The Minority Premed Club and the Minority Recruitment Project, sponsored by the College of Medicine, are available, in addition to the Prehealth Professions Office, to encourage minority applicants.

### DEGREES AND DEGREE REQUIREMENTS

#### Undergraduate Degrees

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

The Interdisciplinary Studies major for the Bachelor of Arts degree and the General Fine Arts Studies degree for the Bachelor of Fine Arts degree are described later in this section.

#### Graduate Degrees

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

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

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

1. 125 units.
2. The general education requirements.
3. The requirements of at least one major and a minor (see interdisciplinary studies major for its requirements).
4. 30 units of University credit (for definition of University credit see the Academic Policies and Graduation Requirements 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 Academic Policies and Graduation Requirements section of this catalog).

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

The Department of English offers majors in English and creative writing, allowing a student to major or minor in one department. For details see an advisor in the English Department.

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

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

Requirements for the B.F.A. include:

1. 125 units.
2. The general education requirements.
3. The requirements of at least one major and a minor.
4. 30 units of University credit (for definition of University credit see the Academic Policies and Graduation Requirements section of this catalog) including 18 of the last 30 units offered toward the degree.
5. 15 units of University credit in the major.
6. 2.000 grade-point average in the major and for all University credit course work.
7. 42 upper-division units.
8. Upper-division Writing Proficiency Examination.
9. A junior or senior level “Writing-Emphasis Course” (see Academic Policies and Graduation Requirements section).
10. All other college and University requirements for graduation. (For explanation of University graduation requirements, see the Academic Policies and Graduation Requirements section of this catalog).

Requirements for the B.M. include:

1. 125 to 132 units, depending on emphasis area chosen by the student.
2. The general education requirements.
3. Courses to complete the major.
4. 30 units of University credit (for definition see the Academic Policies and Graduation Requirements section of this catalog), including 16 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 Academic Policies and Graduation Requirements section of this catalog.)

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

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

THE MAJOR FOR FINE ARTS—The Faculty of Fine Arts requires students to declare a degree program at the time of application for admission to the University or upon entrance into the Faculty. Students can file a change in major at any time upon approval of the Office of the Dean. Students choose a major advisor in the selected department upon declaring a major. For general fine arts studies, advising is provided in the Music Building, Room 111L.

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, media arts, music, and theatre arts.

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

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

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

Some departments permit a split minor (a minimum of 8 units in one department and 12 units in another department) or a thematic minor. The thematic minor is developed around a theme identified by the student, using courses from three 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 nine units of upper-division University credit (except for a Japanese language minor, when the student is not using the language to satisfy the second language requirement in general education. See the Department of East Asian Studies for information.) Excluded from the minor: freshman composition, courses below Math 124, military aerospace studies, military or naval science, activity courses in exercise and sports science, and first year courses in foreign language and American Sign Language that are also used to satisfy the second language requirement in general education. Reminder: a maximum of 10 units of general education coursework can be used to fulfill all other graduation requirements (i.e., major, minor, IDS subject areas).

THE MINOR FOR FINE ARTS—The minor complements the major area of study and is an essential component of the bachelor of arts 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:

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

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

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

The General Education Program for B.A. and B.S. students in the College of Arts and Sciences is designed to afford students the opportunity to learn how different disciplines define, acquire, and organize knowledge; this is accomplished by the program's breadth, involving courses ranging from physics to poetry. The program is intended as well to enhance understanding of the reciprocal influences of Western and non-Western cultures; the tradition and cultures requirement lies at the heart of general education. In addition, the general education courses are meant to develop analytic, synthetic, linguistic, and computational skills useful for lifelong learning; this is the motivation behind the proficiency segment of the program. Finally, the program is constructed 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 self so students will be able to respond more fully and effectively to an increasingly complex world.

The following information, under the title Booklink, is available for purchase in the ASUA Bookstore. An addendum to Booklink, which lists courses approved after the catalog is printed, is included in Booklink or is independently available in the Office of Academic Services. Booklink is also supplemented by Booklink Supplement, which provides a detailed description of all general education courses, and by a newsletter produced every semester that lists the courses offered that semester. Booklink Supplement can be purchased at the ASUA Bookstore; the newsletter is free and can be picked up in the Office of Academic Services.

The requirements consist of two parts. You must: (1) demonstrate basic proficiency in English composition, mathematics, and a second language; and (2) complete course requirements in four study areas - Traditions and Cultures; Biological and Physical Sciences; Individuals, Societies, and Institutions; and Arts and Literature.

In addition, please note:

- A course satisfying a General Education requirement must be taken for a grade.
- Any course accepted for General Education, including SER 370a-b and 431a-b, counts towards the minimum 90 units required in the College of Arts and Sciences for all B.A. or B.S. students in the college.
- A maximum of 10 units of general education coursework can be used to fulfill all other graduation requirements (i.e., major, minor, IDS subject areas).
I. BASIC PROFICIENCIES
A. Composition ................................................. 6 units
B. Mathematics ................................................. 3 units
C. Second Language ............................................ 6 units

*Fourth-semester proficiency is required. For most languages, this equals 16 units of coursework; for some languages, this equals as many as 20 units. It is possible for a student who fulfills the language requirement by examination to have no University of Arizona units in a second language.

II. STUDY AREAS
A. Traditions and Cultures ...................................... 9 units
B. Biological & Physical Sciences ............................... 8 units
C. Individuals, Societies & Institutions ....................... 9 units
D. The Arts & Literature ....................................... 6 units

The composition and mathematics requirements should be satisfied during the first year of an undergraduate program. The second language requirement should be begun as well during the first year.

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 also 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. Finally, 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.

All Study Area courses are expected to include a writing component. Writing in general education courses places students in an active relationship with the body of facts, ideas, and theories presented in courses and helps them develop a critical appreciation of the ways knowledge is acquired and used. Writing also develops the attitudes of mind essential to the wise and humane use of knowledge and intellectual skills: respect for evidence, reason, and the contingent nature of truth; open-mindedness; motivation, involving personal characteristics such as initiative, curiosity, and an appetite for learning; and the willingness to pursue a line of inquiry to its logical conclusion. Each department develops the specific purposes and kinds of writing required in their general education courses, so that students understand the standard features of strong writing across disciplines and the aspects of writing that vary according to discipline. However, midterm and final examinations are not deemed sufficient for this requirement, even when they include essay questions. In science courses lab reports may be an essential skill, while students in the performing arts may be expected to write critiques of performances. Students in humanities or social science may be expected to write critical and theoretical essays. Most important is that the writing assignments are relevant to the discipline and appropriate to the course level.

These requirements may be fulfilled during any semester of the undergraduate years. However, the Biological and Physical Science requirement should be completed as soon as possible after establishing mathematical competency, and the majority of Traditions and Cultures courses are aimed at lower division students.
At least one course in a student’s Study Area courses must focus systematically on gender, class, race, or ethnicity. Such courses are marked with an asterisk (*).

Transfer credit may be allowed for courses in which equivalency has been established. (See also Transfer Students and General Education below.)

A. Traditions and Cultures

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

The internal organization of this Study Area is intended to reinforce the assumption of these two forces. You must take a total of nine units (three courses), three units (one course) from List 1 and a six-unit sequence from List 2. Studied in conjunction, these two course sets provide a greater understanding of the reciprocal influences of Western and Non-Western cultural traditions.

List 1

Native New World
ANTH 205 . . . . . Prehistoric Peoples of the Southwest (AINS 205)
*ANTH 206 . . . . . Native Peoples of the Southwest (AINS 206)
ANTH 423 . . . . . Anthropology of Mexico (AINS/MAS 423)
ANTH 451 . . . . . Archaeology of North America
*ENGL 477 . . . . . American Indian Literature (AINS 477)
*LING 210 . . . . . Native Languages of North America (AINS 210)

East Asia and the Pacific
ANTH 432 . . . . . Peoples of the Pacific
CHN 142 . . . . . Chinese Humanities (RELI 142)
CHN 174 . . . . . Chinese Civilization (HIST 174)
CHN 375-376 . . . History of China
EAS 270 . . . . . Modern East Asia: A History (HIST 270)
HIST 272 . . . . . Japanese Civilization (JPN 272)
HIST 474a-b-c . . History of Japan (JPN 474a-b-c)
*HIST 489 . . . . . Women in East Asia
JPN 144 . . . . . Japanese Humanities (RELI 144)
JPN 220 . . . . . Japanese Religion
NES 170 . . . . . Indian Civilization (HIST 170)

Africa
FREN 453 . . . . . Culture and Civilization of North Africa
GEOG 413 . . . . . Africa
HIST 190 . . . . . Introduction to African History

Middle East and South Asia
CLAS 334 . . . . . Art and Archaeology of Ancient Egypt (ARH/ANTH 334)
GEOG 469 . . . . . Geography of the Middle East (NES 469)
JUS 372a-b . . . . History and Religion of Ancient Israel (HIST/RELI/NES 372a-b)
*NES 140 . . . . . Middle Eastern Humanities (RELI 140)
NES 171 . . . . . Middle Eastern Civilizations of the Near East (ANTH/HIST 171)
NES 172 . . . . . Islamic Civilization: Traditional and Modern Middle East (ANTH/HIST 172)

NES 434 . . . . . Islamic Thought
NES 477a-b . . . History of the Middle East
POL 441 . . . . . The Arab-Israeli Conflict (NES 441)

Comparative Focus
ANTH 315 . . . . . World Ethnography
HIST 468a-b . . . Asia and the West (NES 468a-b)
MUS 434 . . . . . Music in World Cultures
POL 270 . . . . . Colonization and Native Peoples (AINS 270)

List 2

History of Architecture and Western Civilization
ARCH 324 . . . . . Ancient through Medieval
ARCH 334 . . . . . Renaissance to Present

The Classical Tradition
CLAS 220 . . . . . Classical Tradition I
CLAS 221 . . . . . Classical Tradition II

Critical Concepts in Western Culture
CCLS 200 . . . . . Critical Concepts in Western Culture

Western Civilization: Literary Perspectives (Honors only)
ENGL 251a . . . . . Ancient Visions
ENGL 251b . . . . . The Middle Ages through the Enlightenment
ENGL 251c . . . . . 19th and 20th Centuries

Western Civilization and the Arts
either
FA 207 . . . . . . The Twentieth Century
FA 307 . . . . . . Paleolithic through Renaissance
FA 317 . . . . . . Baroque through 19th Century
or
Ar H 117 . . . . . . Survey of World Art, Prehistoric-Gothic
Ar H 118 . . . . . . Survey of World Art, Renaissance-20th Century

FA 207 . . . . . . The Twentieth Century

The History of Western Civilization
either
HIST 101 . . . . . . Backgrounds and Formation to 1648
or
HIST 102 . . . . . . Emergence of the Modern World since 1648
and one of
HIST 101 . . . . . . Backgrounds and Formations to 1648
HIST 102 . . . . . . Emergence of the Modern World since 1648
HIST 103 . . . . . . Topics in Civilization
HIST 106 . . . . . . History of the United States from 1607 to 1877
HIST 107 . . . . . . History of the United States from 1877 to the present
HIST 160 . . . . . . Colonial Latin America
HIST 161 . . . . . . Modern Latin America

Introduction to Humanities
HUM 250a . . . . . (ancient to early Christian)
HUM 250b . . . . . (Medieval to 18th century)
HUM 250c . . . . . (late 18th century to present)

Philosophical Foundations of Western Civilization
PHIL 121 . . . . . . Justice and Virtue
PHIL 122 . . . . . . Mind, Matter, and God
PHIL 123 . . . . . . Science and Inquiry
B. Biological and Physical Sciences
This Study Area will provide the student with the vocabulary and the facts needed to understand major scientific principles. In addition, it will show how data are collected to test hypotheses, how conclusions from these data can be used to make predictions, construct models, or formulate general theories, and what part skepticism and knowledge of limits play in the interpretation and acceptance of new ideas.
This requirement is to be satisfied by two courses, four units each, which include laboratory work. (In addition to traditional laboratories, courses involving field trips and data analysis/discussion sessions may be considered lab experiences.) Students are strongly encouraged to take either one two-semester sequence in the biological sciences (which include ecology and evolutionary biology, microbiology, molecular and cellular biology) or one two-semester sequence in the physical sciences (which include astronomy, atmospheric sciences, chemistry, geography 103a and 104a, geosciences, hydrology and water resources, physics, planetary sciences, soil and water science).

ASTR 100/101L . . . . Essentials of Astronomy/Laboratory
ASTR 110a-110b . . . Introductory Astronomy
ATMO 171/171L . . . . Introduction to Meteorology
and Climatology/Laboratory
CHEM 101a/102a . . . Lectures in General
Chemistry/Laboratory
CHEM 101b/102b . . . Lectures in General
Chemistry/Laboratory
CHEM 103a/104a . . Fundamentals of Chemistry/Techniques
CHEM 103b/104b . . Fundamentals of Chemistry/Techniques
CHEM 105a/106a . . Honors Fundamentals of
Chemistry/Honors Techniques
CHEM 105b/106b . . Honors Fundamentals of
Chemistry/Honors Techniques
ECOL 100 . . . . Biology Concepts
ECOL 105b/105L . . Introductory Botany/Laboratory
ECOL 182 . . . . Introductory Biology II
(BIO/MCB/MICR 182)
ECOL 206 . . . . Environmental Biology
GEOG 103a/104a . . Physical Geography/Laboratory
GEOG 103b/104b . . Physical Geography/Laboratory
GEOG 101/103 . . . Introduction to Physical
Geology/Laboratory
GEOG 102/104 . . Introduction to Historical
Geology/Laboratory
GEOG 107a/107b . . Introduction to Global Change
(HWR 107a-107b)
HWR 101a/101b . . Water and the Environment
MSE 255/256 . . . . Materials Science in Modern
Society/Laboratory
MSE 257/258 . . . . Materials Science of Art and
Archaeological Objects/Laboratory
(MS/LAS 257/258)
MIC 205 . . . . Microbiology
PHYS 102a/102b . . Introductory Physics/Laboratory
PHYS 102b/102b . . Introductory Physics/Laboratory
PHYS 109 . . . . Physics in the Modern World
PHYS 110 . . . . Introductory Mechanics
PHYS 111a-111b . . Introduction to Mechanics,
Thermodynamics and Relativity
PHYS 112a-112b . . Introduction to Electricity, Magnetism,
Optics and Quantum Theory
PHYS 116 . . . . Introductory Electricity and Magnetism
PTYS 106 . . . . Survey of the Solar System
PL S 100/101 . . . . Plant Science/Laboratory
SW 105/106 . . . . Introduction to Environmental
Science/Laboratory

C. Individuals, Societies, and Institutions
Courses in this Study Area afford students an opportunity to examine systematically individual and collective action, 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, they understand more clearly 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 courses, offered in at least two different departments.
AREC 242 . . . . World Food Economy
AREC 375 . . . . Economics of Land and Water in the
American West (ECON/RNR 375)
*AINS 100 . . . . Introduction to American Indian
Studies
ANTH 101 . . . . Introduction to Physical Anthropology
and Archaeology
ANTH 102 . . . . Introduction to Cultural Anthropology
and Linguistic Anthropology
ANTH 110 . . . . Exploring Archaeology
*ANTH 303 . . . . Gender and Language
(LING/WS 303)
ANTH 307 . . . . Ecological Anthropology
*ANTH 316 . . . . Political Economy of Language in the
Southwest
*ANTH 319 . . . . Mexican American Culture
(MAS/LAS 319)
*ANTH 405 . . . . Urban Adaptation of Ethnic Groups
*ANTH 406 . . . . Gender and Social Identity
ANTH 409 . . . . Economic Anthropology
(ECON/LAS 409)
ANTH 479 . . . . Culture and Materials Technology
(MS/ENGR 479)
*ANTH 490 . . . . Women in Middle Eastern Society
(NES/WS 490)
ATMO 336 . . . . Weather, Climate and Society
*CLAS 330 . . . . Women in Antiquity (HUM/WS 330)
ECON 200 . . . . Basic Economic Issues
ECON 371 . . . . Economic Development
GEOG 102a/102b . . Human Geography
GEOG 305 . . . . Economic Geography
GEOG 360 . . . . Environmental Perception
GEOG 379 . . . . Urban Growth and Development
GEOG 411 . . . . Middle America (LAS 411)
GEOG 412 . . . . South America (LAS 412)
GEOG 456 . . . . The American City (PLNG 456)
GEOG 461 . . . . Population and Resources
(PLNG/HWR 461)
GEOG 464 . . . . The Arid and Semiarid Lands
GEOG 488 . . . . Governing Science and Technology
(ANTH/POL 488)
*HIST 236 . . . . Indians in U.S. History
HIST 245 . . . . Frontier America
*HIST 253a-b . . . History of Women in the U.S. I-II
(WS 253a-b)
HIST 271 . . . . The History of Christianity (RELI 271)
*HIST 351 . . . . Race and Class in Latin America
(AAS/LAS 351)
*HIST 361 . . . . History of the U.S. Mexico Border
Region (MAS 361)
HIST 396H . . . . Honors Proseminar
women in East Asia
Race and Ethnicity in the United States: A Regional Perspective
Intercultural Perspectives
News in Mass Communications
Ethics and the News Media (PHIL 439)
The Press and Society (MAR 470)
Introduction to Language
Native Languages of North America
(AINS 210)
Language and Social Issues
Language Variation
Introduction to Mexican-American Studies
Contemporary Biology in Human Affairs
Mineral Resources, Geotechnology, and the Environment
Technology and Society
History of Science and Technology
Poverty and Health
Introduction to Philosophy
Introduction to Moral and Social Philosophy
Science, Technology and Human Values
Philosophy of Religion (RELI 233)
Existential Problems
Ancient Philosophy (CLAS 260)
Modern Philosophy
Introduction to the Philosophy of Science
History of Ethics
Medical Ethics
Minds, Brains, and Computers
(WPSY 350)
Western European Political Systems
Introduction to Latin American Politics
Contemporary International Politics
Politics and the Vietnam War
Minority Groups and American Politics
(AINS/MAS 330)
Politics of the Mexican-American Community (MAS 332)
Politics and American Indians
Ancient and Medieval Political Theory
Early Modern Political Theory
Recent Political Thought
American Political Thought
Democracies, Emerging and Evolving
Latin American Political Development
Government and Politics of Mexico
(MAS 448)
Introduction to Psychology/Topics in Psychology (NOTE: 101 and 102 are required.)
Psychology of Gender
Health Psychology
Human Development
Social Psychology
Gender and Psychopathology
Introduction to Sociology
Sociology of Women (WS 150)
Minority Relations and Urban Society
(AINS/MAS 160)
Collective Behavior and Social Movements
Sociology of Sexuality
Social Stratification (ANTH 450)
Race and Ethnic Relations
Anticipating the Future: Focus on Environment
Introduction to Women's Studies
Women in Western Culture
Introduction to Women and Religion
(RELI 225)

D. Arts and Literature
The purpose of this study area is to provide students with opportunities to explore the processes by which visual, performing, and literary artists produce their works, and to evaluate the significance of those works both metaphorically and in larger cultural contexts.

Students are required to complete three units each in the arts and in literature.

Arts
Appreciating the Visual Arts
Art in Society
Drawing
Color and Design
Three Dimensional Design
Looking at Dance
Beginning Ballet (1 unit)
Ballet: Limited Experience (1 unit)
Intermediate Ballet (1 unit)
Improvisation (1 unit)
Modern Dance Limited Experience (1 unit)
Beginning Alignment Floor Barre (1 unit)
Ballet Technique I (2 units, 2 units)
Dance Technique I: Performance Foundations (2 units, 2 units)
Jazz Dance Technique (2 units, 2 units, 2 units, 2 units)
History of Dance
Dance Ensemble (2 units, 2 units, 2 units, 2 units)
Human Movement in the Arts
Folklore: Forms of Nonverbal Folklore
History of Dance
Jazz Dance Technique (2 units, 2 units)
Basic Musicianship
Exploring Music through Piano for the General Student
Survey of Music I
Survey of Music II
Musical Skills and Structure I
Large Conducted Ensembles (1 unit)
Coached Ensembles (1 unit)
Small Conducted Ensembles (1 unit)
Jazz History
Survey of Mexican Folk Music
Music Fundamentals through Experience
Large Conducted Ensembles (1 unit)
Coached Ensembles (1 unit)
Small Conducted Ensembles (1 unit)
American Pop Music: Sinatra Era
Aesthetics
College of Arts and Sciences 63
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>T AR 100</td>
<td>Acting for General College Student</td>
</tr>
<tr>
<td>T AR 103</td>
<td>Theatre Appreciation</td>
</tr>
<tr>
<td>T AR 238</td>
<td>Modern Drama through Performance</td>
</tr>
<tr>
<td>T AR 336</td>
<td>Introduction to Shakespeare through Performance</td>
</tr>
<tr>
<td>CLAS 342</td>
<td>Homer</td>
</tr>
<tr>
<td>CLAS 346</td>
<td>Classical Greek Tragedy</td>
</tr>
<tr>
<td>CLAS 347</td>
<td>Love in Classical Literature</td>
</tr>
<tr>
<td>CLAS 348</td>
<td>Myth and Archetype (RELI 348)</td>
</tr>
<tr>
<td>ENGL 260</td>
<td>Major British Writers</td>
</tr>
<tr>
<td>ENGL 261</td>
<td>Modern Literature</td>
</tr>
<tr>
<td>ENGL 265</td>
<td>Major American Writers</td>
</tr>
<tr>
<td>ENGL 267a-b</td>
<td>World Literature</td>
</tr>
<tr>
<td>ENGL 270a</td>
<td>Approaches to Literature: Major Author(s)</td>
</tr>
<tr>
<td>ENGL 270b</td>
<td>Approaches to Literature: Major Work(s)</td>
</tr>
<tr>
<td>ENGL 270c</td>
<td>Approaches to Literature: Literary Mode or Genre</td>
</tr>
<tr>
<td>ENGL 270d</td>
<td>Approaches to Literature: Major Themes</td>
</tr>
<tr>
<td>ENGL 310</td>
<td>The Novel Instructor</td>
</tr>
<tr>
<td>ENGL 319</td>
<td>Tolkien, Lewis, et al.</td>
</tr>
<tr>
<td>ENGL 320a-320b</td>
<td>Literature of the Bible</td>
</tr>
<tr>
<td>ENGL 331</td>
<td>Shakespeare's Major Plays</td>
</tr>
<tr>
<td>ENGL 372a-372b</td>
<td>The Short Story</td>
</tr>
<tr>
<td>ENGL 380</td>
<td>Literary Analysis</td>
</tr>
<tr>
<td>ENGL 416</td>
<td>The Nature of Literature</td>
</tr>
<tr>
<td>ENGL 419b</td>
<td>Non-fiction Prose: Other Prose Forms</td>
</tr>
<tr>
<td>ENGL 424</td>
<td>Studies in Southwest Literature (AIN 424)</td>
</tr>
<tr>
<td>ENGL 426</td>
<td>English Medieval Literature</td>
</tr>
<tr>
<td>ENGL 431a-b</td>
<td>Shakespeare</td>
</tr>
<tr>
<td>ENGL 432</td>
<td>Renaissance Drama</td>
</tr>
<tr>
<td>ENGL 444</td>
<td>Milton</td>
</tr>
<tr>
<td>ENGL 449a</td>
<td>Folklore (AIN/ANTH 449a)</td>
</tr>
<tr>
<td>ENGL 465</td>
<td>Victorian Literature</td>
</tr>
<tr>
<td>*ENGL 477</td>
<td>American Indian Literature (AIN 477)</td>
</tr>
<tr>
<td>FREN 282</td>
<td>The French Novel and Society</td>
</tr>
<tr>
<td>FREN 283</td>
<td>Existentialism and the Absurd: The French Foundations</td>
</tr>
<tr>
<td>FREN 396H</td>
<td>Honors Proseminar (French Women Writers of the 20th Century)</td>
</tr>
<tr>
<td>GER 275</td>
<td>Creative Minds: The German Classical Heritage</td>
</tr>
<tr>
<td>GER 276</td>
<td>Decadence, Dissonance, Death Wish: From Kaiser to Führer</td>
</tr>
<tr>
<td>GER 277</td>
<td>Eroticism and Love in the Middle Ages</td>
</tr>
<tr>
<td>GER 320</td>
<td>History of German Cinema</td>
</tr>
<tr>
<td>GER 375</td>
<td>Love, Madness and Decay in fin-de-siècle Vienna</td>
</tr>
<tr>
<td>GER 455</td>
<td>Music and German Literature</td>
</tr>
<tr>
<td>HUM 420</td>
<td>From Orality to Literature: Storytelling in Contemporary Literature</td>
</tr>
<tr>
<td>*HUM 454</td>
<td>Irish Revolutionary Literature</td>
</tr>
<tr>
<td>ITAL 282</td>
<td>The Middle Ages: Italian Literature in Translation</td>
</tr>
<tr>
<td>ITAL 283</td>
<td>The Renaissance: Italian Literature in Translation</td>
</tr>
<tr>
<td>ITAL 284</td>
<td>Italian Theater in Translation</td>
</tr>
<tr>
<td>JPN 310</td>
<td>Japanese Literature and War</td>
</tr>
<tr>
<td>PHIL 238</td>
<td>Philosophy in Literature</td>
</tr>
<tr>
<td>PRS 450</td>
<td>Contemporary Persian Literature in English Translation</td>
</tr>
<tr>
<td>RUSS 250a-b</td>
<td>Russian Humanities in Translation</td>
</tr>
<tr>
<td>RUSS 330</td>
<td>Russian Literature from the Beginnings to 1850</td>
</tr>
<tr>
<td>RUSS 340</td>
<td>Nineteenth Century Russian Literature (in English)</td>
</tr>
<tr>
<td>RUSS 350</td>
<td>Twentieth Century Russian Literature (in English)</td>
</tr>
<tr>
<td>SPAN 435</td>
<td>Cervantes' Don Quixote</td>
</tr>
<tr>
<td>SPAN 445</td>
<td>Novel of the Mexican Revolution</td>
</tr>
<tr>
<td>T AR 336</td>
<td>Introduction to Shakespeare through Performance</td>
</tr>
</tbody>
</table>

**The Honors Program and General Education**

Students should be aware that departments offer honors sections in many of the courses that satisfy general education requirements. Such courses or course sections are always identified by the suffix H when listed in the semester schedule of classes. The following General Education Courses are regularly available for honors credit.

**English Composition**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENGL 103H</td>
<td>ENGL 104H</td>
</tr>
<tr>
<td>ENGL 109H</td>
<td></td>
</tr>
</tbody>
</table>

**Second Language**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>FREN 201</td>
<td>Intermediate French I</td>
</tr>
<tr>
<td>FREN 202</td>
<td>Intermediate French II</td>
</tr>
<tr>
<td>GER 203</td>
<td>Intensive Intermediate German</td>
</tr>
<tr>
<td>RUSS 101a-b</td>
<td>Elementary Russian</td>
</tr>
<tr>
<td>RUSS 201a-b</td>
<td>Intermediate Russian</td>
</tr>
<tr>
<td>SPAN 101</td>
<td>First Semester Spanish</td>
</tr>
<tr>
<td>SPAN 102</td>
<td>Second Semester Spanish</td>
</tr>
<tr>
<td>SPAN 201</td>
<td>Second Year Spanish</td>
</tr>
<tr>
<td>SPAN 202</td>
<td>Second Year Spanish</td>
</tr>
</tbody>
</table>

**Study Area A - Traditions and Cultures**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>HIST 272</td>
<td>Japanese Civilization</td>
</tr>
</tbody>
</table>

**Study Area B - Biological and Physical Sciences**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTR 101L</td>
<td>Essentials of Astronomy Laboratory</td>
</tr>
<tr>
<td>CHEM 105a-b</td>
<td>Honors Fundamentals of Chemistry</td>
</tr>
<tr>
<td>ECOL 182</td>
<td>Introductory Biology I</td>
</tr>
<tr>
<td>GEOS 101/103</td>
<td>Introduction to Physical Geology/Laboratory</td>
</tr>
<tr>
<td>GEOS 102/104</td>
<td>Introduction to Historical Geology/Laboratory</td>
</tr>
<tr>
<td>PHYS 110</td>
<td>Introductory Mechanics</td>
</tr>
<tr>
<td>PHYS 116</td>
<td>Introduction to Electricity and Magnetism</td>
</tr>
</tbody>
</table>

**Study Area C - Individuals, Societies, and Institutions**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANTH 101</td>
<td>Intro to Physical Anthropology and Archaeology</td>
</tr>
<tr>
<td>ECON 200</td>
<td>Basic Economic Issues</td>
</tr>
<tr>
<td>ECON 371</td>
<td>Economic Development</td>
</tr>
<tr>
<td>LING 101</td>
<td>Introduction to Language</td>
</tr>
</tbody>
</table>
B.F.A. and B.M. General Education Requirements

General education requirements vary among the several degree programs of the Faculty of Fine Arts. Bachelor of Arts programs require the general education 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, 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 with their departmental advisor.

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

### Bachelor of Fine Arts (MAJORS IN STUDIO ART, DANCE, THEATRE PRODUCTION, MUSICAL THEATRE, AND MEDIA ARTS)

#### and Bachelor of Music (MAJORS IN PERFORMANCE, COMPOSITION, AND JAZZ STUDIES)

**I. Communication and Conceptualization (12 units)**

<table>
<thead>
<tr>
<th>A. Freshman Composition (6 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ENGL 100, 101, and 102.</td>
</tr>
<tr>
<td>2. ENGL 101 and 102.</td>
</tr>
<tr>
<td>3. ENGL 103H and 104H (Honors).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B. Mathematics (3 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Three units of MATH 101 or 117 and above; MIS 111. (Media arts majors may not take MATH 101.)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C. Oral Communication (3 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Selected from oral interpretation, beginning acting, speaking in the Arts, and media arts performance courses. Media arts majors are required to take COMM 100 and 102. Theatre production, acting, majors must take T AR 367 for this requirement. Musical theatre majors may substitute T AR 367 or T AR 475 for this requirement.</td>
</tr>
</tbody>
</table>

**II. Study Areas (33 total units)**

<table>
<thead>
<tr>
<th>A. Western Civilization (6 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western civilization courses must be selected from outside of the student's major department from the following courses: ARH 117, 118; DNC 259; MUS 107, 108; HUM 355; NES 140; PHIL 111, 113; T AR 140a, 140b; WS 200; FA 207, 307, 317; HIST 101, 102, 103; HUM 250a, 250b, 250c; ENGL 251a, 251b, 251c; or PHIL 121, 122, 123.</td>
</tr>
</tbody>
</table>

To satisfy group II-A-E requirements, musical theatre majors must include 3-6 units of upper division course work.

<table>
<thead>
<tr>
<th>B. Science (3 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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; RNR 135; WSC 125, PL S 100.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>C. Individuals, Societies, and Institutions (6 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses to be selected from anthropology, economics, geography and regional development, (except GEOG 103a-103b and 104a-104b), history (except HIST 101, 102, 103), M AR 101, philosophy (except PHIL 111 and 113), political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except NES 140), religious studies, women's studies (except WS 200).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. Non-Western and Minority Studies (3 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E. The Arts (6 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From all fine arts offerings in departments other than the student's major, with only one course of applied (studio/performance) arts accepted.</td>
</tr>
</tbody>
</table>

To satisfy group II-E requirements, media arts students must include no fewer than three units from ART 101, 102, or 104. Musical theatre majors are required to take MUS 120a and 120b.

<table>
<thead>
<tr>
<th>F. Department-Specified General Education Course Work Outside of the Major Department (9-15 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musical theatre requirements (16 units)</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

1. **Department of Art Requirements:**

   Students select from the following courses. Some of the courses are required for a particular study emphasis within the Department of Art, so each student should consult with an advisor in the designated study emphasis.

   ANTH 430, D NC 100, 159; EXSS 201; JOUR 301; M AR 101, 200; MKTG 361; MUS 107, 108; PHIL 110, 111, 433; T AR 140a or 140b; WS 253a, 253b.

2. **Committee on Dance Requirements:**

   MUS 107, 108; PHIL 110; T AR 101.

3. **Department of Media Arts Requirements:**

   15-units as outlined below:
   a. HIST 101 and 102 or 6-units from HUM 250a,b,c (6)
   b. FA 207 or HUM 260 or CCLS 200 (3)
   c. Music Theory of Performance (3)
   d. Literature (3)

4. **School of Music Requirements:**

   9 to 12 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.

---

**Study Area D - Arts and Literature**

**Art**

<table>
<thead>
<tr>
<th>DNC 370</th>
<th>Human Movement in the Arts</th>
</tr>
</thead>
<tbody>
<tr>
<td>M AR 200</td>
<td>Fundamentals of Theory and Aesthetics in Media Arts</td>
</tr>
<tr>
<td>M AR 336</td>
<td>History of Japanese Film</td>
</tr>
<tr>
<td>MUS 120a</td>
<td>Musical Skills and Structures I</td>
</tr>
<tr>
<td>T AR 100</td>
<td>Acting for General College Students</td>
</tr>
<tr>
<td>T AR 238</td>
<td>Modern Drama Through Performance</td>
</tr>
<tr>
<td>T AR 336</td>
<td>Introduction to Shakespeare through Performance</td>
</tr>
</tbody>
</table>

**Literature**

| CLAS 342 | Homer |

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

**Study Areas (33 total units)**

<table>
<thead>
<tr>
<th>A. Western Civilization (6 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western civilization courses must be selected from outside of the student's major department from the following courses: ARH 117, 118; DNC 259; MUS 107, 108; HUM 355; NES 140; PHIL 111, 113; T AR 140a, 140b; WS 200; FA 207, 307, 317; HIST 101, 102, 103; HUM 250a, 250b, 250c; ENGL 251a, 251b, 251c; or PHIL 121, 122, 123.</td>
</tr>
</tbody>
</table>

To satisfy group II-A-E requirements, musical theatre majors must include 3-6 units of upper division course work.

<table>
<thead>
<tr>
<th>B. Science (3 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>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; RNR 135; WSC 125, PL S 100.</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>C. Individuals, Societies, and Institutions (6 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Courses to be selected from anthropology, economics, geography and regional development, (except GEOG 103a-103b and 104a-104b), history (except HIST 101, 102, 103), M AR 101, philosophy (except PHIL 111 and 113), political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except NES 140), religious studies, women's studies (except WS 200).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>D. Non-Western and Minority Studies (3 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>E. The Arts (6 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>From all fine arts offerings in departments other than the student's major, with only one course of applied (studio/performance) arts accepted.</td>
</tr>
</tbody>
</table>

To satisfy group II-E requirements, media arts students must include no fewer than three units from ART 101, 102, or 104. Musical theatre majors are required to take MUS 120a and 120b.

<table>
<thead>
<tr>
<th>F. Department-Specified General Education Course Work Outside of the Major Department (9-15 units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musical theatre requirements (16 units)</td>
</tr>
<tr>
<td>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.</td>
</tr>
</tbody>
</table>

1. **Department of Art Requirements:**

   Students select from the following courses. Some of the courses are required for a particular study emphasis within the Department of Art, so each student should consult with an advisor in the designated study emphasis.

   ANTH 430, D NC 100, 159; EXSS 201; JOUR 301; M AR 101, 200; MKTG 361; MUS 107, 108; PHIL 110, 111, 433; T AR 140a or 140b; WS 253a, 253b.

2. **Committee on Dance Requirements:**

   MUS 107, 108; PHIL 110; T AR 101.

3. **Department of Media Arts Requirements:**

   15-units as outlined below:
   a. HIST 101 and 102 or 6-units from HUM 250a,b,c (6)
   b. FA 207 or HUM 260 or CCLS 200 (3)
   c. Music Theory of Performance (3)
   d. Literature (3)

4. **School of Music Requirements:**

   9 to 12 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.
II. Bachelor of Fine Arts
(Majors in Art Education and Theatre Arts Education)

I. Communication and Conceptualization (12 units)
   A. Freshman Composition (6 units)
      Completion of one of the following sequences:
      1. ENGL 100, 101 and 102.
      2. ENGL 101 and 102.
      3. ENGL 103H and 104H (Honors).
   B. Mathematics (3 units)
      MATH 101 or 117R/S or above or MIS 111
   C. Oral Communication (3 units)
      Selected from oral interpretation, beginning acting, speaking in the arts, and media arts performance courses. Theatre arts education majors may substitute TAR 367 or TAR 468 for this requirement.

II. Study Areas (33 total units)
   A. Western Civilization (6 units)
      Western civilization courses must be selected from outside of the student's major department from the following courses: ARH 117, 118; DNC 259; TAR 140a, 140b; WS 200; 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; RNR 135; WFSC 125; PL S 100.
   C. Individuals, Societies, and Institutions (9 units)
      Required courses: PSYC 101 and HIST 106 or 107. One additional course selected from anthropology, economics, geography and regional development (except GEOG 103a-103b and 104a-104b), history (except HIST 101, 102, 103), M AR 101, political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except NES 140), religious studies, women's studies (except WS 200).
      Note: Examination in U.S./Arizona Constitutions or completion of appropriate coursework also is required, although not included in total units required in study areas.
   D. Non-Western and Minority Studies (3 units)
      Students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization.

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 330a-330b to area II-E.

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

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

I. Communication and Conceptualization (12 units)
   A. Freshman Composition (6 units)
      Completion of one of the following sequences:
      1. ENGL 100, 101 and 102.
      2. ENGL 101 and 102.
      3. ENGL 103H and 104H (Honors).
   B. Mathematics (3 units)
      Three units of MATH 101 or 117R/S and above or MIS 111.
   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; RNR 135; WFSC 125; PL S 100.
   C. Individuals, Societies, and Institutions (6 units)
      Courses to be selected from anthropology, economics, geography and regional development (except GEOG 103a-103b and 104a-104b), M AR 101, history (except HIST 101, 102, 103), philosophy (except PHIL 111 and 113), political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except NES 140), religious studies, women's studies (except WS 200).
   D. Non-Western and Minority Studies (3 units)
      All general fine arts studies students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization. This course can be part of the general studies major, general education, or elective course work and must be approved by the program advisor.
   E. ENGL 207, 209, 210, 307, 308 (3 units).

III. Additional Fine Arts Courses
   See Dean of Fine Arts Office for current requirements.
POLICIES

Change of Major
Fine Arts majors should consult an advisor in the Office of the Dean of the Faculty of Fine Arts Music Building, Room 111.

To change from a major in the Faculties of Humanities, Science or Social and Behavioral Science to another within the same three faculties, the student must fill out a declaration of major form from the Office of Academic Services, Modern Languages Building, Room 347. Approval for the change must be obtained first from the new department by the student before the form is turned in to the Office of Academic Services. To declare an Interdisciplinary Studies Major, go to the Office of Academic Services for instructions regarding special procedures.

The change of major is effective at the beginning of the next semester.

Course Load
The maximum course load is 19 units of credit per semester. All courses, including those taken for credit, audit, by correspondence, or at another academic institution are counted in determining the maximum academic load in the Faculties of Humanities, Science and Social and Behavioral Science. Students in these faculties who wish to register for more than 19 hours must have a grade-point average of at least 3.0 and must secure permission from the Assistant Dean of the college. In the Faculty of Fine Arts, correspondence courses are not counted in the 19 unit maximum.

Grade Appeal Procedures
Grade appeals in the Faculties of Humanities, Science, and Social and Behavioral Sciences are heard in the Office of the Associate Dean of the college. However, students should go to the dean's office in the faculty of the course in question. Grade appeals in the Faculty of Fine Arts are handled within the department.

Dual Use of Credits
A maximum of 10 units of general education course work can be used to fulfill other degree requirements (major, minor, IDS subject areas) in the Faculties of Humanities, Science and Social and Behavioral Science.

Transfer Students-General Information
The Office of Admissions and New Student Enrollment (in the Nugent Building) reviews the official transcript to determine course transfer credits. The evaluator may assign a transfer course to a discipline, or may assign a direct course equivalency for a course from an Arizona community college. Entering transfer students who wish to determine the application of courses to the general education program should see an advisor in the Office of Academic Services.

The evaluation of transfer course work in the major and minor disciplines is done by the major advisor. Except for students in Fine Arts, all students may 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.

For non-Fine Arts students, a copy of the transcript from the Office of Admissions is required for evaluations. Advisors will not evaluate the application of courses to the degree program without a university transcript evaluation. In Fine Arts, advisors use the computerized evaluation. However, students must have previously submitted their transfer transcripts to the Office of Admissions.

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, a list of faculty advisors and specific information about the special and pre-professional programs.

Transfer Students from Arizona Community Colleges
The University of Arizona has prepared transfer guides which will help community college students select courses to satisfy the General Education requirements. These transfer guides are available at every community college in the student advising offices. Students should work closely with the community college advisors in planning their curriculum, in order to make the smoothest possible transition to the University.

In addition, the Arizona community colleges and the Arizona universities have entered into an agreement regarding the application of transfer units toward General Education. This agreement is called the Transfer General Education Core Curriculum (TGEC).

To complete a degree program efficiently, students should select courses to meet the Transfer General Education Core Curriculum requirements that will also fulfill program requirements in the college and major they intend to pursue upon transfer (see Transfer General Education Core Curriculum (TGEC) under Admission and Registration section). Community college students transferring to The University of Arizona from an Arizona community college will satisfy the general education requirements of the College of Arts and Sciences upon completion of the following college requirements.

I. The College of Arts and Sciences strongly recommends, for all transfer students with a B.A. or B.S. degree objective, that 6 semester hours of the Arts and Humanities subject area in the transfer core be devoted to a western civilization sequence.

II. The College of Arts and Sciences will require of all transfer students with a B.A. or B.S. degree objective, as part of the college portion of the general education requirements:
- proficiency in a second language at the fourth semester level;
- a course in non-western civilization;
- a course in literature.

The college requirements for a course in non-western civilization can be met within the transfer core curriculum as the required three semester hours of coursework emphasizing global/international awareness or historical awareness. Should this requirement in the transfer core curriculum not be met with a non-western course, the student will be required to take an upper-division course in non-western civilization at The University of Arizona (See List I, Study Area A for the possibilities). The college requirements for a course in literature can be met within the transfer core curriculum as one of the six units of options. Should the student not choose a literature course as an option, s/he will be required to take an upper division course in literature at The University of Arizona. (See the Literature list, Study Area D for the possibilities.)
McClelland Hall, Samuel O. Witt Courtyard (interior courtyard). Photo by Bill Keller

Business & Public Administration
The college offers professional education in both business and public administration. Its purpose is to prepare men and women for 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. The college's graduate program in public administration is recognized by the National Association of Schools of Public Affairs and Administration.

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

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

DEGREE PROGRAMS

Undergraduate Degrees

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

Undergraduate Majors

Within the B.S.B.A. degree program, students may select a major in accounting, business economics, entrepreneurship (competitive entry), finance, general business administration, human resource management, management information systems, marketing, operations management, or real estate. The real estate major is under review, see the department for information. An International Business Program also is available to undergraduates.

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

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

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

Graduate Degrees

The Graduate College, through the Karl Eller Graduate School of Management in the College of Business and Public Administration, offers a number of graduate degrees for qualified students. These include the Master of Business Administration; Master of Accounting; Master of Arts degree with a major in economics; and Master of Science degree with majors in finance, management and policy, management information systems, and marketing. The School of Public Administration and Policy, in conjunction with the Graduate College, offers the Master of Public Administration. In conjunction with the College of Law, combined programs for the Juris Doctor/Master of Business Administration, Juris Doctor/Master of Arts with a major in economics, and Juris Doctor/Doctor of Philosophy with a major in economics are offered. Through cooperative agreement between the College of Business and Public Administration and the American Graduate School of International Management, a dual degree program is offered which leads to a Master of Business Administration from the University of Arizona and a Master of International Management from the American Graduate School of International Management.

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

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

STUDENT ADVISEMENT

Students new to the college, whether just entering the University or transferring from on-campus into the BPA College, should come to the Undergraduate Programs Office, McClelland Hall 103, for information and academic advising. Students with prior college-level work should bring transcripts.

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 high school credit in mathematics as follows: one unit of elementary algebra, 1/2 unit of intermediate algebra, and 1/2 unit of advanced algebra.

Transfer students from community colleges must meet all freshman and sophomore requirements as shown below for the degree they wish to pursue, either by acceptable transfer credit or course work for 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 community 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 year in the three state universities may not be completed at a two-year college for transfer credit in the business core or major (the introductory course in the legal environment in business will be accepted as lower-division credit as an exception to this policy). Such courses may be utilized in the free elective 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 community college and planning to transfer to one of Arizona's universities without loss of credit:

- **Maximum Preprofessional Courses:** 30 units
  - Accounting ........................................ 6 units
  - Economics ........................................ 3-6 units
  - Quantitative Analysis & Statistics .............. 3 units
  - Legal Environment ................................ 3 units
  - Introduction to Computing ....................... 3 units
  - Lower Division Electives ........................ 9 units

- **Maximum General Education Courses:** 34-42 units
  - English
  - Mathematics
  - Science
  - Foreign Language
  - International/Multi-cultural
  - Western and Non-western Civilization
  - Arts and/or Literature

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

The Advanced Standing Policy restricts all enrollments in upper-division (300- and 400-level) courses taught by the departments in the BPA College during the fall and spring semesters to those who qualify either as BPA, non-BPA, or exempt program students or by catalog exemption.

During presession, winter session and 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, McClelland Hall 103.

In general, permission to register for 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, or by correspondence, of total units, or of the attainment of the requisite University grade-point average 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 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.

Students admitted to BPA by transfer from another college at The University of Arizona are subject to all of the provisions of the advanced standing policy in effect at the time of their acceptance into the BPA course. They must be enrolled in the college at least one fall or spring term prior to graduation to be eligible to receive the B.S.B.A. or the B.S.P.A. degree.

Advanced Standing Requirements

Eligibility requirements for advanced standing are as follows:

**BPA STUDENTS**

Applicants must have

1. credit for a minimum of 56 units, including all stipulated lower-division requirements* (pre-major requirements excepted);
2. taken a minimum of 12 regularly graded units of applicable course work at The University of Arizona;
3. a grade-point average based on all University credit course work of not less than the minimum established by the BPA College**; and
4. an approved application on file with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

*See each degree program description for details.
**1.750 required for students as of fall 1992; see BPA Undergraduate Programs Office for current requirement.
NON-BPA STUDENTS

Applicants must have
1. credit for a minimum of 56 units;
2. taken a minimum of 12 regularly graded units at the University of Arizona;
3. a grade-point average based on all University credit course work attempted at the University of Arizona of not less than the minimum established by the BPA College;2
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.

Exempt Programs

Exempt programs must have the approval of the Dean of the BPA College and the dean of the college which offers the degree program. Students who qualify under this provision will be permitted to take only required upper-division BPA courses which have been specifically approved and designated in their major field of study. Permission is granted on a semester-by-semester basis once eligibility has been established for the term. Exempt programs applications are processed at the end of each term when grades and units can be verified. Registration in upper-division BPA courses may be completed at that time, for the subsequent term, by students who qualify.

Applicants must
1. be enrolled in a program approved as exempt and have a grade-point average based on all university credit course work attempted at the University of Arizona of at least 2.000;
2. have credit for a minimum of 56 units, 12 of which must have been at the University of Arizona;
3. have been enrolled in a non-BPA program for one full semester; and
4. have an approved application on file each semester with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

Catalog Exemption

To qualify for catalog exemption, one must be graduating under the 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 attained a minimum of 12 regularly graded units applicable to the degree program at the University of Arizona will be given provisional permission to enroll in upper-division BPA courses until they have the requisite minimum number of quality hours. Thereafter, they must meet the minimum GPA requirement to be eligible to continue taking upper-division BPA courses. Such students must have an approved application on file with the BPA Undergraduate Programs Office.

Writing Proficiency Examination Requirement

All University students are required to take the Upper-Division Writing-Proficiency Examination (UDWPE) once they have accumulated at least 40 units of credit.

Accordingly, BPA students applying for Advanced Standing must provide either evidence of completion of the UDWPE or evidence of having registered to take the UDWPE. In the latter case, any subsequent registration for upper-division BPA courses will be contingent upon having completed the examination as scheduled and prior to the next registration period.

PREScribed Curriculum for Bachelor of Science in Business Administration Degree

The purpose of the undergraduate curriculum in business administration is to provide a broad education to prepare the student for imaginative and responsible citizenship and leadership roles in business or society, both domestic and worldwide. The bulk of the professional course work is concentrated in the upper-division portion of the degree program following a basic foundation of general education. This foundation includes course work in communications, mathematics and quantitative methods, the language of commerce, the social and behavioral sciences, the natural sciences, world civilizations, ethics, international multicultural experience, foreign language, literature and the arts.

The B.S.B.A. degree requires a minimum of 125 units including all of the areas and requirements detailed below. A minimum of 54 units must be completed in course work offered by departments outside of the BPA College. Additionally, a minimum of 51 units must be completed in upper-division courses numbered 300 or higher. A grade-point average of at least 2.000 on all work undertaken for the degree program and in the major field is required for graduation.

Students expecting to receive the B.S.B.A. degree must attain advanced standing as a BPA student and have declared a major prior to applying for degree candidacy. Any course work that might be applicable to the upper-division professional core or major requirements taken while enrolled in other colleges or at other universities is subject to acceptance by the BPA College for degree certification purposes.

Minimum Requirements for the B.S.B.A. Degree

General Education Requirements

I. Basic Skills and Proficiencies

<table>
<thead>
<tr>
<th></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 Examination2</td>
<td>3</td>
</tr>
<tr>
<td>COMM 412</td>
<td>3</td>
</tr>
</tbody>
</table>

II. Study Areas

A. Biological and Physical Sciences

Two semesters selected from astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, geography (103a, 103b, 104a, and 104b only), geosciences,
hydrology, microbiology and immunology, molecular and cellular biology, physics or planetary sciences.

(6-8 units)

B. Social and Behavioral Science and Ethics
Three units selected from anthropology, linguistics, psychology or sociology plus three units from a list of ethics course options available in the BPA Undergraduate Programs Office.

(6 units)

C. Western and Non-Western Civilizations
Six units of western and three units of non-western civilization course options selected from the relevant lists in the BPA Undergraduate Programs Office.

(9 units)

D. International and Multicultural Experience
Two courses in international affairs selected from the relevant options list in the BPA Undergraduate Programs Office.

(6 units)

E. Foreign Language
Two semesters of the same foreign language at the college level is required. Students whose native language is not English or who have passed a language proficiency examination at the 16-unit level can be absolved of the requirement. Contact the Undergraduate Programs Office for details about doing so.

(8 units)

F. Arts and/or Literature
Six units in the arts and/or literature selected from the relevant course option lists available in the BPA Undergraduate Programs Office.

(6 units)

Professional Requirements

III. Professional Core
All candidates for the degree must complete this set of professional courses. These are normally taken in the junior year except for the capstone business policy course which should be completed in the student's last year.

A. ECON 300 and 330; FIN 311; MAP 305 and 320; MIS 373; MKTG 361.

B. Any one business policy course selected from the set: ACCT 361, MKTG 361, FIN 371, MAP 371, MIS 371, or MKTG 471. (Credit is allowed for only one policy course).

(24 units)

IV. Major Fields
A major field of at least 15 units is to be selected. Some majors have up to 6 units of required supplemental course work. See individual major listings for details.

(15-21 units)

V. Free Electives

(7-15 units)

TOTAL REQUIRED FOR GRADUATION

125 units

Minimum Out-of-College Unit Requirement

54

Minimum Upper-Division Unit Requirement

51

*Lower-division professional program requirements and prerequisites that must be completed by all B.S.B.A. degree candidates.

1 Students earning a "unsatisfactory" result on the exam normally will be required to complete additional writing course work as specified by the college.

2 College algebra or the equivalent is prerequisite for MATH 119 and 123, which are prerequisites for STAT 275.

3 Writing Emphasis Course. The writing proficiency exam is a prerequisite.

B.S.B.A. Advanced Standing Lower-Division Requirements

To attain advanced standing as a BPA student, the following lower-division program course requirements must be met:

1. ECON 300 and 330; FIN 311; MAP 305 and 320; MIS 373; MKTG 361.

2. Any business policy course selected from the set: ACCT 361, MKTG 361, FIN 371, MAP 371, MIS 371, or MKTG 471. (Credit is allowed for only one policy course).

3. Writing Emphasis Course. The writing proficiency exam is a prerequisite.

Major Fields Available

Students are asked to declare one of the major fields of business administration upon enrollment. Any subsequent change in major is accomplished by completing a change-of-major form available in McClelland Hall 103.

The major consists of 15 units. Some majors also require supplemental or pre-major course work. Additional units beyond the requirements are optional to the student. Prior permission of the departmental advisor and the college dean is required to apply an individual study course to any major. To graduate, the student must have a grade-point average of 2.000 or better in courses undertaken in the major field. This average is computed on all courses attempted that are applicable to the major, but does not include any pre-major courses or any course taken for the business policy option.

Students must earn at least 9 units of University credit in the major in the BPA College.

The requirements for each major field in business administration are given below.

Accounting

This major prepares students for diversified careers in the independent practice of public accounting, in controllership for business and government, and in general accounting management. Accounting majors must complete ACCT 310 in addition to the requirements listed directly below. Either ACCT 471, MAP 471, MIS 471, or FIN 471 are recommended for the policy requirement.

1. All accounting majors must complete: ACCT 400a-400b.

2. An additional 9 units (three courses) must be selected from the following:

ACCT 401, 410, 420, 422, 431, 451.

*P. 305, 400B.

Some states require a five-year program to be eligible to sit for the Uniform C.P.A. Examination; for this and other career reasons, a five-year program leading to the Master of Accounting degree (see Graduate Catalog) may be necessary to achieve a student's objectives. Information concerning the legal requirements for taking the Uniform C.P.A. Examination may be obtained by writing the state board of accountancy in the capital city of the appropriate state. In Arizona the address is 3110 N. 19th Ave., 140, Phoenix, AZ 85015.

Business Economics

This major is designed for those who want to concentrate in economic analysis and to prepare themselves for such professional work in business firms, governmental agencies, private research, or consulting firms; or to enter college teaching following graduate study. Business economics majors must complete ECON 332 (in lieu of 330), and ECON 361 (in lieu of 300) for the Professional core as well as ECON 376 and 460 prior to beginning major courses. The business policy requirement may be fulfilled by ACCT 471, MAP 471, MIS 471, or MKTG 471. Under certain circumstances, students may take ECON 300 in place of ECON 361 and ECON 330 in place of ECON 332 with the approval of the department and the dean.

The major consists of fifteen units of economics, including ECON 461, to be selected from the 300- and 400-level courses (not including 300, 330, 332, 339, 361, 376 and 460) offered by the Department of Economics.

Entrepreneurship

The entrepreneurship major is a competitive, restricted entry, senior year program sponsored by the Karl Eller Center for
the Study of the Private Market Economy. Students must apply to and be accepted into the program. Participants are selected in the spring term prior to entry, which occurs only in the fall term. Program students complete an integrated set of courses over the fall and spring terms as a group.

The program prepares students for careers as leaders in venture capital and investment banking activities, as managers of innovative corporate endeavors, and as independent entrepreneurs.

Students in the program take a specially designated section of MAP 471 for the business policy requirement. The major consists of the following courses:

1. MKTG/ECON 480 and FIN/MAP 481 in the fall term, and
2. MAP/MKTG 483 and MAP/FIN 484 in the spring along with the business policy requirement.

Finance

This major offers undergraduate preparation for careers or graduate work in corporate financial management, investment analysis, security brokerage, and investment or commercial banking. Finance majors must take ACCT 420 and MAP 376 prior to the beginning of major courses, and either FIN 471 or MAP 471 is recommended from the entire policy set to fulfill the business policy requirement.

1. All students in this major will complete FIN 412, 421, and 431.
2. Six additional units (two courses) will also be chosen from the following: ACCT 400a, 400b, 310; ECON 418, 430, 442; FIN 313, 414, 444, 460, 461; MAP 426.

General Business Administration

This major provides the student the opportunity to develop a broad knowledge of the principal areas of business. Students can tailor the major along individualized lines to prepare for career paths of interest, e.g., in small or family business, international areas, or graduate study. The major aims to develop generalists rather than specialists.

The major may not be combined with any of the other business major options. General business administration majors may take any of the policy set options.

The major consists of 15 units. Students will select one 3- or 400-level course from each of five of the following seven 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); and (7) public administration and policy.

Human Resource 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 year. MAP 471 is the recommended policy option, but students may elect any of the policy options.

1. All students in this major will complete MAP 330 and 430.
2. Nine additional units (three courses) must be selected from the following: COUN 401, ECON 382, 383, 386, PSYC 450, MAP 432, 444, 480, MIS 479.

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 MIS 121 and 301 before the beginning of the major. MIS majors may take any of the policy options; MIS 471 is recommended.

1. All students in this major will complete MIS 307, 331, 341, and 441.
2. Nine additional units (three courses) may be selected from the following: MIS 411, 421, 422, 451, 453, and 461.

Materials describing career paths, recommended major courses, and suggested options for upper-division nonbusiness electives are available in the MIS 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 MAP 376 prior to beginning major courses. Students may elect any of the policy options; MKTG 471 is recommended.

1. All students in the major will complete MKTG 440 and 450. (MKTG 361, a prerequisite to all 400-level marketing courses, should be taken in the first semester of the junior year).
2. Nine additional units (three courses) are to be selected from 400-level marketing courses.

Operations Management

This major offers preparation for management careers in manufacturing and service operations. Emphasis is placed on operation and control of inventory systems, materials management, plant and project scheduling, and service design. Both quantitative and computer based techniques are used for specific applications in these areas.

The major 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 MIS 121 before the beginning of the major. MAP 471 is the recommended policy option, but students may elect any of the policy options.

1. All students in the major will complete MIS 473a-473b.
2. Three additional courses (nine units) must be taken:
   a. At least one course must be selected from MIS 474, 475, 476, or 479.
   b. Two more courses may be taken from either those courses listed under a or MIS 301, 331, 421, 422, SIE 462.

Real Estate

This major is under review. See department for information.

PRESCRIBED CURRICULUM FOR BACHELOR OF SCIENCE IN PUBLIC ADMINISTRATION DEGREE

The undergraduate curriculum in public administration seeks to provide the student with a broad general education as well as preparing one for imaginative and responsible citizenship and leadership roles in the public sector of society. The broad
general education foundation includes course work in communications, mathematics and quantitative methods, the language of commerce, the social and behavioral sciences, the natural sciences, western and non-western civilizations, ethics, international multicultural experience, foreign language, literature and the arts. The professional portion of the program includes course work in management, policy and public sector administration.

The B.S.P.A. degree requires a minimum of 125 units including all of the areas and requirements detailed below. A minimum of 54 units must be completed in course work offered by departments outside the BPA College. Additionally, a minimum of 51 units must be completed in upper-division courses numbered 300 or higher. A grade-point average of at least 2.0000 on all work undertaken for the degree program and in the major field is required for graduation.

Students expecting to receive the B.S.P.A. degree must attain Advanced Standing as a BPA student and have declared a major prior to applying for degree candidacy. Any course work that might be applicable to the upper-division professional core or major requirements which is taken while enrolled in other colleges or at other universities is subject to acceptance by the BPA College for degree certification purposes.

Minimum Requirements for the B.S.P.A. Degree
General Education Requirements

I. Basic Skills and Proficiencies
A. Communications
   ENGL 101 or 103H 3
   ENGL 102 or 104H 3
   Upper-Division Writing Proficiency Examination? 3
   COMM 103, 112, or 412 3

B. Mathematics and Quantitative Methods
   Math 119 3
   Math 123 3
   PA 204 3
   STAT 275 3

C. Language of Commerce/Pre-Professional Course Work
   PA 206 3
   MIS 111 3
   ACCT 200 3
   ACCT 272 3
   ECON 200 3

II. Study Areas
A. Biological and Physical Sciences
   Two semesters selected from astronomy, atmospheric sciences, chemistry, ecology and evolutionary biology, geography (103a, 103b, 104a, and 104b only), geosciences, hydrology, microbiology and immunology, molecular and cellular biology, physics or planetary sciences. (6-8 units)

B. Social and Behavioral Science and Ethics
   Three units selected from anthropology, linguistics, psychology or sociology plus 3 units from a list of ethics course options available in the BPA Undergraduate Programs Office. (6 units)

C. Western and Non-Western Civilizations
   Six units of western and three units of non-western civilization course options selected from the relevant lists in the BPA Undergraduate Programs Office. (9 units)

D. International and Multicultural Experience
   Two courses in international affairs selected from the relevant options list in the BPA Undergraduate Programs Office. (6-8 units)

E. Foreign Language
   Two semesters of the same foreign language at the college level is required. Students whose native language is not English or who have passed a language proficiency examination at the 16-unit level can be absolved of the requirement. Contact the Undergraduate Programs Office for details about doing so. (8 units)

F. Arts and/or Literature
   Six units in the arts and/or literature selected from the relevant course option lists available in the BPA Undergraduate Programs Office. (6 units)

Professional Requirements

III. Professional Core
A. Communications
   ENGL 300 and 435; MAP 305; PA 405, 410, 470; ECON 200; and 6 to 8 units of professional courses.

B. Mathematics and Quantitative Methods
   Math 119, 123, 204, 206; STAT 275; ACCT 200, 272; ECON 200; and 6 to 8 units of biological and physical sciences.

C. Language of Commerce/Pre-Professional Course Work
   PA 206, 207, or 306
   MIS 111
   ACCT 200
   ACCT 272
   ECON 200

IV. Major Fields
A major field of 12 units is to be chosen from the set of restricted options in the selected major area. (12 units)

V. Free Electives
   (13-15 units)

TOTAL REQUIRED FOR GRADUATION 125 units

B.S.P.A. Advanced Standing Lower-Division Requirements

To attain advanced standing as a BPA student, the following lower-division program course requirements must be met: ENGL 101 or 103H, 102 or 104H, MATH 119, 123, MIS 111, PA 204, 206, STAT 275, ACCT 200, 272, ECON 200; and 6 to 8 units of biological and physical sciences. In addition, sufficient general education study area and elective units to meet the minimum 56 required by the policy are necessary.

MAJOR FIELDS AVAILABLE

Students are asked to declare one of the major fields in public administration upon enrollment. Any subsequent change of major is accomplished by completing a change-of-major form available in McClelland Hall 103.

The major consists of 12 units selected from a set of restricted options in the major field. 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 6 units of University credit 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 fields, prepares students for administrative positions in government and non-profit agencies. Graduates of the program may seek entry-level positions in program analysis, research and evaluation, budgeting and finance, personnel, or public information. The public management major also prepares students for graduate study in law, planning, or public policy and administration.

Students must select 12 units (four courses) from the following courses: MAP 320, 330, 432, 444; MIS 411; PA 406, 435; and MKTG 370.

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.

Students must select 12 units (four courses) from the following courses: PA 341, 342, 343, 344, 441, 442.

Health and Human Services Administration
This major prepares students to exercise operational skills and administrative responsibilities in human services and health services agencies and institutions. It is appropriate for students with interests in hospital administration, long-term care administration, human services policy, and in preparation for graduate study in health and allied professions, social work and planning.

Students must select 12 units (four courses) from the following courses: PA 221, 321, 421, 422, 423; PHIL 321; POL 405; and MKTG 370.

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 Office of Executive Programs
The Office of Executive Programs utilizes college faculty, as well as experts from across the country, in the presentation of conferences, programs and seminars for executives. The Executive Development Conference, a nine-day program, attracts top executives from throughout the U.S. and several foreign countries. The Arizona Executive Program is designed to promote the professional development of upwardly mobile managers and executives through a series of weekly and three-day residential sessions. The Public Management Program, an eight-day residential program, brings executive education to senior managers in state and local government.

Distinguished Lectures
Throughout the academic year, leaders in American business and public management are brought to the college to speak to students and faculty. The MBA Student Association sponsors an Executive Lecture Series. Other lectures are presented periodically when exceptional executive talent is available.

Career Guidance
In addition to the services offered by the University of Arizona Career Services Office, the College of Business and Public Administration provides career assistance to its students. At career forums throughout the year, students learn more about the kinds of career opportunities available in a variety of business and public fields. Executives also serve as guest speakers in classes and at special programs sponsored by BPA student organizations.

RESEARCH AND SPECIAL PUBLIC SERVICE UNITS

In addition to the two baccalaureate degrees and other supplemental programs listed above, the College of Business and Public Administration also has the following research centers described in the catalog section on Academic Divisions and Organizations. See:

The Center for the Management of Information (CMI)
The Economic and Business Research (EBR)
The Economic Science Laboratory (ESL)
The Karl Eller Center for the Study of Private Market Economy

STUDENT INVOLVEMENT

The college encourages student participation in the numerous professional clubs, organizations and honorary societies associated with the various fields of business and public administration.

The BPA Student Council is a college-wide service organization which serves as a liaison between students, faculty, administration and other student organizations. The council sponsors and participates in a variety of college activities and programs.

The honoraries and professional organizations affiliated with the college include Alpha Kappa Psi, a professional business fraternity; Alpha Mu Alpha, a national marketing honorary; American Marketing Association, a professional marketing organization student chapter; Beta Alpha Psi, a national accounting honorary; Beta Gamma Sigma, a national scholastic honor society; Delta Sigma Pi, an international business fraternity; Management Information Systems Association, a professional information systems organization; Phi Chi Theta, a college professional fraternity; Pi Alpha Alpha, the National Honor Society for Public Affairs and Administration; Public
Administration Student's Association; University of Arizona Personnel Administration Association, a student chapter of the American Society for Personnel Administration; Accounting Club; Economics Club; Finance Management Association; Association of Collegiate Entrepreneurs; AIESEC-International Association of Students in Economics and Business; American Production and Inventory Control Society; Minority Business Student Association; and Master of Business Administration Student Association.

Outstanding student accomplishments are recognized each year through the presentation of a number of awards and honors.
Student Teaching — College of Education Supervising Teacher (Assoc. Professor Ruth Beeker) with a student teacher at Elvira School. Photo by George Kew

Education
The College of Education is committed to the preparation of qualified individuals in fields of instruction in elementary, secondary, special, and postsecondary education. Further, the college prepares individuals in the supervision and administration of elementary and secondary schools, special education and rehabilitation schools and facilities, community colleges, and universities. The college is composed of the departments of Educational Administration and Higher Education; Educational Psychology; Language, Reading and Culture; Special Education and Rehabilitation; and Teaching and Teacher Education. The college also administers the Center for the Study of Higher Education and the Arizona Center for Evaluation and Measurement.

DEGREES, MAJORS, AND MINORS

Degrees
The College of Education offers academic programs leading to the Bachelor of Arts in Education, Bachelor of Science in Education, Master of Arts, Educational Specialist, Doctor of Education, and Doctor of Philosophy. At the time of catalog production, the Master of Education and Master of Teaching degrees were under review.

Graduate Majors
The Doctor of Philosophy degree is available with majors in educational psychology; higher education; language, reading and culture; special education and rehabilitation; and teaching and teacher education. The Doctor of Education degree is available with majors in educational administration; language, reading and culture; special education and rehabilitation; and teaching and teacher education. The Educational Specialist degree is offered with majors in educational administration; educational psychology; language, reading and culture; and special education and rehabilitation. The Master of Arts degree is available with majors in bilingual/multicultural education; educational psychology; higher education; language, reading and culture; special education and rehabilitation; and teaching and teacher education.

At the time of catalog production, the foundations of education major for the Master of Arts and Doctor of Philosophy degrees was under review. The educational media major for the Master of Arts and Educational Specialist degrees was also under review. Prospective students should consult the Office of Student Services in the college for further information regarding these majors.

For further information on requirements for graduate degree programs in education, please see the Graduate Catalog.

Undergraduate Majors
At the undergraduate level, students select either a major administered within the College of Education or a subject area teaching major administered through another academic department. Majors within the College of Education are available in elementary education and rehabilitation. At the time of catalog production, the major in early childhood education was under review.

For information on course requirements for elementary education major, students should consult an advisor in the Department of Teaching and Teacher Education. For information on course requirements for the rehabilitation major, students should consult an advisor in the Department of Special Education and Rehabilitation.

A teaching major is defined as the secondary school academic subject area in which the student plans to teach. Teaching majors are administered through the relevant academic departments in cooperation with the College of Education, which is responsible for providing the necessary professional education course work. Subject area course requirements for prospective teachers will be found under the appropriate academic department in the Departments and Courses of Instruction section of this catalog. For information on the professional education requirements, consult an advisor in the Department of Teaching and Teacher Education.

The Bachelor of Science in Education degree is awarded for a major in rehabilitation (including a specialty in interpreting for the deaf) and for teaching majors in mathematics or any of the physical sciences. The Bachelor of Arts in Education degree is awarded for majors in elementary education, or any teaching major area other than mathematics or any of the physical sciences. See “Majors and Minors for Secondary School Teaching” for a list of available teaching majors.

Undergraduate Minors
Most teaching majors will require a teaching minor in a second field of specialization. Course requirements for these teaching minors will be listed under the relevant academic department in the Departments and Courses of Instruction section of this catalog. Four particular teaching majors are sufficiently comprehensive as to require no additional minor subject (see “Majors Requiring No Minor”).

Students majoring in elementary education are required to either complete an extended general education preparation exam or a modified extended general education program plus an academic concentration. These options should be selected and planned with the assistance of an advisor in the Department of Teaching and Teacher Education. Majors in rehabilitation require a minor field which should be selected and planned with the assistance of an advisor in the Department of Special Education and Rehabilitation.

Two nonteaching minors are available in the areas of rehabilitation and special education. These minors can be combined with education or teaching majors or can be selected by persons who wish to explore these fields as an adjunct to majors outside the College of Education.

Selection of Majors and Minors
Majors and minors should be selected in consultation with a College of Education advisor as early in the undergraduate career as possible, and no later than the junior year. Major subjects may be changed at the beginning of any semester. However, if a change of major or minor field is made late in the program, an additional semester or more may be necessary to complete the required course work.

Teaching majors and minors should be selected from the following lists of subjects commonly taught in high schools in most states. With the exception of the four majors that require no minors, all subject areas available as teaching majors may also be chosen as teaching minors; additional subject areas are available as minors only.
Majors and Minors for Secondary School Teaching

MAJORS REQUIRING A MINOR

The following teaching majors are also available as teaching minors:

- Chemistry
- Communication
- Earth Science
- English
- French
- General Biology
- Geography
- German
- History
- Journalism
- Latin
- Mathematics
- Physics
- Political Science
- Russian
- Spanish

MINORS ONLY

Anthropology
Athletic Coaching
Bilingual/Bicultural Education
Chemistry/Physics
Computer Science
Economics
Italian
Media Arts
Oriental Studies
Portuguese
Psychology
Sociology

MAJORS REQUIRING NO MINOR

EXTENDED ENGLISH—For information, see the Department of English section in this catalog.

PHYSICAL EDUCATION (K-12 EMPHASIS)—For information, see the Department of Exercise and Sport Sciences section in this catalog.

LANGUAGE ARTS-SOCIAL STUDIES—A 50-unit combination of language arts and social studies intended for junior high/middle school teaching. For information, see an advisor in the Department 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 Department 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; similarly, a major in agricultural education, offered by the College of Agriculture, will earn a Bachelor of Science in Agriculture.

The following teaching majors and degrees are available outside the College of Education:

- Agricultural Education (B.S. Ag.)
- Art Education (B.F.A.)
- Health Education (B.S.H.S.)
- Home Economics Education (B.S.F.C.R.)
- Music Education (B.M.)
- Physical Education (B.S.H.S.)
- Theatre Arts Education (B.F.A.)

BUSINESS EDUCATION—The University offers no formal major in business education. However, students with an interest in teaching business and office subjects can do so through a program developed in cooperation between the College of Education and the College of Business and Public Administration. Because of the nature of the course requirements, students considering this program are encouraged to consult an advisor in both the College of Business and Public Administration and the College of Education early in their careers.

ADMISSIONS

Formal admission to the College of Education is required of all undergraduate students who wish to pursue a major for a College of Education degree as well as for students who wish to enroll in restricted professional education courses for the purposes of earning a teaching certificate. Undergraduate students normally apply for admission to the College of Education at the beginning of their junior year, having completed their first two years of study in the College of Arts and Sciences as pre-education majors. However, students are encouraged to consult the pre-education advisor in the College of Education as soon as they begin considering education as a career goal in order to plan their lower-division course work most effectively. Upon formal admission to the College of Education, students will be assisted by an advisor in the department appropriate to their chosen major.

Admission Requirements for Rehabilitation Major

To be admitted to the rehabilitation degree program, applicants must meet the following minimum requirements:

1. Completion of 56 units of credit applicable to the baccalaureate degree in rehabilitation.
2. Cumulative grade-point average of 2.5000 or better. (This also applies to transfer students' work taken at other institutions.)

Admission Requirements for Majors Involving Initial Teacher Preparation

As a professional school within a land-grant university, the College of Education best serves the needs of the State of Arizona by preparing teachers who possess strong records of academic achievement, who exemplify high ideals of character, who are representative of the cultural heritage and linguistic diversity of the State, and who demonstrate a clear and continuing commitment to the education of fellow human beings.

Admission to programs for initial teacher preparation is by application only. To ensure the selection of students who meet the expectations stated above, the college screens applications according to the following four criteria:

1. Academic achievement, as indicated by grade-point average and scores on required and optional standardized tests.
2. Language proficiency, in English and in other languages common to Arizona and the American Southwest, as indicated by applicant's written materials, letters of recommendation, test scores, and grades in relevant courses.
3. Cross-cultural experience indicative of an understanding of and an ability to work successfully with members of different racial and ethnic groups represented in Arizona and the Southwest, as indicated by family background, bilingualism, relevant work experience, or significant and sustained association with a racial or ethnic group different from one's own.
4. Commitment to the profession and a capacity to meet its professional standards, as indicated by pertinent work experience, pertinent volunteer experience, letters of recommendation, applicant's self statement, and other relevant information that the applicant may choose to submit.

To be eligible for admission, each applicant must have (A) attained a cumulative grade-point average of at least 2.5000 on the most current 56 units of credit, (B) attained passing scores on a college-designated admissions test, (C) completed not less than 56 units of credit applicable to a baccalaureate degree, and (D) taken the Upper-Division Writing-Proficiency Examination. Once eligibility for admission is determined, applications are then reviewed according to criteria 1 through 4 above. At the discretion of the college, interviews may be required in order to provide additional information regarding these criteria. Only those applicants who, in the judgment of the College Committee on Teacher Admissions, Credentials and Standards, meet the standards established by these criteria are offered admission.

The college may, from time to time, establish program initiatives of special importance to the educational needs of the State of Arizona or in certain academic areas of prominence at the University of Arizona. In such instances, applicants whose abilities and accomplishments qualify them for participation in these initiatives, and who meet the eligibility requirements stipulated above, may be given preference in admission.

In unusual cases, the Committee on Teacher Admissions, Credentials and Standards may offer provisional admission to an applicant who meets the eligibility requirements but whose record on one or more of the four criteria is in doubt. The provisional status is reviewed after the applicant completes not more than ten units in the professional education sequence, and a final determination of admission is made in the course of this review.

Meeting or exceeding minimum admission standards as outlined in this admission policy does not in any way imply or guarantee admission to the initial teacher preparation program. If limitations on resources require restrictions to be placed on the number of students admitted in a given semester or year, the Committee on Teacher Admissions, Credentials and Standards will admit students according to the level of distinction achieved on one or more of the criteria above or the strength and balance of the applicant's record across the several criteria.

Post-Baccalaureate Program in Initial Teacher Preparation

Persons who have previously earned a bachelor's degree and are interested in obtaining a state teaching certificate must apply for admission to the initial teacher preparation program in the same way as undergraduate students do. This would also apply to graduate students who have already been admitted to a graduate degree program in the University. The same admission policy and procedures used with undergraduates are used in reviewing the applications of post-baccalaureate and graduate students. To be considered eligible for admission, an applicant must have earned an undergraduate degree at a regionally accredited institution, with an overall grade-point average of 2.5000 or better.

Post-baccalaureate and graduate students who are admitted to the initial teacher preparation program will be required to pass the basic skills portion of the Arizona Teacher Proficiency Examination (ATPE) before they can begin their student teaching, and they will need to pass the professional knowledge portion of the examination prior to their certification.

Further information for post-baccalaureate and graduate students is available in the Office of Student Services.

RESTRICTED ENROLLMENT IN PROFESSIONAL EDUCATION COURSES

Most professional education courses in the initial teacher preparation program (also referred to as "methods" courses) are closed to students who have not been formally admitted to the program. The restriction involves a variety of courses in several departments of the College of Education as well as certain education-related courses in other colleges. A list of restricted courses is available in the Office of Student Services in the College of Education.

Undergraduate students majoring outside the College of Education (see "Teaching Majors for Degrees Outside the College of Education" above) are required to meet the following minimum standards before enrolling in any "closed" professional education courses:

1. Completion of 56 units of credit applicable to a baccalaureate degree,
2. A cumulative grade-point average of 2.5000 or better, and
3. Passing scores on a college-designated admissions test.

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 admission testing, including advisement and remediation, may be obtained from the Office of Student Services.

IMPORTANT: Students who enroll in professional education courses without meeting all necessary requirements will be administratively dropped from the classes. If, through student or administrative oversight, an ineligible student completes a restricted course, Arizona law and Board of Regents policy expressly prohibits the use of the course toward meeting teacher certification requirements. It is therefore essential that prospective enrollees confirm their eligibility in the Office of Student Services prior to registering for a restricted course.

UNDERGRADUATE PROGRAMS

The following undergraduate programs are currently being offered within the departments of Special Education and Rehabilitation and of Teaching and Teacher Education.

Major in Early Childhood Education

At the time of catalog production, the major in early childhood education was under review. Prospective students should consult the Office of Student Services in the college for further information regarding this major.

Major in Elementary Education

Students who wish to prepare for teaching careers in grades kindergarten through sixth grade should select a major in elementary education. Students should check with the Department of Teaching and Teacher Education for current degree requirements.
Dual Program in Bilingual and Elementary Education
This course of study is intended for students who plan to teach in classrooms operating bilingual curricula in English and Spanish.

Majors in Secondary Education
College of Education students planning to teach at the secondary school level must complete the requirements for a teaching major or a teaching major and minor from among the subjects and fields listed under the "Majors and Minors for Secondary School Teaching" section above. Students are encouraged to contact an advisor in the Office of Student Services during their lower-division years concerning selection of appropriate teaching majors and minors. Students should check with the Department of Teaching and Teacher Education for current degree requirements.

Major in Special Education and Rehabilitation
The major in special education and rehabilitation will prepare students for professional employment in public and private agencies, including rehabilitation and education. The major includes specialties in rehabilitation, deaf studies, and early childhood special education. At the time of catalog production, the major in special education and rehabilitation was under review. Students are encouraged to check with the Office of Student Services or the Department of Special Education and Rehabilitation for degree requirements.

Minor in Rehabilitation
A nonteaching minor in rehabilitation exposing a student to various disabled populations is available at the undergraduate level. Students are encouraged to check with the Office of Student Services or the Department 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 Office of Student Services or the Department of Special Education and Rehabilitation for requirements for the minor.

CERTIFICATION FOR COMMUNITY COLLEGE TEACHING
The College of Education cooperates with departments in other colleges of the University in the preparation of students who are candidates for community college teaching certificates. The Arizona Board of Directors for Community Colleges has established the following standards for academic certification.

The minimum requirements for an Arizona Community College Regular Certificate are:

1. A master's or higher earned degree with at least 24 semester hours of upper-division and/or graduate credit in the field to be taught, or

2. A bachelor's degree in a specific area with at least three years of directly related occupational experience and skill in the field to be taught, or

3. An associate's degree or at least 64 semester hours and, in addition, at least five years of directly related occupational experience in the field to be taught.

In addition, applicants must have completed an approved course on the subject of the community college offered at one of the Arizona universities or by a community college district.

 Provisional, special, and district specific Arizona community college certificates are available with varying requirements and periods of validity. The Center for the Study of Higher Education in the College of Education will assist individuals seeking application information on these certificates. The above standards are subject to modification by the Arizona State Board of Directors of Community Colleges.

RESEARCH CENTERS AND PUBLIC SERVICE
Research centers and public services operating within the College of Education greatly enhance the academic programs and research capabilities of the college. Basic and applied research is conducted in all contexts and at all levels of professional education. Professional services are available to clientele ranging from individuals to such institutions as school districts; public and private postsecondary institutions; local, state, and federal agencies; health service-related agencies; correctional institutions; Indian tribal governments; and business and industry.

Arizona Center for Educational Evaluation and Measurement
A description of the nature and function of this center can be found in the "Research and Special Public Service Units" section of this catalog.

Center for the Study of Higher Education
A description of the nature and function of this center can be found in the "Research and Special Public Service Units" section of this catalog.

University Rehabilitation Services
The rehabilitation program provides an excellent setting for interdisciplinary research and demonstration projects. Such projects are directed by faculty members for various university departments. Research is encouraged in all aspects of rehabilitation. A variety of services is available through the Department 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 & Mines
Engineering education is preparation for a professional career. While most graduates embark on careers in engineering practice, men and women with engineering majors find the baccalaureate program excellent preparation for other fields as diverse as law, medicine, business and government. An engineering education develops analytical and quantitative thinking, a critical but optimistic approach to problem solving, and the habit of self-directed future learning. Graduates make successful transition to a wide variety of different careers. The graduate has a thorough understanding of how materials, energy, and information can be adapted to humanity's needs and desires. This is developed through the study of physical science, mathematics, engineering science, engineering design, humanities, social science and 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, Schools and Programs, " College of Engineering and Mines entrance requirements differ from the general university requirements. Also, students transferring from other colleges or universities are required to present a cumulative grade-point average of 2.500 or better for all previous college work.

PROFESSIONAL FIELDS OF STUDY

The college offers four-year curricula leading to Bachelor of Science degrees in engineering and in areas of engineering science:

Engineering
Aerospace Engineering
Agricultural and Biosystems Engineering
Chemical Engineering
Civil Engineering
Computer Engineering
Electrical Engineering
Geological Engineering
Industrial Engineering
Materials Science and Engineering
Mechanical Engineering
Mining Engineering
Nuclear Engineering
Optical Engineering
Systems Engineering

The Engineering Sciences
Engineering Mathematics
Engineering Physics
Hydrology

FRESHMAN YEAR

Students should identify an intended major from the above lists when they are admitted into the college. This will assure personal access to an academic advisor and initiate career decision making. After completion of ENGR 101 and 102 they should re-evaluate their career choices. There will be no loss in credit if majors are changed at the end of the freshman year.

The common freshman curriculum for all degrees offered by the college is as follows:

<table>
<thead>
<tr>
<th>Course</th>
<th>First Semester</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Units</td>
<td>Units</td>
</tr>
<tr>
<td>ENGR 101 (see options)</td>
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<td>ENGR 102</td>
</tr>
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<td>5/3</td>
<td>MATH 125b</td>
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<td>MSE/CHM (see options)</td>
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<td>PHYS 110</td>
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</tr>
<tr>
<td>Total</td>
<td>18/16</td>
<td>Total</td>
</tr>
</tbody>
</table>

MATHEMATICS PLACEMENT

A mathematics readiness test will be taken by all entering freshmen. College algebra and trigonometry should be reviewed before taking the test. Some students may find that enrolling in a pre-calculus course at a local college during the summer prior to entering the University will allow them to enter directly into MATH 124 or 125a and the freshman curriculum. Those who are placed in MATH 124 should postpone the first semester Humanities/Social Science (HSS) course to a summer session or a later semester. Students placed in a pre-calculus course should take that course during the first semester and substitute a second HSS course for ENGR 101. Subsequent semesters can be organized with the assistance of an advisor. Studies show that while graduation may be delayed by a semester for students who begin the freshman year in pre-calculus mathematics, success still depends on individual effort and ability.

OPTIONS AVAILABLE DURING THE FRESHMAN YEAR

Sections of ENGR 101 based on FORTRAN and others based on PASCAL are offered. Students may choose either, but the following are recommended:

FORTRAN
Aerospace Engineering, Chemical Engineering, Civil Engineering, Electrical Engineering, Physics, Geological Engineering, Mechanical Engineering, Mining Engineering, Nuclear Engineering.

PASCAL

EITHER
Agricultural and Biosystems Engineering, Engineering Mathematics, Hydrology, Materials Science and Engineering.

The 4-unit chemistry requirement listed in the second semester of the freshman year may be satisfied by MSE 110 or by CHEM 103b and CHEM 104b. Students may choose either of these options, but the following are recommended:

MSE 110

CHEM
Chemical Engineering, Civil Engineering, Engineering Mathematics, Hydrology, Mining Engineering, Geological Engineering.

EITHER OPTION
Agricultural and Biosystems Engineering, Industrial Engineering, Nuclear Engineering, Systems Engineering.
Students who change majors at the end of the freshman year may need to learn the other computer language or take the other chemistry course. This will be determined by the department into which the student transfers, but additional credit thus earned will apply to the graduation requirements of the newly selected degree.

COLLEGE OF ENGINEERING AND MINES FRESHMAN HONORS PROGRAM

This program recognizes the abilities and achievements of high school graduates and offers a variety of special challenges and resources to encourage the full development of academic and interpersonal skills. The program is open to freshmen who have applied for admission to the College of Engineering and Mines and who have been accepted by the University Honors Program.

1. A Flinn Scholar or National Merit Scholar.
2. Among the top 5% of his or her graduating class.
3. An ACT composite score of at least 30 (or SAT of 1300).

Inquiries should be directed to: Dr. Dunbar Birnie, College of Engineering and Mines, University of Arizona, Tucson, Arizona 85721. Applications for the University Honors Program can be obtained from the Honors Program, Slonaker Building, University of Arizona, Tucson, Arizona 85721. Freshman honors students are strongly encouraged to register for ENGR 196H.

ACCREDITATION AND THE CURRICULAR CONTENT REQUIRED FOR ENGINEERING DEGREES

The Accreditation Board for Engineering and Technology (ABET) is the official agency for accrediting undergraduate engineering degrees. As part of the required curricular content, every engineering student must complete a minimum of 16 units of engineering design, 32 units of engineering science, and 16 units of humanities and social sciences courses. These requirements are integrated into the curricula that are specified on the following pages for each engineering degree.

Engineering Design (ED)

Engineering design is the process of devising a system, component, or process to meet desired needs. It is a decision-making process in which resources are converted optimally to meet stated objectives. ED courses include at least some of the following features: development of creativity, use of open-ended problems, development and use of design methodology, formulation of problem statements and specifications, consideration of alternative solutions, feasibility considerations, and detailed system descriptions. They may also include constraints such as economic factors, safety, reliability, aesthetics, ethics, and social impact.

Engineering Science (ES)

The engineering sciences have their roots in mathematics and basic sciences, but carry knowledge toward creative application. These studies provide a bridge between the sciences and engineering practice. At least one ES course must be taken outside of the department of the major.

Humanities and Social Science (HSS)

The humanities are the branches of knowledge concerned with the culture and values of the human race, and the social sciences are studies of individual relationships in and to society. HSS studies assist in meeting the objective of a broad education and in meeting the objectives of the engineering profession. In the interests of making engineers fully aware of their social responsibilities and better able to consider related factors in the decision-making processes, HSS course work is required as an integral part of the engineering program.

The HSS requirements must also be met by students majoring in engineering mathematics, engineering physics, and hydrology.

The ED and ES units of each engineering course are designated in the course description presented in the catalog section titled Departments and Courses of Instruction. The HSS requirement and a list of approved HSS courses are available in the Geology Building, Room 134.

COLLEGE OF ENGINEERING AND MINES SCHOLARSHIPS

A limited number of scholarships are recommended each year by departments within the College of Engineering and Mines. Students interested in applying for these scholarships should contact their departmental offices for information. It is usually best to do this prior to March 1. All scholarships require the submission of an application to the Office of Student Financial Aid (203 Administration Building) and many require the demonstration of need as defined by that office. Scholarships are not available in the dean's office.

OPTIONS

Biomedical Engineering Option

Biomedical engineering can be defined as a multidiscipline in which physical scientists and engineers interact with life scientists and physicians to solve problems ranging from basic investigations to applications in clinics and the health care delivery system. The departments of Aerospace and Mechanical Engineering, Chemical Engineering, Electrical and Computer Engineering, Nuclear and Energy Engineering, and Systems and Industrial Engineering have biomedical options available as undergraduate technical electives, graduate minor programs and research. A university committee coordinates the option. See "Biomedical Engineering" under the Departments and Courses of Instruction section for further details.

Computer Software Engineering Option

This option deals with the analysis and design of systems in which computer programs play an important role. The computer software engineer performs the systems analysis which determines the computer programs to be developed, participates in the structured design of the programs, manages the programming effort and oversees the testing, debugging, installation and documentation of the programs. This option is available through the undergraduate degree program in systems engineering by structuring the choice of technical electives.

Energy Engineering Option

This option encourages interdisciplinary studies in the College of Engineering and Mines involving production, conversion, distribution, and utilization of energy from conventional and renewable sources. New perspectives on energy supply and demand are emphasized by an exposure to energy management principles, conversion technology and environmental issues. Courses include energy management and utilization, modern air conditioning systems, solar and wind energy, photovoltaics, electrical and thermal power systems, and environmental analysis.

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. This option is available through the undergraduate degree program in industrial engineering by structuring the choice of technical electives.

Premedical Option
An engineering degree can provide a valuable background for physicians who will utilize the modern technological advances being implemented in the practice of medicine or who will participate in medical research. All departments in the college offer a premedical option. Electives which satisfy admission requirements for medical school are selected by the student and departmental advisor.

ADVANCED STANDING

Students must have been granted advanced standing to enroll in 300- or 400-level courses in the College of Engineering and Mines. To qualify for permanent advanced standing, students must meet the following criteria:

1. Completion of a minimum of 56 credit hours, including all required courses listed in the freshman and sophomore years of the curriculum of the student's major department. At least 15 units of required courses must have been completed at the University of Arizona. In addition, all admission deficiencies must have been removed.
2. A University of Arizona cumulative grade-point average of not less than the minimum set by the major department, but in no case below 2.0000.
3. Completion of the Upper-Division Writing-Proficiency Examination.

Students otherwise qualified and lacking no more than three required lower-division courses, or the writing-proficiency examination, may be granted temporary advanced standing. If these requirements are not completed during the next semester they are offered, advanced standing may be revoked until they are completed.

Transfer students who do not meet the 15-unit requirement set forth above, but meet all other requirements, will be granted temporary advanced standing until they have completed a minimum of 15 units of required courses at the University of Arizona. At that time advanced standing will become permanent if the student's grade-point average at the University of Arizona meets the departmental requirement; if it does not, advanced standing will be revoked.

Application forms are available at the Office of the Dean of the College of Engineering and Mines (Room 134, Geology Building) and at all departmental offices in the college.

Students wishing to enroll in 300- or 400-level engineering courses, who are registered in colleges other than the College of Engineering and Mines, will normally be expected to have fulfilled the above criteria relative to their own majors. Such students will be allowed to register for one advanced-standing course each semester with 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 Engineering Student Council. Students are encouraged to participate in these organizations during all four years of enrollment. Contact departmental or college offices for information.

Scholastic Honorary Societies
Alpha Epsilon (agricultural & biosystems engineering)
Alpha Nu Sigma (nuclear engineering)
Eta Kappa Nu (electrical engineering)
Tau Beta Pi (all engineering)

Professional Organizations
American Nuclear Society
American Society of Agricultural Engineers
American Society of Civil Engineers
American Society of Mechanical Engineers
American Institute of Aeronautics and Astronautics
American Institute of Chemical Engineers
American Water Resources Association
Institute of Electrical and Electronic Engineers
Institute of Industrial Engineers
Society of Automotive Engineers
Society of Mining Engineers (AIME)
Society of Reliability Engineers
Student Energy Society
The Minerals, Metals and Materials Society (AIME)

Other Engineering Student Organizations
American Indian Science and Engineering Society
National Society for Black Engineers
Society of Hispanic Professional Engineers
Society of Women Engineers
Theta Tau

GRADUATE STUDY

The Master of Science (M.S.) degree is offered with majors in aerospace engineering, agricultural and biosystems engineering, chemical engineering, civil engineering, electrical engineering, engineering mechanics, geological engineering, hydrology, industrial engineering, materials science and engineering, mechanical engineering, mineral economics, mining engineering, nuclear engineering, reliability engineering, systems engineering and water resources administration. The Doctor of Philosophy (Ph.D.) degree is offered with majors in aerospace engineering, agricultural and biosystems engineering, chemical engineering, civil engineering, electrical engineering, engineering mechanics, geological engineering, hydrology, materials science and engineering, mechanical engineering, mineral economics, mining engineering, nuclear engineering, systems and industrial engineering and water resources administration. Complete details of both graduate programs are set forth in the Graduate Catalog.

PLACEMENT SERVICES

The following programs are available and recommended to all students in the College of Engineering and Mines. Information is available through the Career Services Office.

Cooperative Education Program
The Cooperative Education Program provides students with an opportunity to supplement their academic studies with periods of career-related work experience prior to graduation. Co-op is a full-time, paid work experience away from formal studies. Co-op students who carefully plan their academic schedules will be able to participate and still graduate in 4-1/2 to 5 years. A Summer Cooperative Education Program is also available.
Internship Program
Students who want to work part-time in a career position while attending the University should explore local opportunities available through the Internship Program.

Placement Program
Students who have qualified for advanced standing in the college have reached such a level of career progression that they should visit the Career Services Office and initiate preparation for placement interviews during the senior year. Training in resume writing, interviewing, and other placement skills are available.

BACHELOR OF SCIENCE IN AEROSPACE ENGINEERING
(ABET Accredited)
Aerospace engineering is concerned primarily with solving the problems of flight, and places special emphasis on the design and operation of all types of aircraft, rockets, satellites, and spacecraft. In recent years, aerospace engineers have also become involved in the design of deep-submergence vehicles, modern surface ships, air cushion vehicles, and ground transportation systems.

Equipment supporting aerospace engineering studies includes digital computers with interactive graphics; internal combustion engines; microcomputers and microprocessors; nonlinear control systems; production and tooling shop; low and high-speed wind tunnels; refrigeration and heat transfer loops; and instrumentation of a wide variety.

Required Curriculum:

First Semester

Course
Math 223
Physics 116
Chemical Engineering Elective
Hum./Soc. Sci. Elective
Total

Second Semester

Course
Math 254
Chemical Engineering Elective
ECE 207
Hum./Soc. Sci. Elective
Total

Sophomore Year

First Semester

Course
Math 223
Physics 116
Chemical Engineering Elective
Hum./Soc. Sci. Elective
Total

Second Semester

Course
Math 254
Chemical Engineering Elective
ECE 207
Hum./Soc. Sci. Elective
Total

Junior Year

First Semester

Course
Math 223
Physics 116
Chemical Engineering Elective
Hum./Soc. Sci. Elective
Total

Second Semester

Course
Math 254
Chemical Engineering Elective
ECE 207
Hum./Soc. Sci. Elective
Total

Senior Year

First Semester

Course
Math 223
Physics 116
Chemical Engineering Elective
Hum./Soc. Sci. Elective
Total

Second Semester

Course
Math 254
Chemical Engineering Elective
ECE 207
Hum./Soc. Sci. Elective
Total

Total electives are 27 units. Electives must include a minimum of 8 units of agricultural/biological sciences with the balance of units selected from electives in the selected emphasis area. The design component of the program must total 18 units.

*Total electives are 27 units. Electives must include a minimum of 8 units of agricultural/biological sciences with the balance of units selected from electives in the selected emphasis area. The design component of the program must total 18 units.

BACHELOR OF SCIENCE IN CHEMICAL ENGINEERING
(ABET Accredited)
Chemical engineering is a profession which provides society with materials and energy in a safe and environmentally sound way. It deals with how chemicals are brought together to react, to be separated and purified, mixed, heated, contained and transported. Computers are used as an integral part of making the processes viable and economical.
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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</tr>
<tr>
<td>PHYS 116</td>
<td>4</td>
<td>PHYS 121</td>
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<td>CHEM 241a</td>
<td>3</td>
<td>CHEM 323</td>
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<td>CHEM 243a</td>
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<td>CHEM 243b</td>
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<td>CH E 316</td>
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<td>CH E 402</td>
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<td>CH E 326</td>
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<tr>
<td>CHEM 480a</td>
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<td>CHEM 480b or Adv. Sci.</td>
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<td><strong>Total</strong></td>
<td>18</td>
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**Junior Year**

<table>
<thead>
<tr>
<th>Course</th>
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<tr>
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<td>CH E 443</td>
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<tr>
<td>CH E 413</td>
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<td>CH E 420</td>
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<td>CH E 420</td>
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<tr>
<td>CH E 442</td>
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<td>H.S.S./T.E./T.R.*</td>
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<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
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**Senior Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>CH E 307</td>
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<td>C E 302</td>
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<td>C E 320</td>
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<td>18</td>
<td><strong>Total</strong></td>
<td>17</td>
</tr>
</tbody>
</table>

*B to meet the technical elective requirement, students must fulfill one of the following option sequences: Environmental engineering: C E 371, 423, 440, 441, (C E 402 or G EN 427); geotechnical engineering: C E 423, 440, 441, (C E 402 or G EN 427); hydraulics/water resources: C E 371, 423, 427, structural engineering: C E 336, 432, (434 or 437), (402 or 440); transportation and highway engineering: C E 361, 462, 463, (452 or 468); general civil engineering: C E 336, 361, 371, 423, (440 or 441). Listings of other acceptable technical electives are available from advisors.

**BACHELOR OF SCIENCE IN CIVIL ENGINEERING**

(ABET Accredited)

Civil engineering is concerned with a wide variety of elements of natural and man-made environments. The civil engineer conceives, designs, constructs, manages and maintains physical facilities and infrastructure such as residential and industrial buildings, bridges, transportation systems, tunnels, dams, power plants, space structures, resource sources and treatment systems, municipal and industrial waste disposal. Well-equipped physical and computer laboratories are available for instruction research.

Required Curriculum:

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>MATH 223</td>
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<td>PHYS 121</td>
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<td><strong>Total</strong></td>
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</table>

**Junior Year**

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**BACHELOR OF SCIENCE IN COMPUTER ENGINEERING**

(ABET Accredited)

The computer engineering program prepares students to work in the dynamic and rapidly expanding field of digital technology. Computer engineers design computers and computer systems, apply computers as components of larger systems, and apply digital techniques to solving a broad range of engineering problems. The curriculum includes a strong electrical engineering component, consisting of most of the required courses in the electrical engineering curriculum. To this base it adds extensive course work in both the hardware and software aspects of computers and digital systems. The program is strengthened by the availability of extensive laboratory and computing facilities.

The presence in the department of the Computer Engineering Research Laboratory, the Computer-Aided Design Laboratory, the Digital Image Analysis Laboratory, and the Computer-Aided Engineering Center, as well as research in artificial intelligence and expert systems, computer communications, computer networking, simulation, and other specialties, maintains a modern viewpoint in the undergraduate curriculum.

Required Curriculum:

**Sophomore Year**

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
</tr>
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<tbody>
<tr>
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<tr>
<td>C E 210</td>
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<td>C E 217</td>
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<td>C E 214</td>
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**Junior Year**

<table>
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<td>ECE 351a</td>
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BACHELOR OF SCIENCE IN ELECTRICAL ENGINEERING

(ABET Accredited)
The goal of the electrical engineering undergraduate curriculum is to educate immediately productive electrical engineers who are also qualified to pursue further educational activities. The program emphasizes basic scientific knowledge, modern design techniques, and laboratory techniques needed for design verification.

The presence in the department of the Computer Engineering Research Laboratory, the Computer-Aided Design Laboratory, the Electromagnetics Laboratory, the Microelectronics Laboratory, the Center for Microcontamination Control, and the SEMATECH Center of Excellence, as well as research in lasers, microelectronics, pattern recognition and image processing, simulation, artificial intelligence, optical communications, robotics, and other specialties, maintains a modern viewpoint in the undergraduate program.

Required Curriculum:

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<tr>
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<td>ECE 340</td>
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<td>ECE 351a</td>
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*ECE 340 is recommended for those planning to take ECE 351a.

Sophomore Year

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<td>ECE 220a</td>
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Junior Year

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Senior Year

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<td>MATH 484</td>
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<td>Total</td>
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</table>

*ECE 494a has been replaced by ECE 495a.

BACHELOR OF SCIENCE IN ENGINEERING MATHEMATICS

The engineering mathematics curriculum is designed to give the student a deep understanding of mathematics to complement specific interests in engineering. Graduates of this curriculum working in industry may use their proficiency in analysis, statistics, computer science or numerical analysis to develop techniques needed to obtain meaningful solutions to engineering problems for which there is no standard solution.

The program can be tailored to give each individual the desired concentration in particular areas of mathematics and engineering, the goal being breadth with selective depth. The engineering mathematics curriculum gives an excellent background for graduate work in applied mathematics and computer science as well as various areas in engineering.

Required Curriculum:

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<thead>
<tr>
<th>Course</th>
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<th>Second Semester</th>
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<td>PHYS 116</td>
<td>4 MATH 254</td>
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<tr>
<td>SIE 270</td>
<td>3 PHYS 121</td>
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<td>3 C E 217</td>
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Junior Year

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<tr>
<td>A ME 230</td>
<td>3 A ME 331a</td>
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<td>ECE 207</td>
<td>3 ECE 208</td>
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<td>SIE 230</td>
<td>3 SIE 330R</td>
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Senior Year

<table>
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<tr>
<th>Course</th>
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<tr>
<td>Total</td>
<td>16 Total</td>
<td>15 Total</td>
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</tbody>
</table>

*Those students interested in using technical electives to emphasize computer science should include C SC 227 and 237 their first three semesters.

**Humanities and social science electives: 17 units to be chosen from a list approved by the college. Technical electives: 17 units to be chosen in consultation with an advisor.

BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Modern engineering regularly begins at the edge of scientific knowledge. The engineering physics program is designed to provide the strong scientific base and the grounding in engineering perspective essential to use this knowledge. Graduates are prepared for employment in a variety of engineering fields. They are also prepared for graduate study in physics and in some areas of engineering. Which preparation predominates depends on choices of technical elective courses. These are normally upper-division units chosen in conference with an advisor, which constitute a coherent supplemental program.

Students committing to the program in the freshman year are advised to follow the curriculum shown below. The engineering college freshman curriculum is also acceptable; students choosing this option should plan to replace PHYS 111a-111b; 112a-112b with PHYS 110, 116, 121, and 330.
Required Curriculum:

### Freshman Year

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<th>Course</th>
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<td>MATH 124/125a</td>
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<td>MATH 125b</td>
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<td>ENGL 101</td>
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<td>ENGL 102</td>
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<td>PHYS 111a</td>
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<td>CHEM 103a</td>
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### Sophomore Year

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<td>PHYS 112a</td>
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<td>PHYS 112b</td>
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<tr>
<td>CHEM 103b</td>
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### Junior Year

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<td>MATH 422a</td>
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### Senior Year

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<tbody>
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### BACHELOR OF SCIENCE IN GEOLOGICAL ENGINEERING

(ABET Accredited)

Geological engineering involves the application of geological science to the design of engineering structures. The geological engineer is an environmentalist trained to recognize and understand the significance of geological conditions and their influence on engineering designs.

Graduates spend much of their time on location throughout the world working on the earth's surface and underground. Projects requiring geological engineering expertise cover a broad spectrum, ranging from domestic toxic waste reclamation to foreign dam investigations to mineral resources exploration.

Required Curriculum:

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td>MATH 223</td>
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### BACHELOR OF SCIENCE IN HYDROLOGY

Hydrology, the science of water, deals with the origin, distribution, and the physical, chemical and biological properties of the waters of the Earth. It has application to flood, drought, and weather-related hazards, water supply, recreation, the design of bridges and dams, pollution control, and other water management concerns. The hydrology curriculum is designed to give the student a basic knowledge of hydrology and allied subjects, including hydrologic modeling with computer applications. Flexibility is offered through the selection of humanities/social sciences, technical, and general electives so that a program of study can be developed which best fits the student's needs. Specialization options: Technical electives can be used to obtain specialization in the areas of hydrometeorology, hydrogeology, environmental chemistry, environmental hydrology, water resources engineering, water resources engineering-systems, and water resources engineering-policy. Students should consult with the department regarding development of these options.

Graduates with the degree of Bachelor of Science in Hydrology obtain professional positions in the fields of hydrology and water resources. Because hydrology is a natural science, instruction is augmented at all levels with field trips in Arizona, a state which contains a great diversity of topographic and geologic features and climatic zones, making it a superb outdoor laboratory. The field course and an internship/practicum sequence provide direct experience with hydrologic measurements, testing, and data gathering. Students apply these techniques, on location, to solve a water resource problem.

Required Curriculum:

### Common Freshman Core

<table>
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<th>Course</th>
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</tbody>
</table>
The importance of manufacturing is reflected by the presence of layout, job/workplace design, material flow and distribution. 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.

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:

**Sophomore Year**

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<tr>
<th>Course</th>
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<tbody>
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**Junior Year**

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<td>ECON 201a</td>
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**Summer Session (Presession)**

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**Senior Year**

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</table>

*The Internship/Practicum Project must be approved by the practicum instructor or undergraduate advisor.


**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), health-care 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.

**Bachelor of Science in Materials Science and Engineering (ABET Accredited)**

Materials science and engineering is the study of the structure, processing and properties of materials. The field covers the behavior of metals, ceramics, glasses, polymers, semiconductors, and composites. The curriculum in MSE includes an unusually large number of elective courses, which can be taken both inside and outside MSE. This is a reflection of the interdisciplinary nature of the field.

All students in MSE are required to take the ten core courses, which cover the fundamental principles of MSE. Based upon a student's interests, an appropriate sequence of elective courses is decided upon with a faculty advisor in the sophomore year. Involvement in active research programs is an important part of undergraduate education in MSE. While participation is not mandatory, it is highly encouraged, and students are urged to seek out faculty and arrange for projects as early in their undergraduate careers as possible.
The MSE curriculum prepares students for employment in materials research, development, and production. Graduates are also prepared for graduate study in the many facets of materials science and engineering.

Required Curriculum:

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
</tr>
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<tr>
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<td>3</td>
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<td>PHYS 116</td>
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<td>MSE 260</td>
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<tr>
<td>MSE 222</td>
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<td>Tech. Elective*</td>
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<td>MSE 240</td>
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**Junior Year**

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**Senior Year**

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<td>MSE 442b</td>
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<td>ECE 207</td>
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*Electives must be chosen in consultation with the student's advisor. Each student's program must include 16 units of engineering design content.

**BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING**

(ABET Accredited)

Mechanical engineering is a broad discipline which covers the fields of solid and fluid mechanics, thermodynamics, and engineering design. Basic studies are devoted to machine dynamics, fluid flow, energy and power systems, mechanical properties of materials, and instrumentation. Students can specialize in a wide variety of topics, which include power systems, thermal sciences, automatic controls, reliability and quality assurance, mechanical design and manufacturing.

Equipment supporting mechanical engineering studies includes digital computers with interactive graphics; internal combustion engines; microcomputer and microprocessors; nonlinear control systems; production and tooling shop; low- and high-speed wind tunnels; a laser-doppler velocimeter; refrigeration and heat transfer loops; instrumentation of a wide variety, and a materials test apparatus.

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>
<td>4</td>
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<td>C E 210</td>
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<td>C E 217</td>
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<td>C E 214</td>
<td>3</td>
<td>ECE 207</td>
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**Junior Year**

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<td>A ME 331a</td>
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<td>C E 251</td>
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**BACHELOR OF SCIENCE IN MINING ENGINEERING**

(ABET Accredited)

Mining engineering is that branch of engineering responsible for planning, developing and operating mining and other underground facilities. Mining engineers acquire an intimate understanding of the unique environment presented underground; they learn how rock behaves when excavated, how to plan and supervise mines and how to excavate, transport and process minerals and coal.

Graduates with a Bachelor of Science degree in Mining Engineering find employment in the fields of design and operation of underground and surface mines, management of mines, heavy construction projects and tunneling and underground chamber projects, heavy equipment development and finance.

Required Curriculum:

**Sophomore Year**

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<tr>
<th>Course</th>
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<td>MN E 120</td>
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<td>A ME 230</td>
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<td>C E 210</td>
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<td>C E 217</td>
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<td>C E 214</td>
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<td>A ME 250</td>
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**Junior Year**

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<td>A ME 410</td>
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<td>A ME 411</td>
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<td>A ME 412a</td>
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<td>A ME 495s</td>
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<td>Tech. Elective*</td>
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<tr>
<td>Total</td>
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<td>15</td>
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</table>

*Elective courses are chosen by the student in consultation with a faculty advisor. The 33 units of electives must contain 18 in the humanities and social sciences. At least 9 units must be in AME (exclusive of independent study which can at most total 3 units). Moreover, 3 of these units must be taken from a selected list of courses having a design emphasis. The student may opt to take a maximum of 6 units of technical elective courses outside of AME. 3 of these units must be at the 200- or 300-level; the other 3 units must be at the 400-level. Students are encouraged to discuss their program with an advisor.
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 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 discipline, and especially in the changing nuclear engineering field.

Facilities available for laboratory instruction and research include: the TRIGA nuclear reactor, operating in either the steady or pulsed mode; the 1.25 Mev Radiation Dynamics Electron Accelerator, operating as a source of electrons or bremsstrahlung; a 300 curie Gamma Ray Irradiator for materials and biological specimen irradiation. A variety of laboratories for radioactive material counting, radiochemical processing, materials studies on the effects of radiation, and related studies are also available.

Required Curriculum:

<table>
<thead>
<tr>
<th>Senior Year</th>
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<tbody>
<tr>
<td>Course</td>
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<td>MN E 427</td>
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<td>MN E 430</td>
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</tr>
<tr>
<td>MN E 440</td>
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<td>Tech. Elective*</td>
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</tr>
<tr>
<td>Total</td>
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</table>

*The 25 units of electives are chosen by the student in consultation with a faculty advisor. 16 units (to include ECON 210) are selected from humanities and social sciences and must satisfy the college requirements for these courses. The remaining 9 units of technical electives are selected from engineering and science courses. These must include 3 units of design.*

BACHELOR OF SCIENCE IN OPTICAL ENGINEERING

The undergraduate optical engineering program is designed to educate optical engineers who will be productive immediately upon graduation in areas involving optical design, optical fabrication and testing, lasers, optical detectors, optical instrumentation, optical fiber communications. This program, which is an interdisciplinary program offered by the Department of Electrical and Computer Engineering and the Optical Sciences 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.

Required Curriculum:

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<th>Freshman Year</th>
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<td>MATH 125a/124</td>
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<td>CHEM 103a</td>
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<tbody>
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<td>PHYS 116</td>
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<tr>
<td>SIE 270</td>
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<td>NEE 280</td>
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<td>NEE 201</td>
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<td>ECON 210</td>
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<td>Course</td>
<td>Units</td>
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<tr>
<td>MATH 322</td>
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<td>ECE 274</td>
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<td>ECE 320</td>
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<td>ECE 351a</td>
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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, health-care 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:

<table>
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<tr>
<th>Course</th>
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<th>Course</th>
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<td>PHYS 116</td>
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<td>SIE 250</td>
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<td>SIE 270</td>
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Junior Year

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Senior Year

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</table>

*Five course substitutions as indicated within the brackets are required for the software systems engineering option.

**Technical electives and MATH electives must be chosen from lists of 300- or 400-level courses available in the department office and must be approved by the student's faculty advisor. The SIE elective and technical electives must be chosen to include a total of at least 1 unit of Engineering Design and 2 units of Engineering Science. SIE 422 and 474 individually satisfy these requirements.

***Hum. and soc. sci. electives must be chosen from a list approved by the College of Engineering and Mines and must satisfy sequence requirements. Consult your faculty advisor.
Law
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.

To obtain application forms and additional information including a College of Law Catalog, send a postcard to: The Admissions Office, College of Law, University of Arizona, Tucson, Arizona 85721.

Admission to the College of Law is very competitive. For the Fall of 1992 entering class, 1,925 candidates applied for admission. 385 candidates were admitted and 168 students enrolled. The median LSAT for the 1992 first year class was a 160 (approximately the 84th percentile) and the median undergraduate grade point average was 3.4. Applicants for admission to the College of Law must have earned a bachelor's degree from an accredited college or university. The College of Law does not favor particular undergraduate majors or institutions. Instead, applicants are urged to pursue a rigorous educational experience in a diverse, balanced curriculum and to develop strong analytical and writing skills. Admission is based on careful analysis of the applicant's prior academic achievement, aptitude for the study of law as indicated by the score on the Law School Admission Test (LSAT), personal statement and references.

ADMISSION PROCESS

Applicants are initially evaluated according to personal statements, references and a formula which combines 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 undergraduate academic performance and LSAT scores.

The balance of the entering class will be chosen after careful evaluation by the Admissions Committee from a group of qualified candidates whose backgrounds and academic records demonstrate achievement, and who promise to make a significant contribution to the legal educational process, the legal profession and the community. The College of Law Faculty believes that diversity is essential to a vital educational process and a dynamic legal profession. Although weight is given to academic records and test scores, the Admissions Committee looks to other factors that not only affect the diversity objective in a positive manner but also may render undergraduate grades and test scores less important as indicators of intellectual strength. Among those factors are: graduate study, colleges or universities attended, course of study, grade trends, significant or extracurricular activities, unique educational or occupational experiences, involvement in community affairs, race and ethnicity, economic or cultural background, participation in pre-law school programs (e.g., CLEO) 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 and to the entire file submitted by each applicant.

APPLICATION PROCEDURE

First-year students are admitted only for the Fall semester. Under very special circumstances, offers of admission can be deferred one year at the discretion of the Assistant Dean for Admissions. 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 of the year of expected enrollment.

1. To complete an application file, a candidate for admission must submit:
   A. Application for admission
   B. Personal statement (See item 2 below)
   C. Self-addressed, stamped postcards
   D. Law School Application Matching Form (from the LSDAS Packet)
   E. LSDAS report (See item 4 below)
   F. Domicile Affidavit
   G. Two letters of recommendation (See item 5 below)
   H. A nonrefundable $35 application fee (Only checks or money orders payable to the University of Arizona College of Law are acceptable)

2. The College of Law is particularly interested in qualified students who, by virtue of their background and experience, will bring diverse interests and perspectives to the student body. The principal vehicle for describing those varied educational, life and work experiences is through the personal statement, which is required as part of the application. A candidate's personal statement should be a typed, concise and well-drafted document of two to three pages. It should demonstrate the candidate's writing ability and highlight the candidate's unique characteristics and personal qualities.

3. All candidates must take the Law School Admission Test (LSAT), which is given at centers in the United States four times a year. Information about the test can be obtained by writing Law School Admission Services (LSAS), Box 2000, Newtown, PA 18940-0998 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 of the year prior to anticipated enrollment. Scores for the February test (of the year of anticipated enrollment) will arrive after the deadline.

   An applicant may take the LSAT more than once; however, the scores usually will be averaged for use in the initial evaluation formula. LSAT scores earned prior to June 1991 will not be accepted for Fall 1993 enrollment.

4. All applicants must register for a Law School Data Assembly Service Report (LSDAS). LSDAS reports are produced only for candidates who submit directly to all law colleges a Law School Application Matching Form with their applications for admission. The matching forms are included with the LSAT/LSDAS registration materials found in Law School Admissions 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, we recommend that candidates register with
LSDAS and submit transcripts from each undergraduate institution attended to LSDAS prior to January 1. Students should provide to LSDAS transcripts of any coursework 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.

5. The College of Law requires that applicants submit two letters of recommendation. Candidates are encouraged to provide two strong, substantive letters from undergraduate or graduate faculty under whom they have studied, or others qualified to address the candidate's analytical abilities, writing skills, unique talents and personal qualities. Candidates are urged to send letters in separate sealed envelopes with their applications, to facilitate proper filing. Letters sent directly to the College of Law should be sent to the Assistant Dean for Admissions.

Applicants Who Have Previously Applied To This Law School

Applicants who have been admitted or denied in previous years must file a new application, personal statement, references, domicile affidavit, self-addressed, stamped status card and a $35 application fee. Additionally, all such applicants must again register with LSDAS and have a new LSDAS report, with the entire undergraduate record, submitted to the University of Arizona. Previous applicants must comply with the deadlines stated above. Previous applicants are not required to re-take the LSAT, provided the LSAT was taken before the dates in item 3 above. However, admission to the College of Law has become increasingly competitive in recent years. Applicants who have been denied admission and who choose to re-apply are urged to consider re-taking the LSAT, rather than relying on a score from an unsuccessful application.

Files containing prior applications, letters of recommendation and personal statements are retained by the Admissions Office for two years.

International Students

International students seeking admission to the College of Law must apply as first year students, following the steps outlined in the section on Application Procedure, including taking the LSAT. Applicants who completed undergraduate or graduate work at institutions outside the U.S. or Canada must provide to the College of Law the following materials to facilitate the evaluation of their academic records:

1. An official transcript from the undergraduate or graduate institution(s), including final grades earned
2. An explanation of the grading system reflected on the transcripts, descriptions of the courses taken, the nature and format of those courses, the number of class hours involved and any other pertinent information
3. A detailed, written transcript analysis by an objective agency unaffiliated with the applicant

Deadline Summary

First-Year Applicants

All application materials to the College of Law by March 1 of the year of expected enrollment.

LSAT: Candidates must take the test no later than December of the year prior to expected enrollment.

LSDAS: Advisory deadline of January 1, to have all transcripts to LSDAS.

Financial Aid Priority Processing Deadline: March 1 of the year of expected enrollment.

Transfer Students

A limited number of second year students who have who have done very well at other law schools may be accepted as transfer students at the University of Arizona in either the fall or spring of their second year. Transfer applicants will not be accepted at midyear of the first year or for the third year. However, third year students may apply as visiting students.

A transfer applicant must send the following items to the Admissions Office so that they are received no later than December 1, for applications for the Spring semester, and no later than July 15 for applications for the Fall semester.

1. A completed Application for Transfer Admission
2. A Domicile Affidavit
3. An LSDAS report reflecting the entire undergraduate career and the LSAT score.
4. A law school transcript, including grades and class ranking received through the final semester of study
5. A letter from the dean of the law school the applicant is currently attending, stating that the student is in good standing and eligible to continue studies at that institution.
6. A nonrefundable $35 application fee (only checks or money orders, payable to the University of Arizona College of Law, are acceptable.)

Transfer admission is highly selective. 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. If these minimum requirements are met, the application will be evaluated as to whether the transfer would be in the best interests of the student and the College. Other factors considered in the transfer admission process include: the nature of the law school attended; the candidate’s admissibility as a first year applicant and the circumstances surrounding the request to transfer. Residents ranked below the top quartile of their class and nonresidents ranked below the top ten percent of their class usually will not be accepted as transfer students. Transfer admission is always contingent upon availability of space.

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. To qualify for graduation, transfer students must do a minimum of three semesters of academic work, including their final two semesters’ work, comprising at least 27 units of credit, in residence at the College of Law.

Visiting Applications

A very limited number of third year students who have done well at other law schools and have a compelling reason to study at the University of Arizona may be accepted as visiting students in their third year of law study. It is the policy of the College to only admit visiting students during their third year of law school. As with transfer admission, visiting student status is always contingent upon the availability of space.

A visiting applicant must send the following items to the Admissions Office so they are received no later than December 1, for applications for the Spring semester, and no later than July 15, for applications for the Fall semester.

1. A completed application for Visiting Admission
2. A Domicile Affidavit
3. An LSDAS report reflecting the entire undergraduate career and the LSAT score (unless the applicant has previously applied to the College and provided an LSDAS report reflecting the entire undergraduate career, and it is in the possession of the Admissions Office, the procedure in item 4 under Application Procedure must be followed.)

4. A law school transcript including grades and class rank received through the final semester of study.

5. A letter from the dean of the law school the applicant is currently attending indicating that the student is in good standing and eligible to continue studies at that institution (The letter must also grant permission for the student to enroll at the University of Arizona College of Law and must state any conditions upon the units the student's degree-granting law school has agreed to accept.)

6. A nonrefundable $35 application fee (Only checks and money orders, payable to the University of Arizona College of Law, are acceptable.)

Character and Fitness
Applicants who intend to practice law should be aware that bar admission in all states involves consideration of a bar applicant's character and moral fitness for the practice of law. Applicants should acquaint themselves with the bar admission requirements of the states in which they intend to practice.

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 Assistant Dean, 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 who anticipate the possibility of applying or enrolling in the future should not seek Special Student status. The purpose of Special Student status is to meet a specific educational or work-related need, not to provide a prelaw experience.

Students from Other Colleges. Graduate students, with the written approval of their advisors and Dean of the Graduate College, may register for courses in the College of Law. Students desiring to do so will be required to obtain the approval of the instructor and the Assistant Dean for Student Affairs of the College of Law.

Special students and students from other colleges studying at the College of Law are not degree candidates, and are not eligible for the bar examination in Arizona. In addition, law courses taken as a non-degree student cannot be used as credit toward a law degree should an individual be admitted and enroll subsequently at the College of Law.

Inquiries regarding admission should be addressed to:

The Assistant Dean for Admissions
College of Law
The University of Arizona
Tucson, Arizona 85721
(602) 621-3477
The College of Medicine offers a professional program leading to the M.D. degree and graduate programs leading to the Ph.D. degree in certain of the medical sciences. A combined M.D./Ph.D. program in which the two degrees are awarded concurrently is also available. Candidates for the Ph.D. degree are enrolled in the Graduate College of the University. For information beyond that summarized below, one should request a catalog from the Admissions Office, College of Medicine, University of Arizona, Tucson, Arizona 85724.

PREMEDICAL REQUIREMENTS

Applicants must successfully complete the minimum requirement of 90 semester hours, including 30 hours at the upper-division level, in an accredited college or university. Successful completion of the following specific course work is required: two semesters or three quarters each of inorganic chemistry, organic chemistry, physics, general biology or zoology and English. Students should demonstrate the ability to handle scientific material effectively, irrespective of their majors.

MEDICAL COLLEGE ADMISSION TEST

All applicants must take the current Medical College Admission Test and arrange to have scores forwarded to this college. The test should be taken in the year preceding that in which the student hopes to enter medical school, or at the latest, within two years of application. For the 1993-94 academic year, the MCAT must have been taken in 1991 or later. For the 1994-95 academic year, the MCAT must have been taken in 1992 or later. For applications write: MCAT—The American College Testing Program, P.O. Box 414, Iowa City, Iowa 52243.

APPLICATION TO THE FIRST-YEAR CLASS

The College of Medicine participates in the American Medical College Application Service (AMCAS). Each student need submit only one application if applying only to AMCAS schools. Application materials may be obtained from the pre-med advisor’s office, College of Arts & Sciences Administration. Requests for application material may be obtained from the Admissions Office of the College of Medicine. The application period is June 1 to November 1 of the year preceding that in which the applicant hopes to enter medical school. Those to be considered are requested to appear for personal interviews. Further details of the application procedure may be found in the College of Medicine Catalog.

SELECTION FACTORS

The College of Medicine follows the recommended acceptance procedures of the Association of American Medical Colleges. Acceptance is based upon an assessment of the applicant’s intellectual and personal traits. In evaluating candidates, the Admissions Committee considers ability and scholarship as indicated by the candidate’s entire academic record, the results of the MCAT, letters of recommendation, and personal interviews. Consideration is given only to residents of Arizona and to highly qualified residents of Alaska, Montana, and Wyoming who are certified and funded by the Western Interstate Commission for Higher Education (WICHE). Applicants from states other than these cannot be considered.

ADMISSION OF TRANSFER STUDENTS

Applications are accepted for transfer into the clinical years of the College of Medicine curriculum only from Arizona residents. Please see the College of Medicine Catalog for further information.

ACADEMIC POLICY AND CURRICULUM

All medical students are graded on an Honors-Pass-Fail basis. Students who are enrolled in other colleges of the University and who are taking College of Medicine courses will be graded by the same system as the rest of the University.

The curriculum of the College of Medicine is based upon a four-year program. For information concerning the pace of academic work, please consult the College of Medicine Catalog.
Nursing
The College of Nursing offers a professional program leading to the Bachelor of Science in Nursing degree and graduate programs leading to the Master of Science and Doctor of Philosophy degrees with a major in nursing. For information regarding graduate study, please see the Graduate Catalog.

The College of Nursing also offers a B.S.N. pathway for registered nurses who graduated from associate degree or diploma nursing programs and an accelerated B.S.N. pathway for superior students who are college graduates holding a baccalaureate or higher degree in a non-nursing field.

The program which leads to the B.S. in Nursing prepares the graduate to begin practice as a professional nurse, and to undertake graduate study in nursing. The curriculum is composed of prenursing courses, which are taken in the College of Arts and Sciences, followed by the professional nursing major. After having completed the pre-nursing 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 exciting 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.

The college is accredited by the National League for Nursing and approved by the Arizona State Board of Nursing. Upon recommendation of the faculty, the graduates will be admitted to the licensing examination administered by the state board.

REQUIREMENTS

Any entering freshman who meets university admission requirements as described in the Admission to the University section of this catalog may be admitted to the College of Arts and Sciences for the pre-nursing portion of the program.

Transfer students must meet the same university admission requirements. They may complete all freshman and sophomore general education requirements as listed in the nursing program at another college or university, or may present a combination of transfer and University of Arizona courses for consideration for admission to the nursing major.

There is a selection process before any student can be accepted into the College of Nursing for the professional nursing courses. To be considered for admission to the baccalaureate program, a student must have: removed any high school deficiencies; completed designated prerequisites; earned a 2.750 grade-point average in designated prerequisites; and earned a cumulative grade-point average of 2.750.

Completion of prerequisite courses with a 2.750 average does not assure a student of admission to the professional nursing courses. The number of applicants admitted to the professional courses is limited by the resources of the college. A grade-point average considerably above 2.750 is normally required.

All transfer students must have a minimum 2.750 average on all freshman and sophomore courses for both University of Arizona and transfer credits for consideration for admission to the college. Students who have done well at other nursing schools may be permitted to transfer to the University of Arizona. A letter from the dean or director of the nursing school stating that the applicant is in good standing and eligible to continue nursing studies at that institution is required. Admission criteria for the College of Nursing are periodically reviewed. Consult with the College of Nursing for current information.

Students are required to take the University of Arizona Writing-Proficiency Examination before starting their classes in the College of Nursing. Students who have an unsatisfactory rating on the examination will be required to complete developmental work acceptable to the College of Nursing.

All students entering the College of Nursing are required to have basic computer knowledge, obtained in high school, computer store, university courses, or self-taught.

Since enrollment in the college is limited, completion of freshman courses by entering freshmen or transfer students with the required grade-point average does not assure the student of admission to the major. Once admitted to the major, the student must be full time, attending five consecutive semesters. During these semesters the student must be enrolled for all required courses.

Students seeking acceptance to the College of Nursing for fall semester need to file the special application form, 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 Arizona license to practice nursing. For these applicants, acceptance of transfer credits and the establishment of credit by examination will be considered on an individual basis. (See also “Special Examination for Credit” section of this catalog.)

Since clinical laboratories are in a variety of community settings, all students in the clinical nursing courses are required to provide their own 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 2.000 or better, with an average of 2.0000 or better for all work undertaken in the major field at the University of Arizona (See also Graduation Requirements section of this catalog.)

Graduation from the College of Nursing is not the sole criterion for obtaining a license to practice nursing in Arizona. Licensing requirements are the exclusive responsibility of the State Board of Nursing. Graduates must satisfy licensing requirements independently of degree requirements.
Grading Policy for Nursing Courses
The grade of “D” is unacceptable for courses in the nursing major, including pre-nursing courses, as it does not reflect acceptable performance. Pre-nursing students who do not complete a required course(s) with a grade “C” or better must repeat the course. Students already enrolled in the College of Nursing who do not complete a required course(s) with a grade “C” or better, are not eligible to progress in the professional nursing major. The student may be permitted to repeat the course for credit.

HONORS
The college participates in the Honors Program.

REQUIRED CURRICULUM FOR THE BACHELOR OF SCIENCE IN NURSING DEGREE

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Total Minimum Units Required for Graduation—129-132
* The Booklink indicates Traditions and Cultures as a study area. Use List 1 for Non-Western Civilization and List 2 for Western Civilization.
**General education requirements listed in the junior/senior years, must be upper-division courses selected from Booklink.
Pharmacy
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 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 Departments and Courses of Instruction Section of 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, and (6) an interview. 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 mid January. Applicants will be informed of their admission status by early April.

Application forms for admission to the University are available from the Office of Admissions and New Student Enrollment, The University of Arizona, Tucson, AZ 85721. Profile questionnaire and recommendation forms are available from the Office of the Dean, College of Pharmacy.

**COLLEGE SCHOLASTIC REQUIREMENTS**

Students in the four-year professional Pharm.D. program are required to register for and complete a minimum of 14 units each semester. The cumulative university grade-point average and the cumulative 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 2.000 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 2.000. 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. See "Academic Probation and Disqualification" in the Academic Policies and Graduation Requirements section of this catalog.

**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**

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**Second Prepharmacy Year**

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<tr>
<td>CHEM 243a</td>
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<td>CHEM 243b</td>
</tr>
<tr>
<td>CHEM 322</td>
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<td>CHEM 323</td>
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<td>ECON 200 or 201a</td>
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</table>

*Lower-division social science elective—6 units of introductory courses from the following areas: African American Studies, American Indian Studies, Anthropology, Communication, Family Studies, Geography, History, Journalism, Mexican American Studies, Philosophy, Political Science, Psychology, Sociology, and Women's Studies. Contact the College of Pharmacy for further information.

**Contact the College of Pharmacy for list of options.**
First Professional Year

<table>
<thead>
<tr>
<th>Subject</th>
<th>First Semester</th>
<th>Second Semester</th>
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<tr>
<td>PHSC 302</td>
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<td>PSIO 480, 481</td>
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<tr>
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<td>PHSC 307</td>
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<tr>
<td>PPRH 443</td>
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Second Professional Year

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Third Professional Year

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<td>PPRH 475c</td>
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<td>3</td>
<td>PPRH 461</td>
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<td>PPRH 413</td>
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<td>PPRH 454</td>
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<td>PPRH 414</td>
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<td>PPRH 404</td>
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<td>PHSC 485</td>
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<td>Elective(s)</td>
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Summer Session***

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<td>PPRH 803a-e or</td>
</tr>
<tr>
<td>PPRH 810 a-i</td>
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<td>PPRH 810 a-i</td>
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Fourth Professional Year***

<table>
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<th>Subject</th>
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<th>Second Semester</th>
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<td>PPRH 803a-e,</td>
<td>PPRH 803a-e, or</td>
</tr>
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<td>PPRH 810a-i, or</td>
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<td>PPRH 815a-l</td>
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<td>PPRH 800</td>
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<tr>
<td><strong>Total</strong></td>
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<td><strong>Total</strong></td>
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</table>

***The Summer Session and Fourth Professional Year are individually designed by the clerkship coordinator and the student. The student may be required to complete rotations outside of the Tucson Area.

CURRICULUM ELECTIVES

In addition to the lower-division electives required of all students during their prepharmacy curriculum, students in the College of Pharmacy are required to complete upper-division electives during their professional curriculum. Nine units of upper-division general electives and fifteen units of practicum (clerkship) electives are required.

GENERAL ELECTIVES

General electives for the Doctor of Pharmacy program may be chosen from upper-division (300-400 level) courses in the following departments:

- Accounting
- Anthropology
- Biochemistry
- Chemistry
- Communication
- Computer Science
- Ecology & Evolutionary Biology
- Economics
- Finance & Real Estate
- Health-Related Professions
- Management & Policy
- Management Information Systems
- Marketing
- Microbiology & Immunology
- Molecular & Cellular Biology
- Nutrition & Food Science
- Pharmacology & Toxicology
- Pharmacy Practice
- Psychology
- Sociology
- Statistics

Examples of electives pertinent to pharmacy that may be taken:

- PHSC 399 (1-4)
- PHPR 412
- PHPR 445
- PHPR 400
- PHPR 403
- PHPR 406
- PHPR 407
- PHSC 408
- PHSC 409
- PHSC 410
- PHSC 411
- Electives

SERVICE AND RESEARCH UNITS

The Arizona Poison and Drug Information Center, the Ruth E. Golding Clinical Pharmacokinetics Laboratory, the Jeffrey M. Golding Clinical Research Unit, the Center for Toxicology and the Center for Pharmaceutical Economics are operated by the College of Pharmacy. For a description of their activities, consult the General Information section of this catalog.
The School of Health-Related Professions provides educational opportunities for students interested in pursuing a wide range of health-related careers in the university, community, and commercial sectors. Academic programs within the school offer strong, science-based preparation for researchers, technicians, and teachers who will advance knowledge to promote health, prevent disease, improve the quality of life, and enhance human physical performance. The school also provides course work for undergraduates who wish to enter the professions of medicine and physical therapy or to prepare for graduate study in the health science fields.

The academic units of the school include the Department of Exercise and Sport Sciences, the Division of Community and Environmental Health, and the Division of Medical Technology. The school is an integral part of the Arizona Health Sciences Center and maintains research and curricular ties with other colleges and departments in the physical, biological, and social sciences in recognition of the interdisciplinary nature of the health field.

DEGREES AND MAJORS

Degrees
The School of Health-Related Professions offers academic programs leading to the Bachelor of Science in Health Sciences (B.S.H.S.), Master of Arts, Master of Science, and Master of Education.

Undergraduate Majors
Within the B.S.H.S. degree program, students may select a major in exercise sciences, health education, medical technology, occupational safety and health, or physical education. For detailed descriptions of these majors, see below.

Graduate Majors
At the master's level, a major is offered in exercise and sport sciences. 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 upon acceptance into a specific major. Applicants for all B.S.H.S. majors must have completed a minimum of 56 semester hours of college credit applicable to a baccalaureate degree and must have maintained a cumulative grade-point average of 2.2500 or higher on all collegiate work attempted. Additional admission requirements for specific majors are described below.

Students normally apply for admission to majors in the school at the beginning of their junior year, after completion of two years of study in the College of Arts and Sciences. Any student enrolled in the University who is considering application for admission to one of the majors in health-related professions should consult faculty advisors in the School of Health-Related Professions.

GENERAL EDUCATION REQUIREMENTS FOR THE BACHELOR OF SCIENCE IN HEALTH SCIENCES

I. Basic Skills and Proficiencies

<table>
<thead>
<tr>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>A. English</td>
</tr>
</tbody>
</table>

B. Foreign Language

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).

<table>
<thead>
<tr>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>C. Mathematics</td>
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</tbody>
</table>

Total General Education Requirements: 45-53

II. Study Areas

A. Traditions and Cultures

<table>
<thead>
<tr>
<th>Units</th>
</tr>
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<tbody>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

B. Biological and Physical Sciences

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
</tr>
</tbody>
</table>

C. Individuals, Societies and Institutions

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
</tr>
</tbody>
</table>

D. The Arts and Literature

<table>
<thead>
<tr>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
</tr>
</tbody>
</table>

Total: 36

Each of the majors within the B.S.H.S. degree has identified specific courses that are acceptable to meet the general education requirements presented above. These courses are listed in the following section describing major fields.

MAJOR IN EXERCISE SCIENCES

The Department of Exercise and Sport Sciences provides preparation for students intending to pursue graduate study in the exercise sciences as well as for those students who may seek admission to professional schools such as medicine or physical therapy. In addition, students selecting the exercise sciences major may find employment in health and sport clubs, or in community fitness and recreation programs.

General Education Requirements for the Major in Exercise Sciences

I. Basic Skills and Proficiencies (9-17 units)

<table>
<thead>
<tr>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>A. English Composition (6 units): ENGL 101 (or 103H), ENGL 102 (or 104H).</td>
</tr>
</tbody>
</table>

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).

<table>
<thead>
<tr>
<th>Units</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>C. Mathematics (3 units): MATH 117R (or 117S).</td>
</tr>
</tbody>
</table>

Total General Education Requirements: 45-53

II. Study Areas (36 units)

A. Traditions and Cultures (9 units): One 3-unit course from Booklink List 1 and a two-course sequence from Booklink List 2.

B. Biological and Physical Sciences (12 units): CHEM 103a-103b, 104a-104b, PHYS 102a, 180a.

C. Individuals, Societies and Institutions (9 units): PSYC 101, and two additional 3-unit courses approved from Booklink, one of which focuses on gender, class, race, or ethnicity.

D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.

Admission to the Major

The following courses must have been completed: CHEM 103a-103b, 104a-104b, ECOL 181, ENGL 101 (or 103H), 102 (or 104H), EXSS 201, 202, 308, MATH 117R (or 117S), 118, 124 or 125a, PHYS 102a-102b, 180a-180b, PSYC 101.

Major Requirements

The major requires completion of a core of 27 units: EXSS 201, 202, 308, 420, 421, 460, 462, 470, 495a, 496b, and 7 units from
EXSS 377, 445, 477, 495a, 495b, 495d, 495e, 495f. The remaining units must be selected, with the approval of an advisor, from courses in one of several exercise science specializations, such as biomechanics, exercise physiology or motor control.

MAJOR IN HEALTH EDUCATION

The Division of Community and Environmental Health offers instructional programs designed to prepare students for careers focusing on the prevention of critical societal health problems. Students may obtain a major in health education with an option in community health or school health education. The community health education option provides students with the competencies necessary to work in governmental, voluntary, clinical, worksite, and commercial health promotion settings. The school health education option prepares health education teachers for primary and secondary schools.

General Education Requirements for the Major in Health Education

I. Basic Skills and Proficiencies (9-17 units)
   A. English Composition (6 units): ENGL 101 (or 103H), ENGL 102 (or 104H).
   B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the second semester level. This can be accomplished through courses (8 units) or by examination (0 units).
   C. Mathematics (3 units): MATH 117R (or 117S).

II. Study Areas (36 units)
   A. Traditions and Cultures (9 units): Choose a two-course sequence from Booklink List 1.
   B. Biological and Physical Sciences (12 units): CHEM 103a, 104a, ECOL 181, 182.
   C. Individuals, Societies, and Institutions (9 units): PSYC 101, SOC 101, and POL 130.
   D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.

Admission to the Major

The following courses must have been completed: CHEM 103a-103b, 104a-104b, ECOL 181, 182, ENGL 101 (or 103H), 102 (or 104H), EXSS 201, 202, HLTH 178, MATH 117R (or 117S), PSYC 101, SOC 101.

Major Requirements

The major requires completion of a core of 33 units. The remaining units must be taken in one of two options: community health or school health education.

THE MAJOR CORE REQUIREMENTS—33 units, including CHEM 103b, 104b, ECOL 320, EXSS 201, 202, 261, HLTH 306, 330, 400, N FS 310, OSH 486.

THE COMMUNITY HEALTH OPTION—HLTH 200, 430, 432, 433, 434, 440, 493 (2 units), FCM 487.

THE SCHOOL HEALTH EDUCATION OPTION—HLTH 381, 430, 432, 434 and College of Education course work required for State Teaching Certification.

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 a College of Education designated admission test, 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 second semester level. This can be accomplished through courses (8 units) or by examination (0 units).
   C. Mathematics (3 units): MATH 117R.

II. Study Areas (36 units)
   A. Traditions and Cultures (9 units): Choose a two-course sequence from Booklink List 2.
   B. Biological and Physical Sciences (12 units): CHEM 103a, 104a, ECOL 181, 182.
   C. Individuals, Societies, and Institutions (9 units): PSYC 101, SOC 101, and POL 130.
   D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.

Admission to the Major

All general education requirements for the major must have been completed as well as the following courses: CHEM 241a-241b, 243a-243b, 322, 323, 460 or 462a, C SC 115 or MIS 111, EXSS 201, 202, MATH 118, MIC 205, 419, PHYS 102a, 102b, STAT 263.

Major Requirements

The major requires completion of 54 units, including MEDT 471R, 471L, 472R, 472L, 473R, 473L, 474R, 474L, 475a-475b-475c, 476, 481, 482, 483, 484, 496a.

MAJOR IN OCCUPATIONAL SAFETY AND HEALTH

The Division of Community and Environmental Health provides professional preparation for students planning a career in the field of industrial hygiene. The major in occupational
safety and health is concerned with training students in the recognition, evaluation, and control of environmental factors and stresses arising from the work place.

General Education Requirements for the Major in Occupational Safety and Health

I. Basic Skills and Proficiencies (9-17 units)
   A. English Composition (6 units): ENGL 101 (or 103H), ENGL 102 (or 104H).
   B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level. 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 units)
   A. Traditions and Cultures (9 units): One 3-unit course from Booklink List 1 and a two-course sequence from Booklink List 2.
   B. Biological and Physical Sciences (12 units): CHEM 103a, 104a, ECOL 181, 182.
   C. Individuals, Societies and Institutions (9 units): PSYC 101, SOC 101, and one additional 3-unit course approved from Booklink which focuses on gender, class, race, or ethnicity.
   D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.

Admission to the Major

All general education requirements for the major must have been completed as well as the following courses: CHEM 103b, 104b, 241a, 243a, MIS 111, PHYS 102a-102b, 180a-180b.

Major Requirements

The major requires completion of the following 56 units: CHEM 322, 323, ECOL 320, EXSS 201, 202, HLTH 433, STAT 263, MIC 205, OSH 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 offers general and professional education for students planning careers in teaching physical education and coaching athletics. The physical education major curriculum prepares students to teach physical education and sports in the public schools and in other agencies which hire physical educators.

General Education Requirements for the Major in Physical Education

I. Basic Skills and Proficiencies (9-17 units)
   A. English Composition (6 units): ENGL 101 (or 103H), ENGL 102 (or 104H).
   B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level. This can be accomplished through courses (8 units) or by examination (0 units).
   C. Mathematics (3 units): MATH 117R (or 117S).

II. Study Areas (36 units)
   A. Traditions and Cultures (9 units): EXSS 288 plus one 3-unit course from Booklink List 1 and one 3-unit course from Booklink List 2.
   B. Biological and Physical Sciences (12 units): CHEM 103a, 103b, 104a, 104b, EXSS 201.
   C. Individuals, Societies and Institutions (9 units): EXSS 279, 354 (2 units), 355, 360, 371, 377, 380, 381, 385, 394b, 397a, 410, and 8 units of professional activities (EXSS 279, 354, 355, 360, 371, 377, 380, 381, 385, 394b, 397a, 410, and 8 units of professional activities).
   D. The Arts and Literature (6 units): Two 3-unit courses approved from Booklink.

Admission to the Major

Students who wish to pursue a physical education major leading to teaching certification are required to take course work in the College of Education and must meet the specific eligibility requirements listed below. Items 3-6 in this list, requirements established by the College of Education, apply to all undergraduate students whose major programs require College of Education professional education courses which have restricted enrollment. It should be noted that admission to these courses may be restricted should the number of qualified applicants exceed the capacity of the College of Education. Admission to the physical education major is contingent upon completion of the eligibility requirements listed below:

1. a minimum of 56 units applicable to the physical education major, including CHEM 103a-103b, 104a-104b, ENGL 101 (or 103H), ENGL 102 (or 104H), EXSS 201, 202, 285, 288, 320, 373, 374, and 6 units of professional activities (EXSS 208-232), 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 a College of Education designated admission test, and
6. evidence, at the time of application, of successful completion of the Upper-Division Writing-Proficiency Examination and successful completion of a Developmental Writing Workshop if the Upper-Division Writing-Proficiency Examination was evaluated as unsatisfactory.

Major Requirements

The physical education teaching major (secondary-school emphasis) requires completion of a minimum of 55 units in the Department of Exercise and Sport Sciences. An additional 6 units of exercise and sport sciences courses plus student teaching are required to obtain teaching certification for grades K through 12. In both the secondary emphasis and the K-12 emphasis, a minimum of 21 units of College of Education course work is required for State Teaching Certification: ED P 310, EDUC 350, LRC 435, TTE 493b and 496c.

THE PHYSICAL EDUCATION TEACHING MAJOR (SECONDARY-SCHOOL EMPHASIS)—27 units of EXSS courses required for admission to the major (listed above); 37 additional units, including EXSS 279, 354 (2 units), 355, 360, 371, 377, 380, 381, 385, 394b, 397a, 410, and 8 units of professional activities selected from EXSS 208-232. The departmental professional skills requirements may be satisfied through proficiency examination or completion of a minimum of ten courses and 14 units from Professional Activity courses.

THE PHYSICAL EDUCATION TEACHING MAJOR (K-12 EMPHASIS)—64 units of exercise and sport sciences courses as required for the secondary school emphasis (described above), plus 9 additional units to include EXSS 294a, 350, 452 and TTE 493a.
Graduate College
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 non-credit 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 a least 3.25 in order to establish eligibility for seeking admission to the graduate degree program of their choice.

Graduate Record Examination (GRE)

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.

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.

Provisional Admission

Provisional admission indicates some reservation on the part of the Graduate College with regard to the applicant's qualifications to undertake graduate work leading to an advanced degree. This restriction does not, however, impair the student's opportunity to earn graduate credit in properly selected courses. If admitted provisionally, a student who then completes nine credit hours of graduate work with superior grades will be in good standing, subject to any additional requirements established by the major department or academic unit. Students admitted provisionally because they lack only GRE scores may request conversion to regular graduate status immediately upon the receipt of the scores in the Graduate College and may have the requirement to complete nine credit hours of graduate work waived. Students on provisional status who wish to be admitted to regular graduate status should obtain the "Provisional to Regular Graduate Status Request Form" from the Graduate College and follow the directions on the form. Only students in Regular Graduate Status can be awarded a degree.
Graduate Nondegree Status

Individuals holding a bachelor's degree, or its equivalent, from a college or university which grants degrees recognized by the University of Arizona may attend graduate-level courses without being admitted to a graduate degree program. Such students may enroll in graduate-level course work as their qualifications and performance permit; however, no more than 6 units earned while in this status may later be requested to be applied toward an advanced degree awarded at the University.

Admission of International Students

Nonimmigrants should request graduate application forms from the Graduate Student Admissions Office and departmental requirements and materials from the major academic unit. All international student applications with required credentials must reach the Graduate Student Admissions Office before February 1 for summer and fall terms and August 1 for the spring term. International applicants may apply for a deferment of their application processing fee until enrollment if they are from Hungary, Liberia, Poland, Tunisia, the territories of the former U.S.S.R. or Zimbabwe. All other international applicants must submit a $3500 processing fee with their application. Faxed documents for international applications will be accepted for department review purposes only. An official document must be submitted before formal admission to the Graduate College will be granted. 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.

International Special Status

Students admitted to this status are full-time students, taking a minimum of nine hours of credit per semester. Those units may be in appropriate courses at either the undergraduate or graduate level. At the conclusion of the student's first semester in residence, the Graduate College and the academic unit to which the student seeks admission will evaluate the student's progress. If the academic unit recommends a change to regular graduate status, the student can receive graduate credit for all graduate eligible work taken during the first semester in residence. If regular graduate status is not recommended, a final evaluation of the student's progress will be conducted following the student's second semester in residence in international special status. Students admitted to regular graduate status can receive graduate credit only for the graduate eligible units taken during the one semester immediately preceding the award of regular graduate status.

Proficiency in English

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. The TOEFL must be taken no more than two years prior to the date of admission. 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. Such courses are regarded as deficiencies and must be completed before graduation. Students whose native language is not English and who wish to be considered for a teaching assistantship must submit a TOEFL score of 550 or higher and 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.

Financial Resources for International Students

Students on nonimmigrant visas must certify that they possess adequate financial resources to support themselves while in residence at the University of Arizona. If sponsorship is through an organization or government agency, the sponsor must inform the Graduate Student Admissions Office, in advance, what the terms of support will be. Financial guarantees must be dated and addressed to the University of Arizona. If the University is to bill for tuition and fees, billing must be through an embassy or an agent in the United States. An official letter regarding billing information must be sent to the University of Arizona Bursar's Office, SUPO Box 21042, Tucson, AZ 85720. 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. International students and family members on nonimmigrant visas may be required to obtain health insurance through the University of Arizona. In addition, international students may be required to have a TB screening test at the UofA Student Health Service prior to registering for classes at the University. Information pertaining to insurance and TB screening will be forwarded to all international students upon admission to the University.

Application for Admission

Application for admission to the Graduate College must be made on forms furnished by the Graduate College. New applicants should submit one set of complete official transcripts/degree certificates of all undergraduate and graduate work with the Graduate College application. Each transcript must be in its original, sealed envelope. All applications and supporting documents should be sent to the Graduate Admissions Office, University of Arizona, Administration Building, Room 322, Tucson, Arizona 85721-0001. Credits which appear as transfer credits on any other transcript are not valid; applicants must submit an official transcript from the school where the credits were earned. Applications and required credentials for domestic applicants must be submitted to the Graduate Admissions Office before February 1 for summer and full term and December 1 for spring term. Applicants are urged to have all materials submitted well in advance of the above dates. Submission of the application and materials up to one year in advance is recommended. Applicants whose records are not in English are required to provide a certified translation of their records. Applicants should also contact the department of their intended major to obtain departmental application materials and required.
Students who have been admitted to the Graduate College but who were not enrolled during the previous regular semester must reapply for admission. (See the Graduate Catalog for exception to this policy.) All material becomes the property of the Graduate College and will not be returned.

ADVANCED DEGREES OFFERED

Full descriptions of programs and requirements for each of the following degrees may be found in the Graduate Catalog. A number of 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 Public Health
- Master of Science (M.S.)
- Master of Teaching (M.T.)
- Educational Specialist (Ed.S.)
- Doctor of Education (Ed.D.)
- Doctor of Musical Arts (A.Mus.D.)
- Doctor of Philosophy (Ph.D.)

OFFICE OF GRADUATE 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 and challenges by creating a number of interdisciplinary units and programs. These include centers and programs whose instructional and research activities are in the humanities (for example, American Indian Studies, Comparative Cultural and Literary Studies, and Latin American Studies), in the sciences (for example: Applied Mathematics, Cancer Biology, Neuroscience, Physiological Sciences), and others combine aspects of these academic streams (for example: Arid Lands Resource Sciences, Environment and Behavior, Planning). Each program constitutes a faculty committee whose curricular and administrative activities are carried out by an executive council. Through this faculty governance structure, the programs have gained autonomy, diversity and excellence which come from a sense of belonging, on the part of faculty and students, to a broadly based common academic goal.

The Office of Graduate Interdisciplinary Programs is responsible for furthering the development of ongoing and new activities in these programs. Additional information concerning individual programs may be obtained through this office (621-8368; 621-8367; 1010 N. Martin Street). The Director of Interdisciplinary Programs works with the Dean of the Graduate College and with the Vice President for Research in fostering educational as well as research projects relevant to interdisciplinary activities. For more information on the following interdisciplinary graduate programs, consult the Departments and Courses of Instruction section of the catalog.

Graduate Interdisciplinary Programs

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<td>Latin American Studies</td>
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<tr>
<td>Applied Mathematics</td>
<td>Medieval Studies</td>
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<tr>
<td>Arid Lands Resource Sciences</td>
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<td>Cancer Biology</td>
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<tr>
<td>Cognitive Science</td>
<td>Optical Sciences*</td>
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<td>Comparative Cultural and Literary Studies</td>
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<td>Environment and Behavior</td>
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<td>Epidemiology</td>
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<td>Genetics</td>
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<tr>
<td>Gerontology</td>
<td>Second Language Acquisition and Teaching</td>
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* Affiliate program
GENERAL DIVISIONS

EXTENDED UNIVERSITY

1955 East Sixth Street
(602) 624-UofA

The University of Arizona Extended University promotes lifelong learning by extending the resources of The University of Arizona through convenient educational programs. These programs include:

Credit Courses for Degree Programs
Extended University manages off-campus courses for University of Arizona undergraduate and graduate credit. Credit courses are offered through a variety of formats worldwide.

Working with the academic deans, Extended University manages degree programs offered through the Evening and Weekend Campus scheduled to begin fall 1993. It also manages VideoCampus, Correspondence, and other off-campus and distance-learning resources.

Advising: Advising is available during daytime and evening hours and provides services such as:
- evaluating students’ current educational needs
- determining goals, both educational and personal
- analyzing student strengths and weaknesses
- addressing financial concerns
- finding creative solutions for time constraints
- making arrangements for transcript evaluation, admission and registration, and support services

Other Credit and Non-Credit Programs

INDIVIDUAL AND PROFESSIONAL DEVELOPMENT COURSES—Individual-development courses are offered for personal enrichment; professional-development courses are designed to enhance job performance and expand career opportunities. Teacher training, computer skills, management and leadership, economics, accelerated language, music, arts, writing, and environmental education are among the many individual and professional development program areas available.

BUSINESS AND CONTRACT EDUCATION—Extended University serves outside companies, agencies, and groups by providing assessments, classes, training programs, video courses, certificate programs, and other services designed for and delivered to the organization’s site.

CERTIFICATE AWARD PROGRAMS—These may be arranged to provide and recognize specialized professional development. Such programs include supervisory skills, public health, writing, substance-abuse counseling, and team-building.

CONFERENCE SERVICES—Working with colleges, departments and faculty, conference services assists in planning regional, national and international conferences, workshops, and seminars.

CONTINUING EDUCATION UNITS (CEUs)—Through the conference services division, continuing education units may be awarded for participation in individual and professional-development courses. One CEU represents ten contact hours of participation in an organized continuing-education experience under responsible sponsorship, capable direction, and qualified instruction. CEUs provide students with a standard of measurement to quantify their educational experience. CEUs also provide recognition of one’s efforts to broaden his or her knowledge, skills, and experiences by establishing a permanent record of educational history.

SENIOR PROGRAMS/SAGE—Seniors’ Achievement and Growth through Education (SAGE) is a membership learning-in-retirement society which offers university-level intellectual stimulation in a social context to senior citizens.

ELDERHOSTEL—One of the largest Elderhostel programs in the United States, UA Elderhostel offers low-cost, one-week residential academic programs for people age 60 and over. Programs are available in Nogales and Tucson as well as at the White Stallion Ranch northwest of Tucson.

PHOENIX PROGRAMS—Extended University maintains an office in Phoenix to arrange credit, certificate and individual and professional development courses and programs.

CHILDREN’S PROGRAMS/SEEK—Summer enrichment classes for children include classes for elementary and middle school children, a summer Spanish-language immersion program and creative movement and weekend enrichment classes during the school year. Video-based foreign-language education to school children in their regular classrooms is also available.

TRAVELEARN—Educational group travel tours provide learning opportunities which include scholarly escorts, on-site lectures and discussions, seminars, and field experiences.

Correspondence

University, high-school, middle school, ESL, and bilingual courses are available for credit or enrichment. The program is designed to meet the educational needs and objectives of students unable to attend regular on-campus classes. These may be students who have begun college work at The University of Arizona or elsewhere; professional or business people who need to upgrade their skills; students who need high-school courses to satisfy requirements for diplomas or remove deficiencies for college admission; adults who need help preparing for the G.E.D. test; people living in remote areas who want to take advantage of the resources of higher education; middle school students; and others. Courses may begin at any time, and there are no admission or age requirements. Students receive individual instruction and a written record of accomplishments.

University Correspondence Courses

University correspondence courses are designed to parallel the same courses offered on campus. As many as sixty units taken through university correspondence may be applied to an undergraduate degree. Correspondence units do not fulfill those graduation requirements which specify “University Credit” (see “Graduation Average” and “University Credit Requirement” policies in the Academic Policies and Graduation Requirements section of this catalog).

Correspondence study programs may be completed by students anywhere in the world. Lessons and examinations are mailed between student and instructor. Tucson-area students take examinations in the correspondence office at Extended University. Students residing outside Tucson take exams in the local community under the supervision of an approved proctor. Up to one year is allowed for completion of a correspondence course.
Although admission to The University of Arizona is not required for correspondence enrollment, all credit earned by correspondence students is held in reserve for them until they enroll in a degree program. University of Arizona students must obtain the written approval of the dean of the college in which they are enrolled before they may register for a credit correspondence course. Prospective correspondence students from other colleges or universities are responsible for obtaining any authorization required from their institutions.

**Evening and Weekend Campus**

The University of Arizona Evening and Weekend Campus is scheduled to begin offering classes in fall 1993. It will offer credit courses on evenings and weekends to adults who cannot attend daytime classes.

**The PCC/UA Bachelor of Arts Degree Program**

Pima Community College (PCC) and The University of Arizona cooperate in providing evening and weekend courses which lead to a PCC Associate of Arts degree and a UA Bachelor of Arts degree with a major in interdisciplinary studies (IDS).

The IDS major allows students to create a program that supports their occupational goals. Lower-division courses are taken at PCC to fulfill the requirements for the Associate of Arts degree and meet the general education requirements for The University of Arizona. Students take upper-division courses at The University of Arizona to complete the baccalaureate degree.

The IDS major permits a student to combine three disciplines into a coherent and intellectually challenging major. Areas of study available for the IDS major are: business, communication, English, political science, psychology, regional development, and Spanish.

For detailed requirements, see the College of Arts and Sciences section of this catalog. For additional general information about the program, contact an advisor at any Pima Community College campus or call the Extended University advisor at (602) 624-UofA.

**Office of the Summer Session**

**Summer Session**

Summer Session provides opportunities for academic, cultural, and recreational enrichment. Courses offered are of the same character as those given during the regular academic year, with the same academic standards applied. More than 800 credit courses are offered during the summer. The summer program is coordinated by the Office of Summer Session, with departmental academic programs determined by academic deans.

Up to 15 units of credit per summer may be earned at The University of Arizona. Summer Session classes are open to all regularly admitted students. Summer-only undergraduate admission is also available.

Detailed information about summer courses and other programs is published in the *Summer Session Schedule of Classes* available each February.

**Winter Session**

Winter Session is a three-week term that is held during the break between the fall and spring semesters. Students may earn up to three units of credit. Registration for Winter Session takes place in early December. For more information, call the Summer Session Office at (602) 624-UofA.

**VideoCampus**

VideoCampus delivers University of Arizona courses to students in a live interactive mode via broadcast, campus feed, or satellite, and by videotape. Courses are also available throughout Tucson via People's Choice TV. Using video technology and other delivery methods, students can be served anywhere in the world. Programs now available include: undergraduate and graduate credit courses, graduate degree programs, courses for individual and professional development, customized courses developed for clients' specific needs, and video conferences on topics such as managerial and technical training, professional development, and office management.

Videotaped courses can be mailed to any location. In addition, VideoCampus also uses a live microwave signal to transmit class presentations between the Tucson campus and any site in the Tucson area.

**Degree Programs:** The following degree programs are available wholly or partially through VideoCampus:

- The Master of Library Science degree
- The Master of Science degree with a major in electrical engineering, emphases in communication devices, digital hardware, electronic circuits, electronic packaging, and general purpose
- The Master of Science degree with a major in optical sciences available from The University of Arizona in cooperation with the National Technological University satellite network.

**Noncredit Courses:** Prerecorded noncredit courses, available at any time, cover a variety of subjects. For a complete list of courses, call (602) 624-UofA.

**Video Conferences:** In the Tucson area, VideoCampus Educational Telecommunications receives and transmits satellite-distributed video conferences to a variety of locations on topics such as managerial and technical training, professional development, and office management.

**SIERRA VISTA CAMPUS**

Until Summer 1993:

2500 East Fry Boulevard
Sierra Vista, Arizona 85635

After Summer 1993:

1140 N. Colombo
Sierra Vista, Arizona 85635

(602)629-0335 (Tucson)

(602)629-0362 (Tucson Fax)

(602)458-UASV (Sierra Vista)

The University of Arizona Sierra Vista Campus delivers educational services at the junior, senior, and graduate levels to the Sierra Vista-Fort Huachuca community and surrounding areas. Students may take lower-division courses at Cochise College and upper-division University of Arizona credit work at the Sierra Vista Campus for a complete undergraduate degree program. Most classes are offered one evening per week.

Admission procedures for The University of Arizona credit programs in Sierra Vista are the same as for the Tucson campus.

In addition to facilities for teaching and advising at the Sierra Vista Campus, the University maintains offices for Com-
munity and Public Service, the Cooperative Extension Service, and the Southeast Arizona Area Health Education Center (SEAHEC). The campus also maintains an office at Fort Huachuca.

Degree Programs in Sierra Vista
Students in Cochise County may complete entire undergraduate and graduate (master's level) programs at the Sierra Vista Campus.

Baccalaureate-degree programs are offered through a Two Plus Two arrangement with Cochise College, enabling the student to complete the equivalent of two years of course work at Cochise and two years of course work at The University of Arizona Sierra Vista Campus.

University of Arizona degree programs available in Sierra Vista are:

1. Bachelor of Arts with a major in interdisciplinary studies. For this major, study areas are available in business, English, family studies, history, political science, and psychology.
2. Bachelor of Arts with a major in political science.
3. Bachelor of Arts with a major in psychology.
4. Bachelor of Arts in Education with a major in elementary education.
5. Master of Science with a major in electrical engineering and emphasis in information systems.

In addition, the Sierra Vista Campus offers a nondegree professional education sequence which prepares students for Postbaccalaureate Certification in Elementary Education. Course work is also available toward the Master of Library Science, the Master of Arts and the Master of Education with a major in teaching and teacher education.

Undergraduate Study

Two Plus Two
Students enrolled in the Two Plus Two interdisciplinary studies, political science, psychology or elementary education major may fulfill the general education requirements for The University of Arizona's College of Arts and Sciences at Cochise College. Those requirements include:

I. Basic Skills and Proficiencies
   A. Freshman Composition (minimum of 6 credit hours)
   B. Mathematics (3 credit hours, College Algebra or above)
   C. Foreign Language (up to 16 credit hours)

II. Study Areas
   A. Traditions and Cultures (9 credit hours)
   B. Biological and Physical Sciences (8 credit hours)*
   C. Individuals, Societies, and Institutions (9 credit hours)
   D. Arts and Literature (6 credit hours)*

*Requirements may vary slightly; please consult an advisor for complete degree information.

Interdisciplinary studies programs are planned with and approved by an academic advisor. Advising appointments may be made by calling the Sierra Vista Campus office at (602) 458-UASV.

Bachelor of Arts Degree: Interdisciplinary Studies Major
After completing the general education program, students choose three subject areas. Those available in Sierra Vista include business, English, family studies, history, political science, and psychology. Students should consult the College of Arts and Sciences section of this catalog for details regarding degree requirements.

Bachelor of Arts Degree: Political Science Major
The political science major in Sierra Vista emphasizes international relations, but also contains course work covering all major areas of political science at Cochise College. (See the Department of Political Science section for specific degree information.) Advising appointments may be made by calling the Sierra Vista Campus.

Bachelor of Arts Degree: Psychology Major
The psychology major in Sierra Vista is designed to provide a broad background to the field of psychology. (See the Department of Psychology section for specific degree information.) Advising appointments may be made by calling the Sierra Vista Campus.

Bachelor of Arts in Education Degree:
Elementary Education Major
The College of Education offers the junior- and senior-level professional courses necessary to complete a Bachelor of Arts in Education with a major in elementary education. Entrance into the College of Education for these professional courses is by competitive application. To be eligible for admission, students must have:

1. completed applications to The University of Arizona and the College of Education;
2. attained a cumulative grade-point average of at least 2.5;
3. attained passing scores on the Pre-Professional Skills Test (PPST) administered by Cochise College;
4. completed at least 56 credit hours of course work;
5. taken the Upper-Division Writing-Proficiency Examination (UDWPE).

Postbaccalaureate Certification in Elementary Education
Students who already have bachelor's degrees may qualify to take the professional education courses necessary to apply for a teaching certificate—all in Sierra Vista. To be considered for admission to the College of Education's postbaccalaureate program, the applicant must have earned an undergraduate degree with a grade-point average of at least 2.5 at a regionally accredited institution. The amount of time the program takes depends upon the content of the undergraduate degree.

Note: Admission requirements are currently under review by the College of Education. Please consult an advisor.

Advising appointments may be made by calling the Sierra Vista Campus.

Graduate Study

Master of Science Degree: Electrical Engineering Major
The Master of Science degree requires at least 30 units. The course work offered in Sierra Vista is through a combination of interactive video and video tape. There are thesis and non-thesis options. The nonthesis option requires at least 24 units in the major field and six units in a minor field. The thesis option requires 36 units in the major field, six units in a minor field, and six units of thesis credit. Each candidate must pass a final oral examination.

To enter the program, students must have a Bachelor of Science degree from an accredited or approved institution; an undergraduate grade-point average of at least 3.2; a Graduate Record Exam quantitative score greater than 80 percent; a verbal score greater than 25 percent; and a Statement of Purpose. For more information, contact the graduate academic advisor in the Department of Electrical and Computer Engineering, Tucson Campus, (602) 621-6195.
Master of Library Science: Library Science Major

Through the library science extension program, students may begin study in Sierra Vista toward an M.L.S. degree. The remaining program is completed on the Tucson campus for a total of at least 36 units of graduate credit.

Admission requirements: A bachelor's degree with a well-balanced undergraduate curriculum, a grade-point average of at least 3.0, submission of scores no more than five years old on the aptitude test of the Graduate Record Examination. Previous library experience is strongly recommended. For more information about admission and degree requirements, please call the Graduate Library School, (602) 621-3565.

Master of Arts & Master of Education: Teaching and Teacher Education Major

Students may study toward the Master of Arts (M.A.) or the Master of Education (M.Ed.) Degree in Teaching and Teacher Education at the Sierra Vista Campus. For further information, contact the Sierra Vista Office.

The Office of Community and Public Service

Responding to community needs and concerns, the office provides assistance to individuals, businesses, local government leaders, and organizations that are interested in establishing contacts with the University. Outreach programs enhance community and governmental relations, economic development, and the understanding of state and local policy issues. The office arranges for speakers, exhibits, and materials to represent the University at local events and programs.

Cooperative Extension—Cochise County

The University of Arizona Cooperative Extension has a full-time agent located at the Sierra Vista Campus. Programs or information on nutrition, family and youth issues, home gardening, family finances, landscaping and conservation of natural resources are all available for interested groups or individuals. For more information on any of the programs or 4-H Youth Development programs and clubs, contact the office at 458-1104.

Southeast Arizona Area Health Education Center, Inc. (SEAHEC)

Established to serve health professionals through training, recruitment, and resources, SEAHEC has a satellite office in Cochise County in conjunction with The University of Arizona. Each year SEAHEC brings more than a hundred university students into rural areas for a portion of their clinical training in fields such as pharmacy, nursing, medicine, social work, and physical therapy. For more information, contact SEAHEC, The University of Arizona Sierra Vista Campus, (602) 458-1119.

STUDY ABROAD

Harvill Building, Suite 147
(602) 621-4819

The Study Abroad Office, a part of the Office of International Programs, offers opportunities for foreign study on a summer, semester, or year-long basis. Study Abroad counsellors assist students in choosing a program, gaining admission, planning transportation, securing housing and arranging for academic credit. The Office keeps an extensive library of literature and videotapes on foreign study programs. Costs vary and limited financial aid is available from the Study Abroad Office and foreign institutions. Of greater significance, students qualifying for financial aid through the University of Arizona (Federal grants and loans) can normally apply those funds toward foreign study.

Historically, foreign study programs centered almost exclusively on language training and the humanities. That is no longer the case; a host of other intellectual interests, from economics and media arts to the natural sciences, can now be addressed. Many programs are available in Europe; England, Spain, France, and Denmark are popular destinations. Programs also exist in Russia and Eastern Europe. Additionally, as part of a commitment to offer more opportunities in non-Western arenas, the Study Abroad Office is expanding its programs in Latin America, the Middle East and East Asia. Several exchange and internship programs with foreign universities are also available to U.A. undergraduates. The number of U.A.-sponsored programs will continue to grow; students should check with the Study Abroad Office (Harvill 147) for current program information.

GUADALAJARA SUMMER SCHOOL

Douglass Building, Room 315
(602) 621-7551

Students nationwide have the opportunity to study Intensive Spanish (1st, 2nd, & 3rd years) in six weeks for up to eight units of credit, and Intensive Spanish (1st & 2nd years) in three weeks for four units of credit. A five-week session offers additional Spanish language courses, as well as course work in such areas as literature, anthropology, bilingual education, and political science. A host family program, students' travel experiences and contact with the people of Mexico assist in integrating students' studies with the real-life context of Mexico. Undergraduate and graduate credits earned are transferable to most U.S. colleges and universities. For more information, contact the Guadalajara Summer School.

SCHOOL OF MILITARY SCIENCE, NAVAL SCIENCE AND MILITARY AEROSPACE STUDIES

South Hall, Rooms 101, 109, 104, respectively
(602) 621-1609, 621-1281, 621-3521, respectively

The Reserve Officer Training Corps (ROTC) has been an integral part of the University of Arizona since 1917. The School of Military Science, Naval Science and Military Aerospace Studies consists of three separate departments, the Department of Military Science (Army), Department of Naval Science (Navy and Marine Corps), and the Department of Military Aerospace Studies (Air Force), under the administrative control of the military coordinator, a civilian member of the University staff designated by the President of the University. General objectives of the course of instruction are to furnish leaders suitable for commissioning as officers in the U.S. Army, U.S. Navy, U.S. Marine Corps, and U.S. Air Force. Outstanding Army ROTC students who are designated Distinguished Military Students are eligible to apply for appointment as officers in the Regular Army. All graduating students in the Air Force ROTC program go on active duty. Intermediate objectives of the ROTC programs are to develop self-discipline; integrity; a sense of responsibility; an appreciation of the role of a participating citizen in the national defense; and the capacities for thoughtful and decisive leadership.

Department of Military Science

Army ROTC (Reserve Officers' Training Corps) is a program which offers college students the opportunity to graduate as officers and serve in the U.S. Army, the Army National Guard, or the U.S. Army Reserve. Army ROTC has been an integral part of the University of Arizona since 1917. Army ROTC en-
hances 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 110

Human Behavior
1. PSYC 101
2. SOC 101
3. ANTH 101, 102
4. PHIL 113, 322

Military History
1. HIST 215, 315, 322, 436, 449, 450

Computer Literacy
1. MIS 111, 121
2. C SC 115

Mathematics
1. College Algebra, MATH 117R (or 117S)
2. Elements of Calculus, MATH 123
3. Introduction to Statistics, STAT 160
4. PHIL 110

Military Service Credit
Credit toward graduation received for active military service (see “Credit for Military Service” in the Admission and Registration 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 Naval ROTC (NROTC) program is available to eligible high school seniors, college freshmen, sophomores and juniors. Students progress through the program as either scholarship midshipmen or non-scholarship, college program midshipmen. Both programs lead to service as a commissioned officer in the U.S. Navy or Marine Corps.

Students interested in either Naval ROTC program may apply at any point during the year (contact the NROTC office at 621-1281). Also, college program members of the NROTC battalion are reviewed and selected for scholarships continually throughout the year. To become a member of the NROTC program, students must demonstrate superior academic performance and display outstanding leadership potential.

**Financial Aid**

The Naval ROTC program offers financial aid to both scholarship and college program midshipmen. Students in the NROTC scholarship program receive full tuition, course fees, books, uniforms and $100 per month. Additionally, scholarship students are eligible to receive the financial aid package for two, three, four, or five years. NROTC college program midshipmen receive Naval Science textbooks, uniforms, and if qualified, $100 per month during their junior and senior years.

Applications for the NROTC four- and five-year scholarship program must be made to the Navy by December 1 for entry in the program the following fall semester. The major factors examined during the application process are ACT/SAT scores, high school and college academic performance, leadership potential, and extracurricular activities. Applications for the NROTC two- or three-year scholarship programs and the non-scholarship, college program must be submitted through The University of Arizona NROTC Unit. These applications are accepted year round and are judged on the same criteria as the four- and five-year scholarship applicants.

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

**Courses of Instruction**

Students are encouraged to pursue majors in the engineering and physical science (mathematics, chemistry, and physics) fields of study to meet the technological requirements of today's modern Navy. However, a student may elect to pursue any academic major provided the midshipman also completes the required Naval Science curriculum and the Navy-specified college courses outlined below.

While enrolled in the NROTC program the student will complete the following Naval Science and university courses in addition to their academic major requirements:

**First Year**
- Naval Science 101 Introduction to Naval Science
- Naval Science 202 Seapower and Maritime Affairs

**Second Year**
- Naval Science 401 Leadership and Management I
- Naval Science 102 Naval Ship Systems I

**Third Year**
- Naval Science 301 Navigation and Naval Operations I
- Naval Science 302 Navigation and Naval Operations II

**Fourth Year**
- Naval Science 201 Naval Ship Systems II
- Naval Science 402 Leadership and Management II

Scholarship students must take the following university courses: ENGL 101, 102; MATH 124/125a-125b; PHYS 104a-104b or 110-116 or 110a-111b; one semester of foreign language; ENGR 110/MIS 111/C SC 115; and one semester in American Military History or National Security Policy. College program students have English, mathematics, computer and physical science requirements, also.

Course descriptions may be found under Naval Science in the Departments and Courses of Instruction section of this catalog. Marine Corps option students will take Naval Science 310, Evolution of Warfare; Naval Science 410, Amphibious Warfare; and two elective courses (approved by the Professor of Naval Science) during their third and fourth years.

All ROTC students attend Naval Science Leadership Laboratory once a week. In addition, NROTC scholarship students and senior college program students attend 4-6 weeks of summer training at various Naval Stations and ships throughout the world.

**Department of Military Aerospace Studies**

The Department of Military Aerospace Studies (Air Force ROTC), provides unique opportunities to students interested in entering the military profession as Air Force officers. Today's Air Force is a highly technologically advanced branch of the military forces. Whether a student's interest lies in flying the most advanced aircraft in the world or in the development of state-of-the-art technology, the Air Force can offer exciting and challenging opportunities to those who qualify. Graduates go on active duty in career fields where they can immediately apply their university education. Additionally, they assume advanced leadership and management responsibilities not normally found in civilian entry level positions. Although a bachelor's degree is the minimum requirement, students working toward higher degrees can also join the program and receive a commission in the U.S. Air Force.

**Programs**

Air Force ROTC offers both a two- and four-year program. Both allow a student to compete for a commission in the United States Air Force and they also provide the same mixture of military academic and leadership studies. The four-year program is generally recommended, however, due to the increased training provided.

The four-year program consists of the General Military Course—four semesters of lower-division aerospace studies classes; and the Professional Officer Course—four semesters of upper-division aerospace studies classes. The first four semesters carry no military obligation, giving students the opportunity to look at the military profession and the Air Force before making a commitment. Since the first four semesters have no prerequisites, they are open to any student interested in exploring Air Force opportunities. Also, a student may attend the first two semesters concurrently with the second two semesters, therefore effectively creating a three-year program.

The two-year program consists of the Professional Officer Course. Students must have at least a junior standing to enter the two-year program, but should apply during the fall or early spring of their sophomore year of study. Seniors and graduate students wishing to enter the two-year program must be willing to spend two years in ROTC as full-time students.
Financial Aid
Every student accepted into the Professional Officer Course receives a $100.00 per month, tax-free subsistence allowance during the academic year. Scholarships are also available. Air Force ROTC offers four, three, and two-year scholarships. Students must apply for four-year scholarships as seniors in high school. Subsequent to high school, students must be enrolled in an Air Force ROTC class to apply. A student enrolled in any lower-division Air Force ROTC class may qualify for a scholarship. Scholarships pay tuition and fees, the cost of books, plus a $100.00 per month, tax-free subsistence allowance. Scholarships are awarded based on the student's achievement, not financial need, and do not extend the active duty commitment.

Credit
Lower-division Air Force ROTC classes carry two units of credit each semester. Upper-division classes carry three units each semester.

For more information, please contact the Department of Military Aerospace Studies.
DEPARTMENTS AND COURSES OF INSTRUCTION

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 biennium catalog. A copy of this publication is available upon request from the University Curriculum Office.

CLASS SCHEDULES—To confirm or identify the semester of offering for any course, students should consult the Schedule of Classes for each term. Schedules for fall and spring classes are available in April and October, respectively. The Summer Session Schedule of Classes is available in February.

PREREQUISITES—Students must meet the course 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 CLASSIFICATION SYSTEM

The number by which a course is designated indicates the level of the course. Courses are numbered as follows:

100-299: Lower-division courses primarily for freshmen and sophomores.
100-199: Primarily introductory and beginning courses.
300-499: Upper-division courses primarily for juniors and seniors.
300-399: Advanced-intermediate-level courses.
400-499: Advanced-level courses.
500-599: Graduate courses. Open to exceptionally well-qualified seniors with the prior written approval of the course instructor and the Graduate College.
600-699: Graduate courses. Not open to undergraduate students.
700-799: Graduate courses limited to doctoral students.
800-899: Courses limited to students working toward degrees offered by the College of Medicine or the College of Pharmacy. Not available for credit toward other degrees.

*Certain 400- and 500-level courses with the same number and title may be convened jointly. Students may receive credit for such courses only once, whether jointly convened or separately, unless designated [Rpt.] or unless special approval is granted by the student’s major advisor.

Semester Courses (Single Numbers)

A course designated by a single number (as ECON 248) is one semester in length.

Year Courses (Double Numbers)

A course designated by a double number (as POL 233a-233b) is continued through two successive semesters, the work of the first semester being prerequisite to that of the second unless otherwise indicated in the statement of prerequisites.

HOW TO READ COURSE DESCRIPTIONS—

Following is a standard course description with the individual symbols explained in the order in which they appear in the description.

Sample Course Listing:

406. Social Structure in Modern Societies (3) [Rpt.] I 1991-92
GRD Critical review of modern theory and research on social structure and social organization in modern societies. 2R, 3L.
P, 6 units of sociology or CR. (Identical with Hist. 406) Smith

Explanation:

406.—Course number.
Social Structure in Modern Societies—Course title.
(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 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.
1991-92—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, S, and D indicate “recitation,” “laboratory,” “studio” and “discussion.” 2R, 3L indicates that the class meets for two hours of recitation and three hours of laboratory per week (based upon 15 weeks). For courses consisting of recitation (lecture) periods only, the number of class hours per week is the same as the unit value and is not specified in the course listing.

In addition to the above abbreviations for class structure, the College of Engineering and Mines uses the abbreviations ED and ES to designate the number of units in the areas of “engineering design” and “engineering science.” Thus 1ED, 2ES signifies that the course meets the requirement for 1 unit of engineering design and 2 units of engineering science.
P—Prerequisites. Identifies courses or other experiences which must be completed prior to enrolling in the course listed.
CR—Concurrent registration. Identifies courses which must be taken during the same term as the course listed.
(Identical with HIST 406)—Crosslisting. Identifies other departments which give credit for the same course. The complete course listing is shown in the course list of the “home”
department which has instructional responsibility for the course. An abbreviated listing appears in the course list of the “crosslisting” department. Exceptions are house-numbered courses, which do not have course descriptions.

Smith—Professor in charge.

Note: Not all of the above information may be noted in any individual course.

UNIVERSITY-WIDE “HOUSE-NUMBERED” COURSES

Most University of Arizona courses use a combination of lectures, 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 subscript and subtitle. 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.


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) A, B, C, D, E, I, P/F, 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.

Individual Studies

191, 291, 391, 491, 591, 691, 791. Preceptorship (Credit varies) Specialized work on an individual basis, consisting of teaching and practice in actual service in a technical, business, or governmental establishment.

Grades Available: S/P, C, D, E, I, W.

493, 593. 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.

900. Research (Credit varies) Individual research, not related to thesis or dissertation preparation, by graduate students.

Grades Available: S/P, C, D, E, I, W.

908. Case Studies (Credit varies) Individual study of a particular case, or report thereof.

Grades Available: S/P, E, K, W.

909. Master's Report (Credit varies) Individual study or special project or formal report thereof submitted in lieu of thesis for certain master's degrees.

Grades Available: S/P, E, K, W.

910. Thesis (Credit varies) Research for the master's thesis (whether library research, laboratory or field observation or research, artistic creation, or thesis writing). Maximum total credit permitted varies with the major department.

Grades Available: S/P, E, K, W.

915. Master's Recitals (Credit varies) For master's students in performance.

Grades Available: S/P, E, K, W.

920. Dissertation (1 to 9) Research for the doctoral dissertation (whether library research, laboratory or field observation or research, artistic creation, or dissertation writing).

Grades Available: S/P, E, K, W.

925. Doctoral Recitals (1 to 9) For doctoral students in music performance.

Grades Available: S/P, E, K, W.

930. Supplementary Registration (1 to 9) For students who have completed all course requirements for their advanced degree programs. May be used concurrently with other enrollments to bring to total number of units to the required minimum.

Grade Available: K.

*Graduate students doing independent work which cannot be classified as actual research will register for credit under course number 599, 699, or 799.
ACADEMIC DEPARTMENTS AND COMMITTEES

Faculty Lists
The listing of faculty which precedes the departmental course offerings identifies all resident faculty members appointed for the 1992-93 academic year, as well as emeritus faculty. A department designation in parentheses following a faculty member's name identifies the department in which the primary appointment is held. These designations appear only in cases of multiple appointments. For identification of Regents' Professors as well as other pertinent faculty information, consult the listing of the Faculty of the University in the last section of this catalog.

Courses
Permanent courses offered by the University of Arizona are listed on the following pages by department or committee in alphabetical order.

Accounting (ACCT)
McClelland Hall, Room 301
(602) 621-2620

Professors Andrew D. Bailey, Jr., Head, William B. Barrett, Dan S. Dhaliwal, William L. Felix, Jr., William S. Waller
Assistant Professors Sanjay Kallapur, Sharon S. Lassar, Jeffrey W. Schatzberg, Galen R. Sevick, Brian P. Shapiro, Mark A. Trombley, Cynthia C. Vines, Shing-wu Wang
Lecturers Joan W. Norvelle, Associate Head, T. Harry McKinney, Eldon L. Schafer

The accounting program prepares students for careers such as the independent practice of public accounting, controllership, and general accounting management. Graduate work in accounting is offered for those who wish more background for the positions described above and for those who wish to teach in colleges and universities. In many instances, a five-year program leading to a Master of Accounting degree will be desirable to achieve a student's objectives. (See BPA Major Fields Available—Accounting—elsewhere in this catalog and the Graduate Catalog)

Students who desire the Bachelor of Science in Business Administration with a major in accounting will follow the program of studies shown in the College of Business and Public Administration section of the catalog.

The department offers graduate instruction leading to the Master of Accounting degree and participates in the programs leading to the Master of Business Administration and Doctor of Philosophy degrees with a major in management. For admission and degree requirements, please see the Graduate Catalog.

Accounting courses are not offered on a pass-fail basis.


305. Introduction to Accounting and Auditing (3) I II The application of statistical tools to accounting and auditing problems. P, STAT 175.

310. Cost and Managerial Accounting (3) I II Concepts and analytical procedures necessary in the generation of accounting data for management planning and control. P, 210, ECON 201a-201b or ECON 300, MATH 123.

400a-400b. Intermediate Financial Accounting (3-3) I II Theory and methodology involved in the preparation of consolidated financial statements and in accounting for partnerships. Credit allowed for this course or 500a-500b, but not for both. P, 210. May be convened with 500a-500b.

401. Advanced Accounting (3) I II Theory and methodology involved in the preparation of consolidated financial statements and in accounting for partnerships. Credit allowed for this course or 501, but not for both. P, 400b. May be convened with 501.

410. Principles of Profit Planning and Control (3) I II Examination of the value of managerial accounting in organizational decision-making and control, addressing specific managerial accounting problems and their solution. P, 310. Credit for this or 510 but not for both. May be convened with 510.

420. Introduction to Federal Taxation (3) I II Principles of federal income taxation, with emphasis on how individuals are taxed: additional topics. Credit allowed for this course or 520, but not for both. P, 210. May be convened with 520.

422. Advanced Federal Taxation (3) I II Introduction to advanced topics: taxation of corporations and stockholders' transactions in stocks, taxation of partnerships and fiduciaries; gift and estate taxation. Credit allowed for this course or 522, but not for both. P, 420. May be convened with 522.

425. Issues in Accounting and Taxation (3) I Professional discussion of current issues such as estate and income tax, financial planning, IRS audits, bankruptcy, accounting developments and accounting in business formation. Credit allowed for this course or 525, but not for both. P, 420. May be convened with 525.

429. International Corporate Taxation (3) I Concepts of U.S. taxation of international transactions, including rules for sourcing income and allocating deductions and such fundamental multistate concepts as nexus, unitary taxes and apportionment. Credit allowed for this course or 529, but not for both. P, 422 or permission of instructor. May be convened with 529.

431. Principles of Auditing (3) I II The opinion formulation process of the professional auditor; the auditor's reports, professional standards, internal and operational auditing. Credit allowed for this course or 531, but not for both. P, 305, 400b. May be convened with 531.

451. Analysis of Financial Statements (3) I II Examination of demand and supply forces underlying the provision of financial statements, the properties of financial statement information. Credit for this course or 551, but not for both. P, 400b. May be convened with 551.

461. Accounting Information Systems (3) I II The analysis, design and implementation of information systems, with special emphasis on accounting applications. P, 310. (Identical with MIS 461)

471. Policy Formation and Accounting Information Systems (3) I II Integrative course using the case study approach and focusing on the financial impact of accounting, marketing and production strategies. Open only to BPA majors. P, 310, 400b, FIN 311, MAP 305, MKTG 361. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

*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.

500a-500b. Intermediate Financial Accounting (3-3) I II For a description of course topics, see 400a-400b. Graduate-level requirements include a special project. Credit allowed for this course or 400a-400b, but not for both. P, 550. Open to MBA candidates only. May be convened with 400a-400b.

501. Advanced Accounting (3) I II For a description of course topics see 401. Graduate-level requirements include a special project. Credit allowed for this course or 401, but not for both. P, 400b or 500b. May be convened with 401. Open to MBA candidates only.
685. Contemporary Financial Accounting

Thought (3) II Special topics in accounting theory and research. Of special interest to doctoral students. P, 682.

696. Seminar

a. Auditing (1-3) II
b. Managerial Accounting (1-3) III
c. Taxation (1-3) I II
d. Theory (1-3) II
e. Behavioral (1-3) I II

797. Workshop

a. Research Design (1-3) [Rpt./6 units] I II

Open only to Ph.D. students in accounting.

Aerospace and Mechanical Engineering (AME)

AME Building, Room 301
(602) 621-2235


Associate Professors Ara Arabyan, Abhijit Chandra, Kee-Ying Fung, Edward J. Kerschen,

Assistant Professors Cholik Chan, Yonggang Huang, Jeffrey W. Jacobs, Ernest A. Kerschen,

Graduate students.

The department offers the degrees of Bachelor of Science in Aerospace Engineering, Bachelor of Science in Mechanical Engineering, and Master of Science and Doctor of Philosophy with majors in aerospace engineering and mechanical engineering. (See the College of Engineering section of this catalog for specific undergraduate program requirements. Consult the Graduate Catalog for more information about graduate programs.)

Note: AME majors will receive credit toward the completion of major for the following courses: PSIO 418, "Physiology for Engineers;" PSIO 419, "Physiology Laboratory;" SIE 406, "Engineering Quality Control;" ECE 554, "Electronic Packaging Principles;" E M 511, "Advanced Finite Element Analysis;" SIE 507, "Advanced Quality Control."

230. Thermodynamics (3) I II Basic laws and examples of engineering applications of macroscopic thermodynamics; equations of state; reversible and irreversible processes. 3ES. P, MATH 223, PHYS 116.

250. Dynamics (3) I II Dynamics of particles and rigid bodies as applied to mechanical systems; introduction to mechanical vibrations. 3ES. P, C, E 214; CR, MATH 254.

300. Instrumentation Laboratory (3) I II Basic principles of laboratory practice and instrumentation; statistical measurement theory including probability and statistics; uncertainty analysis, regression analysis; dynamics of measurement systems; transducers and signal conditioning; circuits. Experiments using basic laboratory instrumentation on the speed of sound, temperature measurements, and the dynamic response of first and second order systems. 2R, 3L. 2ES. P, 230, 331a, ECE 208.


302. Numerical Methods (3) I II Introduction to linear algebra; solution of engineering problems based upon an integrated approach combining numerical analysis and the use of computers. 2ES. P, 250, E 217.

320. Aerodynamics (3) I Basic equations and their approximation; potential flow theory; fundamentals of airfoil and wing theory; asymmetric flows; application to aero- dynamics of wings and bodies. 2ES, 1ED. P, 331a, CR, 302.

321. Aircraft Performance (3) I Properties of the atmosphere, concepts in airflow and propulsion, airfoils and wings, airplane performance; energy methods. 2ES, 1ED. P, 250, 331a.

323. Gasdynamics (3) I Homentropic flow with area changes, normal and oblique shocks, onedimensional flows with friction and heat addition, choking, method of characteristics, applications. 2ES, 1ED. P, 230, 331a, MATH 254.

324. Aerospace Structures (3) I Application of principles of mechanics to the structural analysis of aerospace components. Topics covered are: analysis of stress and strain, constitutive relations, plane problems of elasticity, torsion, bending, elastic stability, energy methods, finite element methods. 2ES, 1ED. P, 301, C, E 217, CR, 302.

330. Intermediate Thermodynamics (3) I II Power systems; nonreacting and reacting mixtures; heat transfer, design exercises. 2ES. 1ED. P, 230.

331a-331b. Principles and Applications of Fluid Mechanics (3-3) I III a Fundamentals of fluid mechanics covering properties of fluids, fluid statics, dynamics of incompressible viscous and inviscid flows, control volume formulations of continuity, momentum and energy equations, dimensional analysis, viscous pipe flow, boundary layers and drag. 3ES. P, 250, MATH 223, MATH 254. 331b: Turbomachinery, pump characteristics, lubrica-
Aerospace and Mechanical Engineering 127

422. Aerospace Engineering Design (3) (II) Application of engineering fundamentals, including structural analysis, structural vibrations, aerodynamic and finite element methods to aerospace vehicle design project. 3ED. P. 420 or CR 428, 324.

424. Introduction to Space Technologies (3) I The space environment: vacuum, microgravity, radiation(s), free molecule flow and drag on bodies. Resources utilization in deep space. Introduction to orbital mechanics. Space transportation, spacecraft thermal design, automation and robotics, communications, space power, space structures. I5ES, I5ED. P. 523. May be convened with 524.

425. Aerospace Propulsion (3) I Basic laws; application to turbojets, ramjets, fanjets, turbo props and rockets; space flight. 2ES, 1ED. P. 230, 323, 331a.

426. Dynamics of Space Flight (3) I Two and three body motion; orbit transfer and interplanetary transfer, space vehicle stability and control. 3ES.

427. Stability and Control of Aerospace Vehicles (3) I Static and dynamic stability of rigid and nonrigid vehicles; automatic control of aircraft, missiles and spacecraft. 2ES, 1ED. P. 321.

428. Space Mission Conceptual Design (3) II Introduction to space mission design and modern tools available to aid the designer. Includes brief case histories of some of the more successful space missions and design of a mission. 3ED. P. 424. May be convened with 528.


432. Heat Transfer (3) I II Study of conduction, convection and radiation heat transfer, with applications to engineering problems. 3ES, P. 331a, 230.

441. Air Conditioning Engineering (3) I Analysis and design of systems and components for control of temperature, humidity, air cleanliness and acoustics; applications to residential and commercial buildings. 1.5ES, 1.5ED. P. 330; CR, 331a. (Identical with NEE 441).

442. HVAC System Design (3) II (Identical with NEE 442) May be convened with 542.

443. Power Systems Analysis (3) I II Performance of gas and vapor power cycles, processes and components; fundamentals of combustion; nuclear and unconventional energy sources. 2ES, 1ED. P. 330.


447. Direct Energy Conversion (3) II (Identical with NEE 447) May be convened with 547.

448. Wind Energy Conversion Systems (3) I Aerodynamic theory of vertical and horizontal axis propellers and windmills; optimal design of blades and electrical components; lab. and field measurements of operating systems. 3R, 1L. 1ES. 2ED. Field trips. P. 331a, ECE 208.

452. Computer Aided Analysis of Mechanical Systems (3) I Kinematic and dynamic analysis of mechanical systems in planar motion, numerical methods and use of computer programs in analysis. 2ES, 1ED. P. 302. May be convened with 552.

454. Optimal Control of Parametric Systems (3) I Scalar minimization, vector minimization, continuous static games, matrix games, numerical techniques and applications. 2.5ES, 0.5ED. P. MATH 254.

455. Control System Design (3) I System models; linear dynamical systems; output feedback design; stability analysis, state feedback design. 2ES, 1ED. P. 250, 301; CR, 300.

456. Control of Manufacturing Process (3) I Modeling and control of manufacturing processes. Mathematical modeling of processes, actuators, transducers and sensors; classical control methods including transient response steady-state errors, bode diagrams; root locus and design of closed loop control systems; introduction to digital control systems and robotics; hardware and software issues; computer simulations. 1R, 2L. P. 250, 300, 331b, CR, 411. May be convened with 556.

460. Mechanical Vibrations (3) I Free and forced vibrations of simple mechanical systems; effects of damping; introduction to multidegree of freedom systems. 3ES. P. 250, MATH 254.

461. Finite Element Methods (3) I II Matrix methods for structural analysis, theory of elasticity, work and strain energy, energy theorems, the finite element, the assembled structure, programming aspects of the problem, general purpose programs, application to aerospace structures. 2ES, 1ED. P. 301, C E 217.

462. Composite Materials (3) I Classification and characteristics of composite materials; mechanical behavior of composite materials, micro- and macro-mechanical behavior of laminates; mechanical behavior of short fiber composites. 3ES. P. 302, C E 217. May be convened with 562.

466. Biomechanical Engineering (3) II 1994-95 One subject covered yearly from: biomechanical-solid mechanics (orthopedic, vascular, muscle, skin); feedback control (physiological systems); heat transfer, thermodynamics (temperature regulation exercises, hyperthermia, instrumentation). P. 302, 330, 331b, 410. May be convened with 566.

Students interested in the biomechanical engineering option: please see the headnotes of this department.

472. Reliability Engineering (3) I Time-to-failure, failure-rate, and reliability determination for early, useful and wear-out lives; equipment reliability prediction; spare parts provisioning; reliability growth; reliability allocation. 1.5ES, 1.5ED. P, CR, 474 or SIE 330. May be convened with 572.

473. Probabilistic Mechanical Design (3) I Application of probability theory and statis-
tics to mechanical and structural design; modern mechanical reliability methods; design philosophy. 15ES, 1SED, P, C E 217; CR, 453. May be convened with 572.

474 Reliability and Quality Analysis (3) I Probability and statistics with applications to reliability engineering, discrete and continuous statistical models for engineering variables, fundamentals of statistics. 15ES, 1SED. P, MATH 223. May be convened with 574.

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


502. Modeling and System Identification in Dynamic Engineering Systems (3) I 1993-94 Principles of mathematical modeling of engineering problems; state and parameter identification techniques; lumped and distributed systems; open loop (explicit) and closed loop (implicit) inputs; frequency and time domain representation; deterministic and stochastic inputs. P, 302; CR, 455.

510. Design for Manufacturing (3) I Design methodology: axiomatic, algorithmic, hybrid. Concepts of design sensitivity; applications to several manufacturing processes—metal forming, metal cutting, welding. P. 461 (AI programming ability; knowledge of plasticity).


515. Engineering Program Design (3) I II For a description of course topics, see 415. Graduate-level requirements include a special in-depth report and a seminar presentation on the subject. P. 302, MATH 254. May be convened with 415.

520. Aircraft Conceptual Design (3) I II For a description of course topics, see 420. Graduate-level requirements include development of a three degree-of-freedom flight simulator with active stability augmentation. P. 320, 321, 323. May be convened with 420.

521. Compressible Aerodynamics (3) I Inviscid flow of compressible fluids; governing equations and their method of solution for subsonic, transonic, supersonic, and hypersonic flows. P. 425, 500a-500b, 536a-536b.

523. Advanced Aerospace Propulsion (3) I 1993-94 Interior ballistics of rocket motors; ramjets, turbojets, turbosfans, scramjets; detonation wave theory; combustion chamber instability analysis; nozzle design. P. 425.

524. Introduction to Space Technologies (3) [Rpt./1] I For a description of course topics, see 424. Graduate-level requirements include additional term papers and extra questions on exams. May be convened with 424.

525. Combustion Gasdynamics (3) I 1993-94 Aerothermochemistry; fluid mechanics; thermodynamics; chemistry of propulsion and air pollution; reaction kinetics; combustion stability; detonation; singular perturbations in deflagration. P. 425, 500a.

528. Space Mission Conceptual Design (3) II For a description of course topics, see 428. Graduate-level requirements include additional design project and report. May be convened with 428.

530. Advanced Thermodynamics (3) I II Reversible and irreversible macroscopic thermodynamics; selected engineering applications. P. 230, 331a.

531. Numerical Methods in Fluid Mechanics and Heat Transfer (3) I II For a description of course topics, see 431. Graduate-level requirements include three additional projects. P. 302. May be convened with 431.

532. Convective Transport Phenomena (3) I Convective energy, mass and momentum transfer; internal and external flow; exact, approximate and numerical solutions; application to current problems. P. 432; CR, 500a; computer programming ability.

534. Radiative Heat Transfer (3) I 1993-94 Fundamentals of radiative heat transfer; radiative properties of materials; gray-body and spectral exchange between surfaces; participating media; radiation combined with conduction and convection. Intended for students with strong interests in heat transfer, combustion, and applications such as energy conversion systems, materials processing, and space technology. P. 432.

536a-536b. Fundamentals of Fluid Mechanics (3-3) 536a: Fundamental equations of motion; fluid mechanics, variational and weighted residual methods, solution of basic governing equations; integral solutions; irrotational flows; simple viscous flows. P. 500a. 536b: Small disturbance in a viscous flow; Navier-Stokes equations; boundary layer equations; slow flow; compressible boundary layers. P. 536b.

537. Fluid Mechanics of Viscous Flows (3) I Behavior of viscous fluids over a range of Reynolds numbers; Navier-Stokes equations; boundary layer equations; slow flow; compressible boundary layers. P. 536b.

538. Nature of Turbulent Shear Flow (3) I 1994-95 Physical phenomena in turbulent shear flows; experimental techniques; observations and physical consequences; prediction methods; recent advances. P. 500b, 536a-536b.


542. HVAC System Design (3) I (Identical with NEE 542) May be convened with 442.

545. Solar Energy Engineering (3) I (Identical with NEE 545) May be convened with 445.

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

548. Combustion Generated Air Pollution (3) II Pollutant formation in combustion processes and methods of control; diffusion models for atmospheric dispersion, including plume rise calculations. P. 230, 331a. (Identical with C E 548)

550. Advanced Dynamics (3) [Rpt.] I Lagrange's equations, rigid body and multidisciplinary dynamics; Euler's equations, vibrations theory. P. 250, knowledge of differential equations.

552. Computer-Aided Analysis of Mechanical Systems (3) I For a description of course topics, see 452. Graduate-level requirements include an additional project and extra questions on exams. May be convened with 452.

553. Advanced Computer-Aided Analysis of Mechanical Systems (3) II Computational methods in multidisciplinary dynamics; Euler parameters; automatic generation and numerical methods in solving equations of motion; application in vehicle dynamics, spacecraft, and robotics. P. knowledge of kinematics, dynamics and numerical methods. P. 552.


556. Control of Manufacturing Process (3) I For a description of course topics, see 456. Graduate-level requirements include more in-depth homework with focus on theoretical considerations, and design project requiring implementation of a five degree of freedom robot. May be convened with 456.


561. Finite Element Analysis in Structural Mechanics (3) II Advanced problems in structural analysis using the finite element method; analysis of complex systems; dynamics. Composite structures and material systems; program development. P. 461.

562. Composite Materials (3) II For a description of course topics, see 462. Graduate-level requirements include an additional project on composite materials. P. 302, C E 217. May be convened with 462.


566. Biomechanical Engineering (3) II 1994-95 For a description of course topics, see 466. Graduate-level requirements include a project and additional reading assignments. P. 302, 330, 331b, 410. May be convened with 466.

Students interested in the biomedical engineering option: please see the headnote of this department.
Aerospace and Mechanical Engineering—African American Studies 129

572. Reliability Engineering (3) I For a description of course topics, see 472. Graduate-level requirements include a special report of 30 pages on a specific reliability engineering topic. P, CR, 474 or SE 330. May be convened with 472.

573. Probabilistic Mechanical Design (3) I For a description of course topics, see 473. Graduate-level requirements include additional homework with focus on theoretical considerations, and a research project. P, C E 217, CR, 410. May be convened with 473.

574. Reliability and Quality Analysis (3) I For a description of course topics, see 474. Graduate-level requirements include additional assignments and independent study. Monte Carlo simulation. May be convened with 474.

575. Reliability Testing (3) II Mean-time-between-failure and reliability confidence limits; sequential testing; sampling; accelerated, sudden-death, and suspended-items, non-parametric, and Bayesian testing. P, 472.

576. Advanced Probabilistic Design (3) II Advanced methods for mechanical and structural reliability analysis, system reliability analysis, random loading models, applications to fatigue, fracture, buckling, creep, etc. P, 473.

577. Maintainability Engineering (3) II Extension of 472; complex systems reliability; maintainability engineering; reliability and availability of maintained systems; operational readiness; system effectiveness; maintainability demonstration. P, 472.


579. Boundary Element Method (3) I Introduction to BEM, applications to Laplace equations, conduction-convection problems, transient problems, problems involving material nonlinearities, large strain problems, concepts of design sensitivity-analyses through BEM. P, 461, 561.


581. Advanced Topics in Heat Transfer (3) II 1993-94 Topics will depend on instructor(s). Possible topics include linear and nonlinear convective stability, turbulent convective heat transfer, advanced analytical and numerical methods in heat transfer, boiling and condensation, multiphase flow, and heat transfer phenomena. P, 500a-500b, 532, 536a-536b.

582. Hydrodynamic Stability (3) I Introduction to linear stability theory in fluid mechanics; the Orr-Sommerfeld equation, behavior of eigen-solutions, stability limits, extensions to problems in two-component systems. P, 500a-500b, 536a-536b.


695. Colloquium
   a. Research Conference (1) I II

696. Seminar
   g. Graduate Seminar (1) I II

African American Studies (AAS)
TKE Building, Room 305
(602) 621-5665
Committee on African American Studies
Professor Joan Dayan
Associate Professor Brackette F. Williams, Director
Assistant Research Anthropologist
Drexel Woodson
African American Studies Advisory Committee: Karen Anderson, Ellen Basso, Myra Dinerstein, Jesse Hargrove, Celestino Fernandez, Macario Saldate, Rudy Troike, Carlos Velez-Ibanez, Fred Wiggins

The objectives of the African American Studies Program are to provide students with opportunities to learn about the African heritage in the Americas. Its curriculum is designed 1) to explore past and present cultural, political, and economic links between Africa and African descent populations in the Americas, and 2) to provide a comparative interdisciplinary theoretical and methodological examination of issues shaping the lives of persons of African descent in the United States and other nations of the Americas. The program seeks to accomplish these goals by 1) identifying courses offered in other departments and programs which focus on Africa or populations of African descent in the Americas, and 2) providing a minor in African American studies which provides different perspectives from which to examine issues to which students are exposed. African American studies courses are intended to supplement disciplinary offering as well as provide students with perspectives from within and across disciplines which challenge and question their established theories, methods, and conclusions.

For the minor in African American studies, students are required to successfully complete twenty-two (22) credit hours of courses. Ten (10) credit hours must be taken in Area I and the remaining twelve (12) can be taken in any one, not a combination, of the other four study areas. Cross-listed offerings acceptable for the African American studies requirement are included in the appropriate study area described below. (Note: these acceptable cross-listed courses may change. Students should seek advice from the African American studies advisor to determine whether a course is acceptable.)

Study Area I: African American studies theory and methodology: examines the past and present research agenda of African American studies. Courses in this area address the development of the field in relation to changes in issues of concern to African descent populations in the Americas. Courses in this area examine problems in the institutionalization of African American studies, the interdisciplinary nature of its methodology and theory, and exploration of disciplines, scholars, and historical events which have influenced the field of its past and contemporary research agenda—ten (10) credits.

AAS 220 Introduction to African American Studies (3)
AAS 222 African American Studies: A History of Ideas (3)
AAS 296H Honors Prospremacy (4)

Study Area II: African American literature, literary criticism and drama: examines historical developments and contemporary variations in the literary and performing arts of African descent populations in Africa and the Americas. Courses in this area attend to the sociopolitical and economic context of artistic productions with special attention to the implications such contexts have for general literary and symbolic theories—twelve (12) credit hours, at least three (3) of which should be devoted to a course that explores the influence of gender on variations in artistic productions.

AAS 478 African American Literature (3)
(Identical with ENGL 478)
AAS 306 African Women in the Americas (3)
AAS 339 Introduction to African and African-American Art (3) (Identical with ARH 339)
AAS 442 Writers, Women and the Gods (3)
AAS 450a-450b French Literature of Black Africa and the Caribbean (3) (Identical with FREN 450a-450b)

Study Area III: African and African American history, politics, and economy: examines the form, function and implications of underlying processes in the historical formation of contemporary demographic, economic, and political patterns that characterize African descent populations in the Americas in comparison with those of the African continent—twelve (12) credit hours, at least three (3) of which should be devoted to a course
that is primarily focused on Africa and three (3) to one that directs attention to an African descent population outside of the United States but in the Americas.

AAS 190 Introduction to African History (3) (Identical with HIST 190)
AAS 435 The Coming of the Civil War, U.S. 1845-1861 (3) (Identical with HIST 435)
AAS 436 Civil War and Reconstruction, 1861-1878 (3) (Identical with HIST 436)
AAS 468 Government and Politics of Africa (3) (Identical with POL 468)

**Study Area IV: African American society, culture, and the individual:** examines processes of cultural production, institution building, and group and individual identity formation among African descent populations in the Americas and on the African continent. Courses in this area examine past and current theories of culture formation, personality development, stages of moral development, and sociopolitical integration with special attention to their comparative implications among Americans of African descent within and across the categorical distinctions generally referred to as "racial groups," and "class strata"—12 credit hours.

AAS 329 Cultures and Societies of Africa (Identical with ANTH 329)
AAS 351 Race and Class in Latin America (3) (Identical with HIST 351)
AAS 487 Race and Public Policy (3) (Identical with POL 487)
AAS 495b Colloquium: Studies in Black America (3) (Identical with HIST 495b)

160. Minority Relations and Urban Society (3) I II (Identical with SOC 160)
190. Introduction to African History (3) I II S (Identical with HIST 190)
220. Introduction to African American Studies (3) I Introductory survey of the literature, history, culture and social issues affecting Black Americans.

222. African American Studies: A History of Ideas (3) (Rpt./2) II Enduring problems in the black experience through examination of some of the political and social ideas in the history of black thought.
239. Cultures and Societies of Africa (3) I I II (Identical with ANTH 329)
300. Minority Groups and American Politics (3) I III (Identical with POL 330)
339. Introduction to African and African-American Art (3) I II (Identical with ARH 339)
347. The Old South (3) (Identical with HIST 347)
348. The South Since the Civil War (3) (Identical with HIST 348)
351. Race and Class in Latin America (3) (Identical with HIST 351)
384. Topics in African History (3) (Rpt.) I II S (Identical with HIST 384)

**Agricultural and Biosystems Engineering (ABE)**

Shantz Building, Room 507 (602) 621-1607

Professors Donald C. Slack, Head, Delmar D. Fangmeier, Martin Fogel (Emeritus), Stuart Hoening (Emeritus), Kenneth R. Frost (Emeritus), Kenneth A. Jordan, William Matlock (Emeritus), George M. Nordby, William O. Shoup, Frank Wiersma (Emeritus), Associate Professors Wayne E. Coates, Dennis L. Larson, William O. Rasmussen, Munulhe Yitayew

Adjunct Professors Clarence Becker, Herman Bouwer, Kenneth G. Renard

Adjunct Associate Professor Kenneth E. Foster, William G. Gensler

Assitant Specialist Edward Martin

The department offers the Bachelor of Science in Agricultural and Biosystems Engineering (see the College of Engineering and Mines section of this catalog for specific undergraduate program requirements and the following list of departmental courses available for the engineering program).

The Bachelor of Science in Agriculture with a major in agricultural and biosystems technology is under review. Contact the Office of Academic Programs, College of Agriculture, for further information.

The department graduate program offerings lead to the Master of Science with a major in agricultural and biosystems engineering and the Doctor of Philosophy with a major in agricultural and biosystems engineering. The graduate programs are detailed in the Graduate Catalog.

**Agricultural and Biosystems Engineering (ABE)**

The Bachelor of Science in Agricultural and Biosystems Engineering emphasizes several areas including: agricultural engineering, irrigation engineering and water resources management, bioenvironmental engineering, biological engineering, and agri-biosystems power and machine systems. The program emphasizes a base science program merging biological and physical sciences. Included in the major areas as appropriate are: energy issues and alternatives; biosystems analysis and design; biotechnology engineering developments; hazardous waste management and water quality control; soil, water, plant relationships; applications of sensors, control systems, digital imaging, computer vision, artificial intelligence and multispectral analysis; robotics; and other emerging technologies. Emphasis is placed upon the design of systems, processes and equipment to serve the engineering needs of the agricultural/biological industries and the water resources/environmental engineering needs of various government, industry, community, and engineering consulting organizations.

The Bachelor of Science in Agricultural and Biosystems Engineering is accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology.
408. Environmental Simulation (3) I  Introduction to the design, development, and usage of simulation tools and techniques to assist in analyzing physical, chemical, and biological components of the environment. Not for ABE majors. P, MATH 123 or 124. May be convened with 508. Rasmussen


423. Agricultural Systems Analysis and Design (3) II 1994-95 Application of systems analysis to agricultural and biological related problems; computer modeling and use of operations research methods. 2ES, 1ED. P, STAT 361. May be convened with 523. Larson

447. Sensors and Controls (3) I 1993-94 The selection, interfacing, and calibration of digital and analog sensors to measure physical variables for manipulation with microprocessors. The development of logic and control circuit processes. 2R, 3L, 1ES, 1ED. P, ECE 207. May be convened with 547.

455. Irrigation Engineering (4) II Introduction to soil and water relations, irrigation systems, irrigation water supply, and irrigation management; basic designs. 3R, 3L, 2ES, 2ED. P, C E 321 or A ME 331a. (Identical with C E 455) May be convened with 555.

456. Irrigation Systems Design (3) I Design and operation of surface, sprinkler, and trickle irrigation systems. Field trips. 1ES, 2ED. P, 455. May be convened with 556.

457. Irrigation Engineering Laboratory (1) II Data acquisition and analysis pertinent to the design and evaluation of irrigation systems. 3L, 1ES. Field trip. CR 455. May be convened with 557.

458. Drainage of Irrigated Lands (3) II 1993-94 Origin and nature of drainage problems in arid lands; drainage theories, investigations and design for irrigated agriculture. Field trips. 1.5ES, 1.5ED. P, C E 321 or A ME 331a. (Identical with C E 458) May be convened with 558.

462. Soil and Water Conservation Engineering (3) II 1994-95 Methods for estimating runoff from croplands, Universal Soil Loss Equation, design of terraces, waterways, small earth dams, erosion control structures. 1.5ES, 1.5ED. P, 406 or C E 321 or A ME 331a. May be convened with 562. Slack

463. Energy from Biomass (3) II Biomass energy sources; collection and processing methods; thermal, anaerobic digestion and fermentation conversion processes, energetic, economic and environmental issues. P, A ME 230. (Identical with NEE 463) May be convened with 563. Larson

494. Practicum a. Agri-biosystems Engineering Design (3) I 3ED. P, 6 units of 400-level ABE courses. Writing-Emphasis Course. Satisfactory of the upper-division writing requirement is included in the Writing Emphasis Courses in the Academic Policies and Graduation Requirements section of this catalog.

b. Advanced Agri-biosystems Engineering Design (3) III 1R, 6L. 3ED. P, 494a.

504. Irrigation Principles and Management (3) II 1993-94 For a description of course topics, see 404. Graduate-level requirements include a special project on a current irrigation topic. Not for ABE majors. P, MATH 117R/S, 5 W 200. (Identical with S W 504) 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 topics. P, MATH 118, 123 or 125A, PHYS 102a. May be convened with 406. Yitayew

508. Environmental Simulation (3) I For a description of course topics, see 408. Graduate-level requirements include a special project on current environmental topics. P, MATH 123 or 124a. May be convened with 408. Rasmussen

510. Agri-biosystems Power Engineering (3) II 1994-95 For a description of course topics, see 410. Graduate-level requirements include a special project. P, A ME 230, 250 or CH E 206. May be convened with 410. Coates

512. Agri-biosystems Machinery Design (3) I 1993-94 For a description of course topics, see 412. Graduate-level requirements include an additional design project. P, A ME 250, C E 217. May be convened with 412. Coates

515. Agri-biosystems Process Engineering (3) I 1994-95 For a description of course topics, see 415. Graduate-level requirements include a special project. CR, A ME 240. May be convened with 415.

523. Agricultural Systems Analysis and Design (3) II 1994-95 For a description of course topics, see 423. Graduate-level requirements include a simulation project. P, STAT 361. May be convened with 423. Larson

547. Sensors and Controls (3) I For a description of course topics, see 447. Graduate-level requirements include an additional design project. P, ECE 207. May be convened with 447.

550. Small Scale Water Management Systems (3) I Design, construction, testing and operation of water management systems for small scale operators; water harvesting; runoff farming. Field trips. P, 6 units of hydrology, hydraulics, or irrigation.

555. Irrigation Engineering (4) II For a description of course topics, see 455. Graduate-level requirements include a special project on a current irrigation topic. P, C E 321 or A ME 331a. Identical with C E 555) May be convened with 455.

556. Irrigation Systems Design (3) I For a description of course topics, see 456. Graduate-level requirements include a special project. P, 455. May be convened with 456.

557. Irrigation Engineering Laboratory (1) II For a description of course topics, see 457. Graduate-level requirements include a special report. May be convened with 457.

558. Drainage of Irrigated Lands (3) II 1993-94 For a description of course topics, see 458. Graduate-level requirements include a special project. P, C E 321 or A ME 331a. (Identical with C E 558) May be convened with 458.

562. Soil and Water Conservation Engineering (3) II 1994-95 For a description of course topics, see 462. Graduate-level requirements include a special project. P, 406 or C E 321 or A ME 331a. May be convened with 462. Slack

563. Energy from Biomass (3) II For a description of course topics, see 463. Graduate-level requirements include a special project. (Identical with NEE 563) May be convened with 463. Larson

605. Soil-Water Dynamics (3) II 1994-95 (Identical with S W 605)

650. Advanced Irrigation Management (3) II 1993-94 Irrigation scheduling using Jensen-Haise and Penman equations for predicting evapotranspiration, determination of crop coefficients, production functions, economics, and energy considerations. P, 404 or 455 or S W 520.


656. Pressurized Irrigation Systems (3) II 1994-95 Analysis of design and operating criteria for sprinkler and trickle or drip irrigation systems, hydraulic of sprinklers and emitters, hydraulics of pipe systems. P, 456.

669. Seminar a. Agricultural and Biosystems Engineering (1) [Rpt./T] I II Yitayew

Agricultural and Resource Economics (AREC)
Economics Building, Room 208
(602) 621-6241

Professors Bruce R. Beattie, Head, Robert C. Angus, Bartley P. Cardon (Emeritus), Dennis C. Cory, Robert S. Fitch (Emeritus), Roger W. Fox, Jimmie S. Hillman (Emeritus), Maurice M. Kelso (Emeritus), Robert O. Kuehl, Jeffrey T. LaFrance, William B. Lord, William E. Martin (Emeritus), Eric A. Monke, Lester D. Taylor
The department's program is designed to relate agricultural and resource problems and issues in contemporary society to their underlying economic explanations. Through the choice of elective courses the major in agricultural and resource economics may build programs in: agricultural business to prepare for careers in the management of farms, ranches and agribusiness firms; economic development for careers in rural area development and foreign agricultural development; resource economics for careers in the management of public resources of land and water; and preparation for graduate study for careers in teaching and research.

The following degrees are offered: Bachelor of Science in Agriculture with a major in agricultural and resource economics and Master of Science with a major in agricultural and resource economics. The Doctor of Philosophy degree with a major in economics and an emphasis in agricultural and resource economics is administered by the combined faculties of the departments of Economics and Agricultural and Resource Economics.

The major: Undergraduate majors must complete the general education requirements as described in the College of Agriculture section of the catalog. Courses in four of the five required study areas must be selected from a departmentally approved list. Included in this list are MATH 119 and 123, ECON 201a, 201b, 330 and AREC 242. Additional requirements include ACCT 200, either ECON 300 or 361, and ECON 332 and a minimum of 22 units in upper-division agricultural and resource economics courses. Majors must choose additional coursework from options in either Agricultural Economics, Agribusiness Management, or Resource and Environmental Economics.

Agricultural Economics Option: This option is designed for the student interested in the management of agricultural production, marketing/sales and service business. In addition to the above general requirements, ACCT 210, 310 and MAP 330 are required. Students taking this option must also complete AREC 213, 215, 339, 403, 404, 450 and 464. Majors in this option are encouraged to enroll in additional relevant courses in the College of Business and Public Administration.

Resource and Environmental Economics Option: This option meets the needs of the student interested in the economic analysis of environmental and natural resource issues facing society. In addition to the general requirements, AREC 217, 339, 350, 375, 403, 404, 464, and 476 are required. Students are encouraged to use 44 elective units in courses relating to biology, political science and natural resource management.

The minor: A minimum of 20 units of course work is required in agricultural economics. At least 19 units must be selected from ACCT 200, AREC 213, 215, 217 and ECON 300, 330 or 361. A minimum of 12 upper-division units must be selected from a list of concentration courses that can be obtained from a minor advisor. Students are expected to have prerequisites and/or supporting courses that may be required for the courses in the minor.

213. Introduction to Agricultural Marketing (3) II Basic economic principles and marketing methods for agricultural crops and livestock in an international marketplace. P, ECON 200 or 201a.

215. Agricultural Business Management (3) I II Applying economic principles in decision making for the agribusiness firm; analytical techniques and management control; problems in organization, management, and operation of an agricultural business. P, ECON 200 or 201a.

217. Resource and Environmental Economics (3) I Relationship between man and use of natural resources and environmental systems, with emphasis on the economic implications of alternative environmental, energy and land-use policies. P, ECON 200 or 201a. (Identical with ECON 217)

242. World Food Economy (3) I World resources of agriculture; population and food supply; economics of hunger, world trade and agricultural policies. P, ECON 200 or 201a. (Identical with ECON 242)

310. Consumer Economics (3) I The economics of consumer behavior and choice with implications for consumer demand. Application to nutrition and food consumption, clothing and textiles, and consumer durables. P, ECON 200 or 201a. (Identical with MCS 310)

313. Economics of Futures Markets (3) I Futures market participants, evolution, functions, performance, regulation, financial instruments, and options on futures contracts, with emphasis on hedging uses of the futures market for agricultural commodities. P, ECON 201a. (Identical with ECON 313 and FIN 313)


350. Ethical Considerations in Agricultural and Natural Resource Policies (3) I Develops the capability in students to critically identify and analyze, from a political economy perspective, policy issues and decisions concerning agriculture and natural resources. P, ECON 200 or 201a.

375. Economics of Land and Water in the American West (3) I II Economic analysis of natural resource issues, policies and management alternatives. Case studies will focus on water supplies, public and tribal lands, river basins and wildlife, resources in the western U.S. P, 217 or ECON 201a. (Identical with ECON 375 and RNR 375)


404. Production Economic Analysis (3) I Application of production economics principles and analytical techniques to the solution of agricultural economics problems. P, MATH. 123, ECON 300 or 361. Thompson

450. Agricultural Finance (3) I Applying business and economic theory to problems confronting agribusiness firms in the acquisition, allocation, control, and transfer of capital resources. P, ECON 300 or 361 and 3 units of accounting. May be convened with 550. Wilson

464. Agricultural Policy (3) I II Economic analysis of the policy issues and proposals impacting on agriculture and rural America, with emphasis on the historical and continuing role of government in price and income policies. P, ECON 201a.

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

476. Natural Resource Economics (3) I II Economic principles useful in analyzing natural resource problems and policies in the Southwestern and nationwide. P, MATH 123, ECON 300 or 361. (Identical with ECON 476, 476s, 476w, and RNR 476)

500. Research Methodology in Agricultural Economics (3) I Study of the research process in agricultural economics as a means of acquiring reliable knowledge. P, ECON 518, ECON 504, or CR. Cory

504. Production Economics (3) I Theory of the firm and industry; single and multiple products, risk and uncertainty. P, MATH 123, ECON 300 or 361. (Identical with ECON 504)

512. Economic Policy in Developing Countries (3) I II The role of policies in economic growth and development. The impact of commodity, factor market and macroeconomic policies on economic incentives. (Identical with AR 1.512 and ECON 512)

513. Consumption Economics and Price Analysis (3) I Theory of the consumer, de-
mand, and market equilibrium, and welfare analysis. P, ECON 361, MATH 123 (Identical with ECON 513) France

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) Monke


516. Agricultural Development (3) I Microeconomic analysis of agriculture in developing economies, focusing on factors affecting production decisions of small farmers, including technologies, interconnectedness, and relationships between agricultural activities and household consumption patterns will also be discussed. P, ECON 300 or 361. (Identical with ECON 516) Fox

540. Design and Analysis of Experiments (3) II Statistical principles of research design for experimental and observational studies; introduction to the linear statistical model for analysis of data from research studies including techniques for complete block and incomplete block designs; factorial experiments; covariates and polynomial response functions. P, STAT 509. Kuehl

549. Applied Econometric Analysis (3) I (Identical with ECON 549) Dahlgran

550. Agricultural Finance (3) I For a description of course topics, see 450. Graduate-level requirements include a research paper of publishable quality which analyzes a current financial issue or problem in the agricultural sector and selected readings in professional journals. P, ECON 300 or 361 and 3 units of accounting. May be convened with 450. Wilson

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

575. Economics of Natural Resource Policy (3) II Theory and application of economic concepts needed to evaluate resource laws and policies; including welfare economics, externalities, public goods and valuation methodologies. Case studies focus on the American West and include federal and state environmental, water, land and wildlife policies. P, ECON 300 or 361. (Identical with AR L 575, ECON 575 and RNR 575) Colby


577. Advanced Topics in the Economics of Environmental Regulation (3) II Advanced economic theory of environmental policy. Topics include regulation of air and water pollution under imperfect competition, imperfect information, costly enforcement, uncertainty, and the use of alternative regulatory instruments. P, ECON 361, MATH 123. (Identical with ECON 577, HWR 577, and WS M 577) Innes

Agricultural Education (AED)

Forbes Building, Room 224
(602) 621-1523

Professors Roger T. Huber, Head, (Entomology), Clinton O Jacobs (Emeritus), Floyd G. McCormick (Emeritus), Kenneth S. Olson, Phillip R. Zurbrick
Associate Professors David E. Cox, Glen M. Miller
Assistant Professor John F. Elliot

The programs of study in agricultural education prepare students for entering careers working with people in a variety of settings. These positions require preparation in basic sciences, technical agriculture, knowledge of the principles and techniques of the teaching-learning process, communication skills and the ability to work with people.

The department offers the degree of Bachelor of Science in Agriculture with majors in agricultural education and agricultural technology management. The major in agricultural education has two options: teaching education in agricultural and non-formal education.

The department also offers programs of study leading to the degrees of Master of Science and Master of Agricultural Education. A strong emphasis in international development studies is offered at the graduate level. (See the Graduate Catalog for detailed information concerning graduate programs)

Agricultural Education:
Teacher Education in Agriculture

One of the options in the agricultural education major, teacher education in agriculture, prepares students for certified teaching careers at the secondary school or the community college level. Such teaching positions require preparation in the basic sciences, agricultural sciences and technology, communications, and knowledge and application of the principles and techniques of the teaching-learning process through professional education course work.

The option in teacher education in agriculture, which leads to teaching, includes course work which meets the requirements for Arizona secondary school teacher certification in agricultural education. In addition, persons who complete the program meet the requirements for Arizona secondary school teacher certification in general education.

Any student who plans to become a certified teacher must be formally admitted to teacher education in agriculture prior to enrolling in professional education course work which includes placement in student teaching (A ED 489). Admission requires the completion of a formal process; including a cumulative grade point average of 2.000 or better, participation in an interview with faculty, and successful completion of any mandated admission tests in effect. Contact a faculty advisor in the department for specific requirements.

Degree requirements: Students must complete course work in the appropriate basic skills and proficiencies, as well as the study areas described under the general education requirements in the College of Agriculture section of the General Catalog. The option in teacher education in agriculture requires students to complete 31 units of the following professional education courses: A ED 221, 301, 338a, 409, 485, 496a, 496b, 497a, 497b, 497h, 489. In addition, 37 units, including the following course work in agriculture are required: A ED 100, 350, 351, 5 units in plant sciences and/or soil science; 5 units in animal sciences; 5 units in agricultural economics, and 5 units in renewable natural resources. Teacher certification in agricultural education requires a total of 50 semester units of agricultural course work. Contact a faculty advisor in the department for specific Arizona teacher certification requirements.

Agricultural Education:
Non-Formal Education

This option has two areas of focus, agricultural or environmental education. Graduates with this option are prepared for a career in agriculture where educational expertise is desired. The non-formal agricultural education focus is similar to the teacher education in agriculture option, except students do not complete student teaching (A ED 489). Students complete other agricultural or related courses in lieu of A ED 489. The non-formal environmental education focus prepares students for a career emphasizing environmental education or for a career in an agency where environmental educational expertise is desired.

Degree requirements: Students in either area of focus must complete A ED 221, 301, 305, 439, 496a and 497h. In addition to the previously mentioned courses, students in the non-formal environmental education focus must complete AREC 350, A ED 402 and 422, RNR 316 or ECOL 206, RNR 384 and S W 105/106. Students in this option complete a minimum of 18 credits in agricultural education and/or education.
Agricultural Technology Management

This major is designed to prepare students to become skilled in the many aspects of agricultural technology, environmental protection, communication, business and economics. Graduates will be prepared for positions in small to large-scale operations where 1) an understanding of environmental complexities, 2) an ability to communicate, and 3) technical competence are important. Employment opportunities include: production/management/sales positions, certified plant/animal protection specialists, and many agricultural service-oriented positions.

Students may develop a specific option in consultation with a faculty advisor in the department. For example, options may be developed in plant sciences, renewable natural resources, veterinary science, etc. Students who elect the plant science option will have the courses necessary to qualify for California and Arizona pest control advisor certification. Graduates planning to enter post-graduate programs in the agricultural sciences will have met most admission requirements.

Degree requirements: Students must complete course work in the appropriate basic skills and proficiencies, as well as the study areas described under the general education requirements in the College of Agriculture section of the General Catalog. In addition, the following courses are required: ACCT 200, 210, AREC 213, 215, 350, A ED 402, ABE 404, COMM 312, 412, ECOL 206, ENGL 307 or 308, ENTO 201R/L, MAP 330, MATH 118, 119, or 123, 3 units of statistics, PL P 205 and S W 105, 106, 200, 201. Specialized options can be developed by contacting a faculty advisor for specific requirements.

100. Principles and Practices of Agricultural Mechanization (3) Basic principles and operative skills in construction and maintenance which are part of agricultural operations in production and urban agriculture systems. Principles for wood and metal construction, inert gas welding, plasma cutting, and construction of wood and metal projects are included. Major emphasis is placed on safety in the laboratory. 1R, 6L.

221. Introduction to Agricultural Education (1) I Objectives, nature, and scope of formal and non-formal education in agriculture; types of programs; qualifications of personnel; career opportunities.

301. Youth Leadership Development (3) I Characteristics of effective advisors; leadership styles; strategies for the management and organization of youth groups in agriculture; practice in leadership development techniques.

485. Teaching Psychomotor Skills in Laboratory Sciences (2) I II Methods and procedures in teaching psychomotor operational skills; conducting demonstrations; providing for student and teacher safety; sequencing skills activities; providing and organizing facilities, including micro-teaching demonstrations. 1R, 3L. May be convened with 485.

597. Workshop for a. Utilizing Occupational Experience Programs (1) [Rpt.] II b. Developing Youth Leadership (1) [Rpt.] II c. Administration, Management, and Supervision of Non-formal Education (1) [Rpt.] II (Identical with HE E 597d) d. Continuing Education in Agriculture (1) [Rpt.] II e. Program Planning and Evaluation (1-3) [Rpt.] II f. Computer Application in Agricultural and Non-formal Education (1) [Rpt.] II (Identical with HE E 597g) g. Environmental Education Issues in Agriculture (1) [Rpt.] II (Identical with HE E 597n) h. Developments in Non-formal Education (1) [Rpt.] II (Identical with HE E 597l)

601. Advanced Agricultural Education Methods (3) [Rpt.] II Problems in organizing and conducting programs of instruction in vocational and extension education. P, eight units of A ED or education.

615. Investigations and Studies in Agricultural Education (3) I Study and analysis of research literature, methods, techniques and procedures for conducting investigations; selecting a problem and developing plans for a study.

621. Program Planning and Evaluation (3) I Developing and evaluating programs in agricultural teaching and extension; situation analysis, objectives, policies, content, procedures, and evaluative criteria. P, 6 units of agricultural education.
Agriculture (AGRI)

Forbes Building, Room 201 (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. Microcomputing Applications (3) I II (Identical with ABE 220)

242. Communicating Knowledge in Agriculture (3) I (Identical with A ED 422)

American Indian Studies (AIMS)

Harvill, Room 430 (602) 621-7108

Graduate Interdisciplinary Program in American Indian Studies

Committee:

Professors Joseph (Jay) H. Stauss (Family and Consumer Resources), Director, Barbara A. Babcock (English), James W. Clarke (Political Science), Lawrence J. Evers (English), Jerrold E. Levy (Anthropology), N. Scott Momaday (English), J. Jefferson Reid (Anthropology), Robert Williams, Jr. (Law)

Associate Professors Thomas M. Holm (Political Science), Jennie R. Joe (Family and Community Medicine), Alice S. Paul (Teaching and Teacher Education), Ofelia Zepeda (Linguistics)

Assistant Professors Mary Jo Fox, Teresa L. McCarty (Language, Reading and Culture), David E. Wilkins (Political Science)

Lecturer Emory Sekaquaptewa (Anthropology)

Adjunct Associate Professor Nancy J. Parezo (Arizona State Museum)

The American Indian Studies Program does not offer a baccalaureate degree. A minor is available and the AIMS director can assist students who are interested in American Indian Studies and are pursuing the interdisciplinary studies major (IDS).

The minor in American Indian studies consists of at least 20 units (or appropriate units as designated by the major degree program) selected by the student in consultation with the Director of American Indian Studies 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 native people. American Indian students are provided with basic information on their cultural heritage and its significance in the contemporary world. Non-native students can obtain greater appreciation for the lifeways and value systems of American Indians.

A Master of Arts with a major in American Indian studies is also available. For admission and degree requirements, please see the Graduate Catalog.

100. Introduction to American Indian Studies (3) I Examines diversity of American Indian tribes, successive colonization waves, conflict between Native Americans and colonizing nations.

102. Linguistics for Native American Communities (3) I S (Identical with LING 102)

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

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

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

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

270. Colonization and Native People (3) I II (Identical with POL 270)

307a-307b. Elementary O'Odham (Papago) Language (3-3) (Identical with LING 307a-307b)

334. Politics and the American Indians (3) I (Identical with POL 334)

350. Oral Tradition (3) I II (Identical with ENGL 350)

396H. Honors Proseminar (3) I II

413. Ethnology of the Southwest (3) I II (Identical with ANTH 413) May be convened with 513.

416. Contemporary Indian America (3) I II (Identical with ANTH 416) May be convened with 516.

423. Anthropology of Mexico (3) II (Identical with ANTH 423) May be convened with 523.

424. Studies in Southwest Literature (3) I II (Identical with ENGL 424) May be convened with 524.

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) (Identical with LING 445a-445b) May be convened with 545a-545b.

449a-449b. Folklore (3-3) (Identical with ENGL 449a-449b) May be convened with 549a-549b.

467. Race and Ethnic Relations (3) I II (Identical with SOC 467)

477. American Indian Literature (3) (Identical with ENGL 477, which is the home) May be convened with 577.

478. American Indians and the Supreme Court (3) (Identical with POL 478) May be convened with 578.

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

487. Race and Public Policy (3) I (Identical with POL 487) May be convened with 587.

490. Indian Religions and Spirituality (3) Examines the positive (curing, harmony with the natural world, etc.) aspects of Indian religions. Indian medicine men may participate in the course at various junctures. (Identical with RELI 490) May be convened with 590.

502a-502b. Dynamics of Indian Societies (3-3) Philosophies, institutions and characteristics of tribal life in North America. 502a: American Indian lifestyle-studies prior to European contact. 502b: Impact of European immigration on tribal groups of North America. (Identical with ANTH 502a-502b)

513. Ethnology of the Southwest (3) I II (Identical with ANTH 513) May be convened with 413.

516. Contemporary Indian America (3) II (Identical with ANTH 516) May be convened with 416.

523. Anthropology of Mexico (3) II (Identical with ANTH 523) May be convened with 423.

524. Studies in Southwest Literature (3) I II (Identical with ENGL 524) May be convened with 424.

530. The Anthropology of Visual Art (3) II (Identical with ANTH 530) May be convened with 430.

545a-545b. Structure of a Non-Western Language (3-3) (Identical with LING 545a-545b) May be convened with 445a-445b.

549a-549b. Folklore (3-3) (Identical with ENGL 549a-549b) May be convened with 449a-449b.

577. American Indian Literature (3) (Identical with ENGL 577, which is the home) May be convened with 477.

578. American Indians and the Supreme Court (3) (Identical with POL 578) May be convened with 478.

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) (Identical with POL 584a-584b)

587. Race and Public Policy (3) I (Identical with POL 587) May be convened with 487.

590. Indian Religions and Spirituality (3) For a description of course topics, see 490. Graduate-level requirements include an additional research paper based on past research and personal experience with related topic. May be convened with 490.

595. Colloquium

a. American Indian Studies (3) [Rpt./4] II

596. Seminar

b. American Indian Studies (1-2) [Rpt./3] I II

c. American Indian Law and Policy (3) [Rpt./2] I II (Identical with POL 596h, which is home.)
Anatomy (ANAT)

Arizona Health Sciences Center
Room 4205
(602) 626-6084

Professors Robert S. McCuskey, Head, Jay B. Angevine, Jr., Joseph T. Bagnara (Emeritus), William D. Barber, Bryan Benson, Robert W. Gore (Physiology), Mac E. Hadley, Mary I. Johnson (Pediatrics), Philip H. Krutzsch (Emeritus), Raymond B. Nagel (Pathology), John Nolte, Donald P. Speer (Surgery), Nicholas J. Strausfeld (Arizona Research Laboratories, Neurobiology) Associate Professors Gail D. Burd, Mary J. C. Hendrix, Associate Head, C. Ward Kishe (Emeritus), R. Clark Lantz, Christopher A. Leadem, Albert V. LeBouton, Ronald L. Misiorowski (Surgery), Mary E. Morbeck (Prof. Anthropology), Leslie P. Tolbert (Arizona Research Laboratories, Neurobiology) Assistant Professors Herman C. Gordon, Nathaniel McMullen, Naomi Rance (Pathology), Mary Rykowski, Paul A. St. John, Jean M. Wilson

Research Assistants Professors Helen Amerman, Denton E. Enke, Richard E. B. Seftor, Karen Yohem, Chen-Su Yuan

Lecturer Norman E. Koelling

Senior Clinical Lecturer James C. Dunn

Research Lecturer Danny Burns

The Department of Anatomy offers a program of study leading up to the Doctor of Philosophy degree with a major in anatomy. The Master of Science degree is offered only in recent instances in which students are unable to continue in the doctoral program. Research areas of faculty include biological anthropology, cellular and systems biology, cancer cell biology, developmental biology, endocrinology, molecular biology, neuroscience, and reproductive biology. For admission and degree requirements, please see the Graduate Catalog.

401. Human Gross Anatomy (3) I Survey of the gross structure of the human body. 1R, 6L. Open to pharmacy students only. (Identical with PCOL 401)

415. Human Reproductive Biology (3) I Structure and function of the human reproductive system with emphasis on physiological mechanisms which regulate fertilization, pregnancy, birth, puberty, reproductive control and reproductive senescence. P, one semester of biology.


467R. Endocrinology (3) II Neural and endocrine integration in the regulation of mammalian physiological functions. (Identical with MCB 467R) May be convened with 567R.

471. Human Embryology (4) II Normal and abnormal development of the human with functional aspects stressed. Includes maturation of germ cells to fertilization to birth. Lecture, discussion and demonstration format. P, MCB 181, 182, EXSS 201, 202 or MCB 456 or 457, or consult with department. (Identical with ECOL 471 and MCB 471) May be convened with 571.

495. Colloquium

Introduction to the Neurosciences I (2) 1993-94 (Identical with MED 495y, which is home) May be convened with 595y.

Introduction to the Neurosciences II (2) 1993-94 (Identical with MED 495z, which is home) May be convened with 595z.

502. Principles of Neuroanatomy (4) I Cellular elements and recognized subsystems of the mammalian nervous system, with emphasis on general principles of neuroanatomical organization and their functional significance. Not open to premedical students. P, 8 units of biological lab science: 401, PSYC 302, PSIO 480 desirable. Consult department before enrolling. (Identical with ESS 302, PSYC 502, and SP H 502)

515. Reproductive Biology (3) I Structure, function and control of the mammalian reproductive system with emphasis on human reproduction. Course requires oral presentation and an in-depth research paper on a selected topic of current interest in reproductive biology.

550. Topics in Pigment Cell Biology (2) I Selected topics on the development and control of normal and abnormal pigment cells in various pigmented phenomena. (Identical with MCB 550)

555. Cancer Biology (3) II 1993-94 (Identical with CBIO 555)

556. Developmental Biology (3) I For a description of course topics, see 456. Graduate-level requirements include a deeper understanding of the subject, through reading and discussion of original research reports. Graduate students will be examined primarily on their ability to synthesize and evaluate information and ideas in the field. P, 456. CHEM 241b. (Identical with MCB 557) May be convened with 457.

558. Advanced Subjects in Endocrinology (2) [Rpt.] I Selected topics in vertebrate and invertebrate endocrinology. P, 467R. (Identical with MCB 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. (Identical with MCB 567R) May be convened with 467R.

571. Human Embryology (4) II For a description of course topics, see 471. Graduate-level requirements include extended term papers plus a class presentation on the topics. P, MCB 181, 182, EXSS 201, 202, or consult with department. (Identical with ECOL 571 and MCB 571) May be convened with 471.

575. Special Topics in Biological Imaging (2) I, II 1993-94 Designed for graduate students in the biological and biomedical sciences to provide an understanding of biological imaging techniques. Lecture and laboratory demonstrations/exercises. Student participation in discussion will be expected. P, consult department before enrolling.

577. Principles of Cell Biology (4) I Intensive, graduate-level introduction to principles and mechanisms of cell biology, including current research strategies in the field. P, consult department before enrolling. (Identical with MCB 577)

582. Topics in Neurodevelopment (2) I 1994-95 (Identical with NRSC 582)

583. Topics in Neural Plasticity (2) II 1994-95 (Identical with MCB 583)

584. Cellular Neurobiology (2) I, II 1993-94 Focuses on a different selected topic in the cell biology of neurons and glial cells each offering. Students read and critically discuss primary literature. P, course in neurobiology or cell biology, consult with department before enrolling. (Identical with MCB 584 and NRSC 584)

588. Principles of Cellular and Molecular Neurobiology (4) I (Identical with NRSC 588)

589. Principles of Systems Neurobiology (4) II (Identical with NRSC 589)

595. Colloquium

Introduction to the Neurosciences I (2) 1993-94 (Identical with MED 495y, which is home) May be convened with 595y.

Introduction to the Neurosciences II (2) 1993-94 (Identical with MED 495z, which is home) May be convened with 595z.

596. Seminar

Concepts in Cellular Differentiation (2) P, 577 or consult with department before enrolling (Identical with MCB 596c)

601. Human Gross Anatomy (8) I Comprehensive survey of the developmental and
gross structure of the human body. Permission required to enroll; consult instructor before registering.


603. Microscopic Structure (1-3) I II Selected concepts of structural organization at light and electron microscopic levels of the anatomy and development of the cells, tissues, and organs of vertebrates. P. 601, 602.

604. Gross Human Anatomy (2-6) I II Study in depth of the gross human anatomy of selected areas or systems. P. 601, 602. Consult instructor before registering.

605. Human Neuroscience (6) I II Functional and morphological organization of the human CNS. Permission required to enroll; consult instructor before registering. Course begins in October and extends through March. (Identical with NEUR 605, PHCL 605 and PSIO 605.)


610a-610b. Anatomical Techniques (1 to 4-1) to 4) Introduction to special techniques and procedures of analytical anatomy. P. 601, 602; consult department before enrolling.


616. Introduction to Anatomical Literature (1) I II A problem-oriented, bibliographic approach to basic anatomical references. Primarily for those students planning a career in anatomy and wishing to prepare themselves for further graduate study. 3L.


b. Biological, Structural and Functional Interactions (1) I [Rpt./4] Open to majors only. Consult instructor before registering.


700. Laboratory Rotation (3) I II [Rpt./6 units] Rotations in the research laboratories of faculty in the Department of Anatomy. Consult instructor before registering. 10L.

801. Human Gross Anatomy (8) I Comprehensive survey of the development and gross structure of the human body. No grade is given until the full 8 units are completed.


805. Human Neuroscience (6) I II Morphological organization of the human central nervous system and neurotransmitters and intrinsic regulatory functions. (Identical with NEUR 805, PHCL 805, and PSIO 805)

### Animal Sciences (ANS)

Shantz Building, Room 205
(602) 621-7623


Associate Professors Sue K. DeNise, Vincent Guerriero, William A. Schurg, R. Spencer Swingle, Mark E. Wise

Assistant Professor Parker Antin

Adjunct Professors Pat Hoyer, Dave Karabinus, Rita Manak, Catheryn Racowski

Lecturer Thomas N. Wegner

Adjunct Lecturers Wendy Davis, David E. Hooper, Michael P. White

Extension Specialists Dennis V. Armstrong, Robert M. Katting, Albert M. Lane (Emeritus), Edward A. LeViness (Emeritus)

Research Specialist S. Peder Cuneo

Animal sciences is a field of study involving the production, marketing, and utilization of animals in agriculture, entertainment, and companionship. Students gain knowledge in the biological processes involved in genetics, nutrition, and reproduction as well as in the practical business aspects of racing and livestock management. Students may find employment in production management, racing administration, or within other related industries serving the agricultural sector such as agribusiness firms, financial institutions, and breed associations. Students may also complete a field of study that prepares them for admission to graduate programs in agriculture or the biological and life sciences or professional schools in veterinary medicine or medicine. A minor in animal sciences is available for nonmajors.

#### Animal Industry Option: The following required courses also satisfy specific study area requirements: Biological and Life Sciences, ECOL 100, 101a-101b, and 102a-102b; Individual and Preprofessional Schools, ECON 200 or 201a. Foundation courses required are ACCT 200, W S 200, V SC 403R or 405, and AREC 213 and 215. In addition, three business and two plant/ range courses must be selected from a departmentally approved list. Requirements of the major are AN S 102, 205, 215, 280, 295a, 313, 315R, 330, 395a, 496a, and three courses selected from 472, 473, 474, 476, 477 and 478.

Science and Preprofessional Option: The following required courses also satisfy specific study area requirements: Biological and Life Sciences, ECOL 181 and 182; Physical and Environmental Sciences, CHEM 103a-103b and 104a-104b; Individuals, Societies and Institutions, ECON 200 or 201a. Foundation courses required are ACCT 200, AN S 213 or ECOL 320; CHEM 214a-214b, 243a-243b, 322, 323, MATH 123, and PHYS 102a-102b and 180a-180b. Recommended courses are BIOG 460, or 462a and CHEM 325. Requirements for the major are AN S 102, 280, 295, 313, 315R, 330, 395a, 460a, V SC 400 or 400b or ECOL 437, and 8 additional units of 400-level courses in animal sciences.

#### Race Track Industry Option: The following required courses also satisfy study area requirements: Physical and Environmental Sciences, CHEM 101a-101b and 102a-102b; Individuals, Societies and Institutions, ECON 200 or 201a. Foundation courses required are ACCT 200; AREC 215, MKTG 361 and a minimum of 9 units of business and communications courses from a departmentally approved list. Requirements for the major are AN S 142, 270, 340, 342, 345a-b, 440 and 444. Students desiring an emphasis in business are required to complete the following courses: N S 458, MAP 305, 320 and 330; ENGL 370, and A ED 422. Students desiring an emphasis in racing animal management are required to complete the following courses: ECOL 100, AN S 213, 215, 313, 315R, 330, 336, and 476.

The minor: A minimum of 20 units is required for the minor. Students must take AN S 102 in addition to the specific prerequisites for the courses selected for the minor. Students select 8 units from the following core courses: AN S 142, 205, 213, 234, 270, 280, or 342 234, 142, 280, 205, 213, 270, 342; and 12 units from the following concentration courses: AN S 313, 315R, 330, 440, 472, 473, 474, 476, 477, and 478.
102. Animal Industry (3) I A comprehensive view of the livestock and poultry industries, 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 animal sciences.

142. Introduction to the Animal Racing Industry (2) I Overview of the history, terminology, personnel, equipment and breeds of animals utilized in the racing industry.

205. Live Animal and Carcass Evaluation (3) II A comprehensive view of meat animal, dairy and horse selection techniques, including the evaluation of meat animals and their carcasses as related to economic importance; the selection of breeding animals based upon visual appraisal and performance records. 1R, 6L.

213. Animal Genetics (3) I Principles of inheritance as applied to domestic animals. P, 4 units of biology. (Identical with WFSC 213)

215. Physiology and Anatomy of Domestic Animals (4) II Systemic physiology and functional anatomy of domestic animals with emphasis on physiological systems of importance to animal production. 3R, 3L. P, 3 units of biology.

234. Feeds and Feeding (3) I Selection, evaluation, and use of feeds for specific purposes; balancing rations for livestock and poultry. Not open to students with credit or CR in 330.

250. Companion Animal Biology (3) I Principles of anatomy, physiology and behavior of companion animals and their interrelationship to humans.

270. Introductory Horse Science (3) I An introduction to the fundamental aspects of horse science; ownership responsibilities, economics, anatomy, physiological systems and careers in the horse industry. Field trip.

280. Science of Meat and Meat Products (3) I II Techniques used in meat processing, with special reference to structure and composition of the various meats. Student has option to select a processing or selection-identification lab. 2R, 3L. Field trip. (Identical with N FS 280)

295. Colloquium
a. Career Orientation (1) I

297. Workshop
a. Cattle Management Practice (1) I 3L. Field trips.

313. Principles of Animal Breeding (3) II Basic concepts involved in the improvement of economically important traits of livestock through application of genetic principles. Field trips. P, 213, MATH 117R/S. Writing-Emphasis Course.*


315L. Physiology of Reproduction Laboratory (1) I Practice in semen collection and storage, artificial insemination, and hormone assay. P or CR, 315R. (Identical with V SC 315L)

330. Principles of Nutrition (3) II Digestion, absorption and metabolism of carbohydrates, lipids, proteins, vitamins and inorganic nutrients. Field trip. P, CHEM 101b and 102b or 103b and 104b. (Identical with WFSC 330)


340. Race Track Marketing and Media Relations (3) I II Concepts and issues related to the marketing and promotion of the animal racing facility and industry. P, 142, CR, MKTG 361 or AREC 213. (Identical with N FS 340)

342. Organization and Administration of the Racing Department (3) II Basic duties and functions of the racing office and department. Personnel required and procedures utilized in developing the racing program. P, 142.


395. Colloquium a. Professional Development in Animal Agriculture (1) I


472. Dairy Herd Management (3) I Proper milking, efficient housing, and health management of dairy cattle; marketing milk from the farm; milk production costs. Field trip. P, 330.


474. Sheep Production (2) I The production, feeding and management of sheep on the farm and ranch. 1R, 3L. P, 330.


477. Beef Resource Management (3) I II Integration of beef production resources into a comprehensive beef production system, including breeding, feeding and marketing strategies. Field trip.

478. Feedlot Beef Production (2) I Feeding and management systems of beef cattle in the feedlot. All-day field trips. P, 330.


497. Workshop a. Race Track (1) [Rpt./4 units] I II Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog)

501. Animal Growth and Development (2) II 1994-95 Growth and development of domestic animals, with emphasis on skeletal muscle, bone and adipose tissue growth, from the cellular level to the whole animal. P, BIOC 460 or 462a.

513. Quantitative Genetics (3) I II 1994-95 Theoretical and applied aspects of quantitative genetics, including population genetics, forced to change gene frequency, breeding systems, and estimation of genetic parameters in a population. P, 6 units of genetics. (Identical with GENE 513)

520. Pathways and Signals in Cells (3) I (Identical with BIOC 520)

530. Principles of Nutrition (3) I II Digestion, absorption and metabolism of carbohydrates, lipids, proteins, vitamins, and inorganic nutrients. Field trip. P, CHEM 101b and 102b or 103b and 104b. (Identical with WFSC 530)

535. Biotechnology in Animal Science (3) II 1994-95 Survey of current recombinant DNA technology and principles. Topics include: vectors and hosts, enzymes used in molecular cloning, DNA sequencing, site-directed mutagenesis, expression systems and polymerase chain reaction. P, BIOC 460 or 462a.

543. Research Animal Methods (3) I I (Identical with V SC 543) May be convened with 443.

585. Domestic Animal Endocrinology (3) I II 1994-95 Endocrine regulation of growth, metabolism and reproduction of domestic farm animals. P, 3 units of biochemistry.

586. Physiology of Lactation and Neonatal Development (2) II 1994-95 The anatomical and physiological mechanisms governing the process of milk secretion and neonatal development. P, 315R.

596. Seminar a. Animal Sciences (1) [Rpt./3] I


619. Nutritional Biochemistry Techniques (3) I II (Identical with N FS 609)

612. Biological Electron Microscopy (4) I (Identical with MCB 612)

615. Chemistry and Metabolism of Lipids (3) I II 1993-94 (Identical with N FS 615)

622. Mineral Metabolism (2) I 1993-94 (Identical with N FS 622)

635. Ruminant Nutrition (3) I Recent findings in ruminant nutrition; the physiochemical
processes of digestion and absorption; importance and metabolism of rumen microflora; normal metabolism and abnormal metabolic disorders; modes of action of feed stimulants. P, 330; 336; CHEM 241a, 243a.


66. Analysis and Purification of Proteins (3) II 1993-94 Principles and procedures for analyzing, purifying, and characterizing proteins and amino acids from cells or from cDNA expression systems. P, BIO 462a preferred, BIOG 460 acceptable. (Identical with BIOG 665 and NFS 665)

67. Animal Physiology Research Techniques (2) I 1994-95 Introduction to selected physiological and biochemical techniques used in animal research. 1R, 3L. Open to majors only. P, BIOG 460 or 462a.

68. Environmental Physiology of Domestic Animals (3) II 1993-94 Physiological, behavioral and anaotomical responses of domestic animals to their environment, with emphasis on adaptive mechanisms. P, 313, 315R, 330. 3 units of general physiology/anatomy.

69. Seminar
a. Animal Sciences (1) [Rpt./3 units] I II

Anthropology (ANTH)
Anthropology Building, Room 210
(602) 621-2585


Associate Professors Constance Cronin, Mark Nichter, John W. Olsen, Thomas K. Park, Richard A. Thompson, Brackette F. Williams

Assistant Professors Ana Alonso, Maria C. Inhorn, David J. Killick, Barbara J. Mills, Daniel Nugent, Willem J. de Reuse

Lecturers Jan Bell (Arizona State Museum), Bruce Hilpert (Arizona State Museum), Daniel S. Matson (Arizona State Museum), Nancy Odegaard (Arizona State Museum), Charles W. Polzer (Arizona State Museum), R. Gwinn Vivian (Arizona State Museum) Advice Professors Bryant Bannister (Laboratory of Tree-Ring Research), Robert E. Dean (Laboratory of Tree-Ring Research), Paul R. Fish (Arizona State Museum), William J. Robinson (Laboratory of Tree-Ring Research), Emeritus,

Adjunct Associate Professors E. Charles Adams (Arizona State Museum), James Greenberg (Bureau of Applied Research in Anthropology), Kenneth Kramme (Arizona State Museum), Nancy Parezo (Arizona State Museum), Thomas Sheridan (Arizona State Museum)

Adjunct Assistant Professors Timothy Finan (Bureau of Applied Research in Anthropology), Helen Henderson (Bureau of Applied Research in Anthropology), Thomas McGuire (Bureau of Applied Research in Anthropology)

Research Anthropologist Emory Sekaquaptewa (Bureau of Applied Research in Anthropology)

The science of anthropology is the study of human beings, their origins, thought, and behavior. The Department of Anthropology offers graduate and undergraduate courses in four subdisciplines: cultural anthropology, physical anthropology, archaeology, and linguistic anthropology, as well as specialized training for field research. Special programs in museum studies, cultural resource management, and forensic anthropology draw upon the extensive resources of the Arizona State Museum. The Bureau of Applied Research in Anthropology is a center for applied anthropological research in the American Southwest and similar multicultural and ecological settings elsewhere in the world. The department cooperates with the Arizona Health Sciences Center; survey of concepts and methods used by physical anthropologists

The degrees offered by the department are the Bachelor of Arts, Master of Arts, and Doctor of Philosophy with a major in anthropology.

The major for the B.A. requires a minimum of 36 units of anthropology. 18 of which must be in upper-division courses. All majors must take 101, 102, 200, 235, 265, and 276, which provide the student with basic training in all four subdisciplines. The student may then select one of three programs: (1) a general program which requires one upper-division course in each of the four subdisciplines plus two additional upper-division courses (a minimum of six courses); (2) a special program which requires three upper-division courses in each of two subdisciplines (a minimum of six courses); or (3) a topical or areal specialization approved by the undergraduate advisor (a minimum of six upper-division courses).

The supporting minor may be chosen from any department or program within the University.

The department participates in the Honors Program.

101. Introduction to Physical Anthropology and Archaeology (3) I II Basic concepts and methods used by physical anthropologists and archaeologists.

102. Introduction to Cultural Anthropology and Linguistic Anthropology (3) I II Basic concepts and methods used by cultural and linguistic anthropologists.

110. Exploring Archaeology (3) I An introduction to the past as revealed by archaeological research; from Neanderthals and their antecedents to Stonehenge, Maya pyramids, and Homer's Troy.

131. Ancient Civilizations of the Near East (3) I (Identical with NES 171)

172. Islamic Civilization: Traditional and Modern Middle East (3) I (Identical with NES 172)

195. Colloquium
a. Anthropology (1) I II

200. Cultural Anthropology (3) I II Contemporary theories and methods in use among cultural anthropologists. Open to majors only.

205. Prehistoric Peoples of the Southwest (3) I II Nontechnical discussion of the lifeways of the ancient people of the Southwest. (Identical with AINS 205)

206. Native Peoples of the Southwest (3) I II Nontechnical discussion of Southwestern Indian cultures from historic times to the present. (Identical with AINS 206)

235. Principles of Archaeology (3) I II History of archaeological research; survey of concepts and methods for the study of prehistoric cultures.

250H. Ethnographic Foundations (3) I An honors course that focuses upon the work of a single anthropologist whose writings substantially shaped the history of the field.

251. Social Constraints on Engineering (3) [Rpt./1] I (Identical with MSE 251)

257. Materials Science of Art and Archaeological Objects (3) I (Identical with MSE 257)
258. Materials Science of Art and Archaeological Objects Laboratory (1) II (Identical with MSE 258)

265. Human Evolution (3) II Neontological and paleontological approaches to human evolution and variation, nonhuman primate studies, bio-molecular and anatomical variation, bio-cultural responses to environmental stress. P, 101 or 111.

276. The Nature of Language (3) I I An introduction to the basic concepts of linguistic anthropology and their implications for the study of culture and society.


304. Introduction to Archaeological Fieldwork (3) II 1994-95 Practical excavation, class discussion, mapping and the preliminary stages of artifact analysis. 2R, 4L. Field trips.


307. Ecological Anthropology (3) I Cultural adaptation with an emphasis on the systematic interaction of environment, technology, and social organization among hunter-gatherers, nomadic herders, and peasant farmers.

308. Family, Household and Society (3) I Introduction to the cross-cultural analysis of family and kinship systems. Writing-Emphasis Course.*

310. Culture and the Individual (3) I Cultural and psychological dimensions of human development and human behavior. (Identical with SOC 310)

315. World Ethnography (3) I I The comparative study of selected societies of the world through extensive use of the media. Writing-Emphasis Course.*

316. Political Economy of Language in the Southwest (3) I Interethnic and interclass contest over language and meanings in development of Southwest as a "region," in relation to access to material resources and civil rights. P, junior standing. Writing-Emphasis Course*

319. Mexican American Culture (3) I Historical background, cultural institutions, identity problems, social relations, and expectations of people of Mexican ancestry in the United States. (Identical with LA S 319 and MAS 319)

320. Evolution of the Earliest States (3) I 1994-95 Intensive introduction to the evolution of the world's earliest states: Mesopotamia, Egypt, Indus, China, Peru, Maya, Mexico. Comparative topics include urbanism, elites, economics, literacy and collapse. P, 101, 110, or consult department before enrolling.

329. Cultures and Societies of Africa (3) II Ethnology and social anthropology of African peoples including their ecology, social organization, and systems of thought. P, 3 units of anthropology. (Identical with AAS 329)

331. Anthropology and Development (3) II 1993-94 The role of anthropology in interdisciplinary projects involving economic development and planned change on the national and international levels. P, 3 units of anthropology. (Identical with LA S 331)

334. Art and Archaeology of Ancient Egypt (3) II 1993-94 (Identical with CLAS 334)

335. Archaeological Interpretation (3) II 1994-95 Survey of modern methods and theories in archaeology, with emphasis on current archaeological problems being investigated throughout the world. P, 235.

337. Studies in Modern Material Culture (3) II Studies relating contemporary behavior and material culture will be planned, implemented and evaluated to test methods of archaeological interpretation in modern societies and to develop new nonreactive methods of social science research. P, 3 units of social science.


375. Ethnography of the Middle East (3) II Introduction to and critical examination of the ethnographic literature on the peoples/cultures of the Middle East. Focus on social organization, cultural meanings, and regional political economy. (Identical with NES 375)

384. Sociology of Latin American Societies (3) II (Identical with SOC 384)

396H. Honors Proseminar (3) I II

400. Processes of Culture Change (3) II Intensive investigation of specific theories and varieties of culture change. P, 200. May be convened with 500.

401. Ancient Mesopotamia (3) I 1994-95 Sumerian, Babylonian, and Assyrian civilization from the first cuneiform documents to the fall of the neo-Babylonian empire, with special attention to issues of sociopolitical organization. P, NES 171, ANTH 101, 110 or consult department before enrolling. (Identical with HIST 401 and NES 401) May be convened with 501.

402. Gender and Language in Japan (3) I 1994-95 (Identical with JPN 402)

403. Anthropology of Conflict Resolution (3) II Decision making, conflict, and violence from a cross-cultural perspective, aiming to build both understanding of conflict processes and skills for managing and resolving them. May be convened with 503.

405. Urban Adaptation of Ethnic Groups (3) I A survey of adaptations of ethnic and social groups to urban areas, focusing on a different group or region each semester. May be convened with 505.

406. Gender and Social Identity (3) I 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. Bilingualism in the Southwest (3) I I Historical background and theoretical issues dealing with linguistic minority groups in the Southwest. Field trip. (Identical with MAS 407) May be convened with 507.

408. Anthropology and Public Policy (3) II Examines the development, goals, techniques, and practices of anthropology as a policy science. May be convened with 508.

409. Econmoc Anthropology (3) II Analysis of production, exchange, distribution, consumption, property, economic surplus, inheritance, and types of economic structure. P, 200, or 12 units of economics. (Identical with ECON 409 and LA S 409) May be convened with 509.

410. Ceramic Ethnoarchaeology (3) I 1993-94 Using ethnoarchaeological and ethnographic case studies from diverse geographical areas, the course examines relationships between ceramics and a range of matters traditionally of interest to archaeologists. May be convened with 510.

411. Anthropology of Religion (3) I Comparative approaches to the study of religion; systems of ritual and symbolization in the primitive world; shamanism and possession; religious movements; religion in the modern world. (Identical with REL 411) May be convened with 511.

412. Peasants and Peasant Societies (3) II 1994-95 Comparison of approaches to analyzing the peasantry. Special concern with peasant political mobilization and consciousness. (Identical with SOC 412) May be convened with 512. Research-Emphasis Course.*

413. Ethnology of the Southwest (3) II Culture history and economic, social, and religious institutions of the living people of the Southwest. P, 200. (Identical with AINS 413) May be convened with 513. Writing-Emphasis Course.*

414A-414B. Indians of the Southwest (3-3) S History, arts and crafts, economics, social institutions, religions, and mythology of the present-day Indians of the Southwest.

416. Contemporary Indian America (3) II 1994-95 The historical development and contemporary significance of the reservation system in the life of the Native American of the United States. (Identical with AINS 416) May be convened with 516.

417. Cultures of Ancient Mexico (3) S Archaeological and ethnohistoric survey of the civilizations of ancient Mexico from earliest times to the period of the Spanish Conquest. Field trips. (Identical with LA S 417) May be convened with 517.

419. Psychological Anthropology (3) II Cultural emphasis and experiences as basic shaping forces in personal development and emotion. Topics include psychoanalysis and anthropology, gender and sexuality, childhood, grief and mourning, dreaming, psychology, path. P, 102 or 200. May be convened with 519.

420. Contemporary American Culture (3) I Different perspectives on American culture as expressed in organization of kinship, space, bureaucracies, media, social classes, ethnic groups, religious sects and movements. May be convened with 520.

422a-422b. Pre-Columbian Art (3-3) (Identical with ARH 422a-422b) May be convened with 522a-522b.

423. Anthropology of Mexico (3) II 1993-94 Historical and cultural background, and contemporary economic, political and social organization of indigenous and non-indigenous groups in Mexico. Primarily concerned with the people of the countryside. (Identical with ANS 423, LA S 423 and MAS 423) May be convened with 523.

425. Language Variation (3) II (Identical with LING 425) May be convened with 525.

427a. The Prehistory of East Asia (3) I The origins and subsequent development of prehistoric cultures in China, Japan, Korea, Mongolia, Siberia and Southeast Asia. Broad concepts such as cultural change and environmental adaptation are stressed in order to draw parallels among these geographically and culturally diverse regions. P, 101. (Identical with EAS 427a) May be convened with 527a.

427b. The Archaeology of Pre-Han China (3) II The origin and florescence of Chinese culture and civilization from an archaeological perspective. An in-depth survey of Chinese prehistory and early history from the early Pleistocene to the third century BC. 427b is not a prerequisite for 427a. P, 101; consult department before enrolling. (Identical with CHN 427b) May be convened with 527b.

430. The Anthropology of Visual Art (3) II An introduction to the anthropology of visual art and the interdisciplinary methodologies and techniques of studying art and aesthetics cross-culturally as sociocultural phenomena. P, 200. (Identical with ANS 430) May be convened with 530.

432. Peoples of the Pacific (3) I II Populations and cultures of Polynesia, Micronesia, and Melanesia; variability of these "natural laboratory" settings in an ecological framework. May be convened with 532.

433. Laboratory in Zooarchaeology (3) I 1994-95 Fragmentary animal remains in archaeological interpretation. Diagnostic morphological features; role in cultural interpretation. Analytical techniques; lab analysis; report preparation. 1R, 6L. May be convened with 533.

434. Kinship and Social Organization (3) II Principles in the comparative study of social systems; types of social structure. P, 200, or 9 units of sociology (Identical with SOC 434) May be convened with 534. Writing-Emphasis Course.

435. Principles of Archaeological Fieldwork (3) II 1993-94 Introduction to the principles of archaeological fieldwork, with emphasis on methods and theory of survey and excavation. 2R, 3L. P, 235. May be convened with 535.

436. Japanese Sociolinguistics (3) (Identical with JPN 436)
472. The Relationship of Early Hominids and Contemporary Faunas (3) I The faunal association of contemporary animals and hominids world-wide. Peopling the New World. Methods utilized to analyze fossil assemblages when associated with hominids. May be convened with 572.

473. Primate Anatomy (4) I Comparative primate functional anatomy from an anthropological viewpoint including extensive laboratory dissection and study of behavior, ecology, and evolution. P, 265 or consult department before enrolling. May be convened with 573.

476. Language in Culture (3) II Survey of the nature of the interrelationships between language and other cultural phenomena. P, LING 101 or ANTH 276. (Identical with LING 476) May be convened with 576. Writing-Emphasis Course* 


478. Archaeological Analysis with Geographic Information Systems (3) II 1994-95 An overview of computer concepts, techniques, and algorithms fundamental to Geographic Information Systems (GIS). Emphasis is placed on the use on GIS to examine, analyze, and model archaeological and environmental distributions within areas of study. May be convened with 578.

479. Culture and Materials Technology (3) I Investigates the ways in which systems of technology are embedded in a cultural context and the resulting impacts on invention, innovation and conservation, technology transfer, and cultural change. (Identical with ENGR 479 and MSE 479) May be convened with 579.

480. Historical Comparative Linguistics (3) II Types and mechanisms of linguistic change; language and dialect formation; determination of prehistoric connections; reconstruction of proto-languages and cultures, and their origins in time and space. P, 276 or LING 101. (Identical with LING 480) May be convened with 580. Writing-Emphasis Course.*

482. Hopi Language in Culture (3) II A conversational introduction to Third Mesa dialect of Hopi, with emphasis on cultural context and covering essentials of Hopi language structure. (Identical with AINS 482) May be convened with 582.

484a-484b. Akkadian Linguistics (3-3) Introduction to the standard literary language of the Babylonians and Assyrians. (Identical with NES 484a-484b) May be convened with 584a-584b.

485. Social Organization of India and Pakistan (3) I (Identical with NES 485) May be convened with 585.

487. Poverty and Health (3) II (Identical with NURS 487) May be convened with 587.

488. Governing Science and Technology (3) II (Identical with GEOG 488)

490. Women in Middle Eastern Society (3) I Middle Eastern society viewed from the perspective of women. Examines the extent to which formal definitions of women's nature and roles coincide with women's self-images and activities. (Identical with NES 490 and WS 490) May be convened with 590.

496. Seminar f. Ceramic Analysis (3) II 1994-95 May be convened with 596f.

497. Workshop c. Dendrochronology (2) 3L. May be convened with 597c. (Identical with GEOS 497c, which is home) *Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

500. Processes of Culture Change (3) II For a description of course topics, see 400. Graduate-level requirements include extra term paper writing and other exercises. May be convened with 400.

501. Ancient Mesopotamia (3) I 1994-95 For a description of course topics, see 401. Graduate-level requirements include additional readings and a research paper. (Identical with HIST 501 and NES 501) May be convened with 401.

502a-502b. Dynamics of Indian Societies (3-3) (Identical with AINS 502a-502b)

503. Anthropology of Conflict Resolution (3) II For a description of course topics, see 403. Graduate-level requirements include major term paper. May be convened with 403.

505. Urban Adaptation of Ethnic Groups (3) I For a description of course topics, see 405. Graduate-level requirements include major research paper. May be convened with 405.

506. Gender and Social Identity (3) II For a description of course topics, see 406. Graduate-level requirements include additional readings and a detailed research paper. May be convened with 406.

507. Bilingualism in the Southwest (3) I II For description of course topics, see 407. Graduate students are required to give an oral presentation of final paper. (Identical with MAS 507) May be convened with 407.

508. Anthropology and Public Policy (3) II For a description of course topics, see 408. Graduate-level requirements include term paper. May be convened with 408.

509. Economic Anthropology (3) II For a description of course topics, see 409. Graduate-level requirements include an in-depth research paper. (Identical with ECON 509 and LA S 509) May be convened with 409.

510. Ceramic Ethnoarchaeology (3) I 1993-94 For a description of course topics, see 410. Graduate-level requirements include a research paper. May be convened with 410.

511. Anthropology of Religion (3) I For a description of course topics, see 411. Graduate-level requirements include a major term paper. May be convened with 411.

512. Peasants and Peasant Societies (3) II 1994-95 For a description of course topics, see 412. Graduate-level requirements include an additional research paper. May be convened with 412.

513. Ethnology of the Southwest (3) II For a description of course topics, see 413. Graduate-level requirements include a research paper. (Identical with AINS 513) May be convened with 413.

514. Late Quaternary Geology (3) I (Identical with GEOS 514)

515. Cultural Ecology of Agrarian Societies in the Middle East (3) II 1994-95 Emphasis is on land tenure, Islamic law, irrigation and agricultural development in the central Middle East, Nile valley, North Africa, and the Sahel from the Middle Ages to the present.

516. Contemporary Indian America (3) II 1994-95 For a description of course topics, see 416. Graduate-level requirements include a term paper based on original archival or field research. (Identical with AINS 516) May be convened with 416.

517. Cultures of Ancient Mexico (3) S For a description of course topics, see 417. Graduate-level requirements include a term paper. (Identical with LA S 517) May be convened with 417.

519. Psychological Anthropology (3) II For a description of course topics, see 419. Graduate-level requirements include a term paper. May be convened with 419.

520. Contemporary American Culture (3) II For a description of course topics, see 420. Graduate-level requirements include a major term paper. May be convened with 420.

521. Ethnology of North America (3) I For a description of course topics, see 421. Graduate-level requirements include an oral presentation and a research paper. May be convened with 421.

522a-522b. Pre-Columbian Art (3-3) (Identical with ARH 522a-522b) May be convened with 422a-422b.

523. Anthropology of Mexico (3) II 1993-94 For a description of course topics, see 423. Graduate-level requirements include a term paper based on original archival or field research. (Identical with AINS 523 and LA S 523) May be convened with 423.

524. Theoretical Population Genetics (3) I (Identical with ECOL 524)

525. Language Variation (3) II (Identical with LING 525) May be convened with 425.

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 EAS 527a) May be convened with 427a.

527b. The Archaeology of Pre-Han China (3) II For a description of course topics, see 427b. Graduate-level requirements include a 20 to 30 page research paper. (Identical with CHIN 527b) May be convened with 427b.

528. Near East Pastoral Nomads and Arid Lands Hunter-Gatherers (3) I 1994-95 A rigorous introduction to pastoral nomads and hunter-gatherers with a focus on arid lands.
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. P, 200. (Identical with AINS 530) May be convened with 430.

532. Peoples of the Pacific (3) I II For a description of course topics, see 432. Graduate-level requirements include a research project and paper. May be convened with 432.

533. Laboratory in Zooarchaeology (3) I 1994-95 For a description of course topics, see 433. Graduate-level requirements include a research paper. May be convened with 433.

534. Kinship and Social Organization (3) II For a description of course topics, see 434. Graduate-level requirements include additional readings and a detailed term paper. May be convened with 434.

535. Principles of Archaeological Fieldwork (3) II 1993-94 For a description of course topics, see 435. Graduate-level requirements include a research paper. May be convened with 435.

536a-536b. Medical Anthropology (3-3) I II 1994-95 536a: Anthropology of illness and health. Lay perceptions of health, ethnophysiology and pathology; pluralistic ideas about illness experiences; indigenous ideas about preventative and promotive health; folk dietetics; social labeling; and illness responsibility attribution. Emphasis on the study of cultural and medical systems. 536b: Comparative medical systems and healing traditions, regional health arenas, and health care seeking. Topics include folk medicine; traditional medical systems, inclusive illness and public health problems, patterns of resort in the use of pluralistic medical resources, and the way in which the practice of biomedicine has been adapted to regional culture. Explores the medical cultures of Mexico and Latin America, Native America, Africa and Asia. 536a is not prerequisite to 536b.

537a-537b. Readings in Akkadian (3-3) Readings in selected literary, religious and economic texts designed not only to improve language mastery but to use those documents in elucidation of specific topics in Mesopotamian culture. P, 484a-484b. (Identical with NES 537a-537b)

538. Zooarchaeology (3) I 1993-94 For a description of course topics, see 438. Graduate-level requirements include a research paper. May be convened with 438.

539. Beginnings of Animal Domestication (3) II 1994-95 For a description of course topics, see 439. Graduate-level requirements include a research paper. May be convened with 439.

540b. Cross-Cultural Communication (3) Cultural fieldwork.

541. Organization of Museums (3) I For a description of course topics, see 441. Graduate-level requirements include a volunteer project in a local museum providing practical, hands-on experience in museum work. May be convened with 441.

542. Museum Collections Management (3) I Principles and procedures governing the acquisition, documentation, care and use of museum collections. 2R, 3L.

543a-543b. The Archaeology of Neolithic and Bronze Age Greece (3-3) (Identical with CLAS 543a-543b) May be convened with 443a-443b.


545. Museum Exhibition (3) II For a description of course topics, see 445. Graduate-level requirements include a concise research paper on some aspect of museum exhibition. May be convened with 445.

546. Museum Conservation (3) II An introduction to the examination of the nature and properties of materials in anthropological collection and their deterioration, restoration, and preservation.

548. Writing Culture (3) [Rpt.] I For a description of course topics, see 448. Graduate-level requirements include a major term paper. May be convened with 448.

549a-549b. Folklore (3-3) (Identical with ENGL 549a-549b) May be convened with 449a-449b.

551. Archaeology of North America (3) I For a description of course topics, see 451. Graduate-level requirements include a research paper. May be convened with 451.

552R. Archaeology of the Southwest (3) I Development of culture in the prehistoric Southwest from the late Pleistocene to the historic period.

552L. Archaeology of the Southwest (3) II 1994-95 The nature of archaeological data recovered in the Southwest, with emphasis on their potential for the drawing of both cultural and chronological inferences.

553a-553b. Mesoamerican Archaeology (3-3) I For a description of course topics, see 453a-453b. Graduate-level requirements include an additional research paper. 553a is not prerequisite to 553b. (Identical with LAS 553a-553b) May be convened with 453a-453b.

554. Andean Archaeology (3) II 1994-95 For a description of course topics, see 454. Graduate-level requirements include two reviews of research monographs. (Identical with LAS 554) May be convened with 454.

555. Ethnoarchaeology (3) I 1994-95 For a description of course topics, see 455. Graduate-level requirements include a research paper. May be convened with 455.

556a-556b. Old World Prehistory (3-3) I II For a description of course topics, see 456a-456b. Graduate-level requirements include a research paper. May be convened with 456a-456b.

557. Prehistoric Mesopotamia (3) I 1993-94 For a description of course topics, see 457. Graduate-level requirements include additional readings and a detailed research paper.

558. Historical Archaeology (3) II 1993-94 For a description of course topics, see 458. Graduate-level requirements include an additional research paper. May be convened with 458.

560. History of Archaeological Theory (3) II 1993-94 For a description of course topics, see 460. Graduate-level requirements include a research paper. May be convened with 460.

561. Paleoindian Origins (3) I Chronological development of Paleo-Indian occupation of the New World in relation to environmental changes of the Quaternary Period; site discoveries, case studies, hypothesis on the peopling of the Americas. Field trip. (Identical with GEOG 561)

562. Archaeological Quantitative Methods (3) I 1994-95 Intensive review of the theory and application of statistical and mathematical methods to archaeological data.

563. Evolution of Ancient States and Civilizations (3) I 1993-94 Classical and modern theories used to explain the rise of ancient states and civilizations are evaluated as systems of anthropological logic and for their ability to elucidate the archaeological record. Major topics include the nature of growth trajectories, variability in ancient states, the collapse of states, and constraints of growth in selected areas of the world. P, consult department before enrolling.

564. Introduction to Dendrochronology (4) (Identical with GEOG 564) May be convened with 464.

565. Women in International Development (3) II 1994-95 For a description of course topics, see 465. Graduate-level requirements include additional readings and a research paper. (Identical with FCR 565 and LA S 565) May be convened with 465.

566. Paleoanthropology (3) I For a description of course topics, see 466. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, or specialized examinations. May be convened with 466.

568. Human Osteology (4) (Identical with AINS 568) May be convened with 468.

570a-570b. Human Adaptability (3-3) For a description of course topics, see 470a-470b. Graduate-level requirements include a substantial research paper on a topic appropriate to the subject matter. (570a is identical with GER 570a) May be convened with 470a-470b.

571a-571b. Applied Medical Anthropology in Western Contexts (3-3) 1993-94 Investigations of the illness experience; symbolic interpretations of medicines and medical procedures; doctor-patient communications and illness narratives. 571a demonstrates the applicability of medical anthropology theories in the related study of health-related behavior. 571b focuses on methods of data collection and presents case studies illustrating the application of
methods in the study of designated health problem areas, interviewer transference and issues of reflexivity. P, 536a.

572. The Relationship of Early Hominids and Contemporary Faunas (3) I For a description of course topics, see 473. Graduate-level requirements include a research paper. May be convened with 472.

573. Primate Anatomy (4) I For a description of course topics, see 473. Graduate-level requirements include a research paper or project, an annotated bibliography, or specialized examinations. May be convened with 473.

576. Language in Culture (3) II For a description of course topics, see 476. Graduate-level requirements include a research paper and a journal-style review of a major monograph. (Identical with LING 576) May be convened with 476.

577. Discourse and Text (3) I 1993-94 For a description of course topics, see 477. Graduate-level requirements include a research paper involving both an in-depth analysis and a critical survey of appropriate literature. (Identical with LING 577) May be convened with 477.

578. Archaeological Analysis with Geographic Information Systems (3) II 1994-95 For a description of course topics, see 478. Graduate-level requirements include an additional research paper. May be convened with 478.

579. Culture and Materials Technology (3) I For a description of course topics see 479. Graduate-level requirements include an additional research paper. (Identical with MSE 579) May be convened with 479.

580. Historical Comparative Linguistics (3) I For a description of course topics, see 480. Graduate-level requirements include a research paper. (Identical with LING 580) May be convened with 480.

581. Quaternary Palynology (4) II 1993-94 (Identical with GEOS 581)

582. Hopi Language in Culture (3) II For a description of course topics, see 482. Graduate-level requirements include a research paper. (Identical with AINS 582) May be convened with 482.

583. Sociolinguistics (3) I Contributions of the ethnography of communication, language variation studies, and conversation/discourse analysis to the interdisciplinary development of sociolinguistics. (Identical with LING 583)

584a-584b. Akkadian Linguistics (3-3) For a description of course topics, see 484a-484b. Graduate-level requirements include additional readings and a detailed research paper. (Identical with NES 584a-584b) May be convened with 484a-484b.

585. Social Organization of India and Pakistan (3) I (Identical with NES 585) May be convened with 485.

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)

590. Women in Middle Eastern Society (3) I For a description of course topics, see 490.

Graduate-level requirements include an additional paper. (Identical with NES 590) May be convened with 490.


b. Pre-Columbian Art (3) [Rpt.4] I (Identical with ARH 596c, which is home)

c. Ceramic Analysis (3) II 1994-95 May be convened with 496f.

d. Experimental Archaeology (3) I 1993-94 May be convened with 496h.

e. Risk and Society (3) [Rpt.6 units] I (Identical with GEOG 596k, which is home)

f. Near Eastern Archaeology (3) [Rpt. I II (Identical with NES 596q, which is home)

g. Quaternary Geochronology (1-4) II (Identical with GEOG 596r, which is home)

597. Workshop a. Physical and Forensic Anthropology I (2) [Rpt.] I Consult dept. before enrolling.

b. Physical and Forensic Anthropology II (2) [Rpt.] II Consult dept. before enrolling.

c. Ceremochrochology (2) 3L. May be convened with 497c. (Identical with GEOG 597c, which is home)

600. Survey of Cultural Anthropology (3) I Intensive introduction, overview, and synthesis of cultural anthropology.

606. Women's Health in the United States (3) II 1994-95 An examination of social, cultural and political-economic factors affecting women's health in historical and contemporary contexts in the U.S. Focus on anthropological and feminist perspectives. (Identical with WS 606)

607. Anthropological Research Methods and Design (3) I Survey of research designs, data collection methods, and data analysis used in ethnographic field research by sociocultural and medical anthropologists. Focus on practical skill acquisition.

608. History of Anthropological Theory (3) I Survey of the foundations of contemporary theory in the field of cultural anthropology.

631. Anthropology and Development (3) II 1994-95 The role of anthropology in interdisciplinary projects involving economic development and planned change on the national and international levels. (Identical with AR L 631 and LA 631)

636. Foundations of Archaeological Interpretation (3) I Surveys the history of archaeological interpretation. Central concepts in archaeological method and theory are presented. Open only to graduate students with a concentration in archaeology.

642a-642b. Advanced Field Course in Archaeology (3-3) S Archaeological methods, theory, and field techniques. 642a Three-week field excavation and survey. Fee. 642b. Three-week laboratory processing and analysis. Fee. Registration restricted. Contact department for application, which must be returned by April 1.

645. Early Civilizations (3) [Rpt.2] II 1993-94 Comparative analysis of early civilizations from both the Old World and the New World, with emphasis on regularities in cultural development. P, 454, 457, or 456a or 456b.

665. Survey of Physical Anthropology (3) I II Modern physical anthropology including evolutionary theory, genetics, skeletal biology, primatology, paleoanthropology, human growth, adaptability and demography.


675a-675b. Anthropology and International Health (3-3) 1994-95 675a: An intensive overview of the field of international health and anthropologists' contributions to it. Responses to biotechnology, primary health care and child survival, diseases and development; health care utilization patterns; world systems and multinational pharmaceutical industry; health care bureaucracies; interaction between traditional medicine and public health. 675b: Health transitions and the household production of health with emphasis on anthropological investigations of health within a broader development context. P, 536a.

679. Language and Ethnography (3) II Training in the use of ethnographic method in linguistic and cultural research where naturally occurring speech is data. Analysis of data from observation, tape recording and videotaping.

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] II 2R, 1L. P or CR, 468 and 597b.


Applied Mathematics (APPL)
Mathematics Building, Room 414
Graduate Interdisciplinary Program in Applied Mathematics
Committee:
Professors Michael Tabor, Head (Applied Mathematics), David W. Arnett (Physics), Thomas F. Balsa (Aerospace and Mechanical Engineering), Harrison H. Barrett (Optical Sciences), Jim M. Cushing (Mathematics), William J. Dallas (Radiology), Donald G.
Dudley (Electrical and Computer Engineering), William G. Faris (Mathematics), Hermann Fasel (Aerospace and Mechanical Engineering), Hermann Flaschka (Mathematics), W. Martin Greenlee (Mathematics), William B. Hubbard (Lunar and Planetary Sciences), Bobby R. Hunt (Electrical and Computer Engineering), C. David Levermore (Mathematics), David O. Lomen (Mathematics), Pierre Meystre (Optical Sciences Center), Richard E. Michod (Ecology and Evolutionary Biology), Jerome V. Moloney (Mathematics), Donald E. Myers (Mathematics), Marcel F. Neuts (Systems and Industrial Engineering), Alan C. Newell (Mathematics), Adrian N. Patrasciou (Physics), Robert B. Roemer (Aerospace and Mechanical Engineering), William M. Schaffer (Ecology and Evolutionary Biology), Alwyn C. Scott (Mathematics), Moshe Shaked (Mathematics), Thomas L. Vincent (Aerospace and Mechanical Engineering), Arthur T. Winfree (Ecology and Evolutionary Biology)

Associate Professors Nicholas M. Ercolani (Mathematics), Jeffrey B. Goldberg (Systems and Industrial Engineering), Thomas G. Kennedy (Mathematics), Edward J. Kerschen (Aerospace and Mechanical Engineering), Jonathan I. Lunine (Planetary Sciences), John N. Palmer (Mathematics), T. W. Secomb (Physics), Daniel L. Stein (Physics)

Assistant Professors Bruce J. Bayly (Mathematics), Moysey Brio (Mathematics), Kwok Wing Chow (Mathematics), Joseph A. Zehnder (Atmospheric Sciences)

A list of affiliate members is available upon request.

The Program in Applied Mathematics offers courses of study leading to the Master of Science and Doctor of Philosophy degrees. It supports and encourages research in many areas of mathematical, physical, biological, and engineering sciences in which the use and development of mathematical methods and modeling techniques plays a central role.

Students entering the program are expected to have a strong background in mathematics including advanced calculus, complex variables and differential equations. However, entry into the program is not restricted to students who have an undergraduate mathematics major. Courses of study in the program are flexible and individually designed. In the first year, students take a sequence of core courses offered in conjunction with the Department of Mathematics, which includes numerical analysis, principles of analysis, and methods of applied mathematics. In addition, students attend a series of weekly case studies in which members of the program describe recent or current research work. In subsequent years students are able to choose from a broad variety of courses suited to their evolving research interests.

For the Doctor of Philosophy degree a dissertation is required. This dissertation is expected to contain original contributions by the student to the solution of a mathematical problem in a scientific discipline, or to the development of applicable mathematical methods and/or modeling techniques.

The listed members of the program are actively involved in the supervision and/or teaching of program graduate students. The departmental affiliations of the faculty in this list give an indication of the breadth of research activities. In addition, the program has a substantial body of affiliate members who are involved in research with a strong applied mathematics component and who are potential research advisors. The combined network of members and affiliate members creates an unusually broad base of interdisciplinary research opportunities in applied mathematics.

Arabic
(See Near Eastern Studies)

Architecture (ARCH)

Architecture Building, Room 104
(602) 621-6751

Professors Robert G. Hershberger, Dean, Charles A. Albanese, Kenneth N. Clark, Robert C. Giebner, Associate Dean, Ronald R. Gourley (Emeritus), Ellery C. Green, Gordon Heck (Emeritus), William Kirby Lockard (Emeritus), Fred S. Matter, Robert E. McConnell (Emeritus), Richard L. Medlin, Robert L. Nevins, Robert R. Rice, Sandra Rosenbloom, Linda W. Sanders, Naders Sobin, William P. Stamm Associate Professors Harry der Boghossian, Nader V. Chalfout, Dennis C. Doxtader, Robert W. Dvorak, Charles Poster
Assistant Professors Dominique Bonnamour-Lloyd, Richard A. Ebelfoot, Abigail Van Slyck


Undergraduate Program: The College of Architecture offers a five-year program leading to the first professional degree, Bachelor of Architecture. For degree requirements, see the College of Architecture section of this catalog. In addition to required architecture and general education courses, electives are taken in four areas of knowledge: sciences, humanities, business, and the arts. Open and architecture electives are also required enabling students to develop an elective concentration.

Graduate Program: The college also offers the Master of Architecture degree for students with a previous degree in architecture. See the Graduate Catalog for more information.

Architectural Design Courses (201, 202, 301, 302, 401, 402, 451, and 452): Design courses deal with buildings, design methods, building consequences and student development and maturation. The design sequence begins with 201, an introductory course for all students enrolled in the professional phase of the college. Early experiences are involved with an overview of design fundamentals, methods and vocabulary. Intermediate and advanced design courses deal with technical and environmental factors that influence built form, with evaluation and communication of design ideas and with analysis and planning for large-scale projects. All design courses stress synthesis and the application of previous course content and experience to current projects. Student projects may be retained by the college.

101. Architecture and Society (3) I II An overview of architecture and its relationship to society through a study of its history, its contemporary forms and its future; designed for nonmajors.

112. Introduction to Design Communication (3) I II Overview of the principles of architectural drawing: lectures on various types of design communication supplemented by studio exercises; experience in graphic projections, perspective and freehand sketching. Fee.

114. Introduction to Architectural Theory (3) I II A broad introduction to the historical, physical and cultural forces that affect the formation of buildings and physical environments. Lectures with slides examine current and recurring problems and principles.

118. Structure in Architecture (2) I II An introduction to the role of structure in architecture; to the principles of structure, and to the behavior of structural elements, subsystems and systems. Fee.

201. Fundamentals of Architectural Design (6) Basic design principles and introduction to design of built form and exterior space, with attention to site analysis and natural siting, horizontal circulation systems, basic materials and structural systems. P. admission to professional phase. Fee.

202. Environmental Influences in Architectural Design (6) Design of built form and exterior space, site planning, climatic analysis
and passive methods of environmental conditioning, including daylighting; horizontal and vertical systems of circulation, advanced materials and structural systems. Fee. P, 201, 212.

212. Design Communication (3) I Methods used to study and communicate architectural ideas, concepts, and systems. Conceptual diagramming, alternative perspective methods and delineation. P, 112 and admission to professional phase.

222. Techniques of Design Communication (3) II Rendering techniques and media for use in finished architectural presentation. Shade and shadow, entourage, reflections, reproduction techniques, color rendering. P, 201 and 212.

226. Environmental Analysis (2) I Introduction to theory and methods of environmental analysis in architecture including the influences of site, climate and social/physical context. Open to majors only. P, admission to professional phase in architecture.

227. Architectural Programming (2) II Introduction to theory and methods of architectural programming including influences of users, economics, time, technology, safety, and aesthetics. Open to majors only. P, 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./1] S Studio-based coursework in architectural design or drawing with supplemental lectures. Emphasis in building design, perspective and rendering, or construction documents. Students must select one area of concentration. Open to non-majors.

270. Introduction to Architectural Computing (3) II Study of micro-computer hardware, software and programming techniques in architecture, including; word processing, spread sheet design, data base management, graphics and structured programming using PASCAL. No previous computer experience required. P, professional phase admission.


302. Architectural Design (6) Design of built form with emphasis on theoretical issues, meaning, principles of order; alternative means of enclosing architectural space; synthesis of space, light, structure, materials, and environmental control systems. Fee. P, 301.


324. History of Architecture and Western Civilization: Ancient through Medieval (4) I History of architecture as a reflection of the western heritage of ideas, values and artistic expression and economic, social, and political conditions. P, for majors, admission to professional phase.

328. Wood and Steel Structural Systems (3) II Analysis and design of structural components and systems constructed of wood and steel including joists, beams, and columns. Analysis and design of members under single and combined loads. Examination of the behavior of individual elements and the total system. P, 318.

334. History of Architecture and Western Civilization: Renaissance to Present (4) 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, 324.


336. Environmental Control Systems (3) I Analysis of contemporary systems of environmental control including heating, ventilation, air conditioning, lighting, power distribution, plumbing and hygiene. Emphasis on integration of these systems into buildings and understanding the impact of systems upon architectural design and each other. P, 236.

343. Watercolor Techniques for Architects (2) Techniques of watercolor communication utilized in architecture.


402. Topics in Architectural Design (6) Studio work emphasizing design of large buildings or building complexes in one of the following: building design, urban design, campus design, design competitions, computer aided design. Offerings are limited by faculty availability, and all topics may not be offered each year. Other topics may be introduced. Fee. P, 401. May be convened with 502.

403. Solar Utilization in the Built Environment (3) I Survey of solar energy utilization principles, methods and case studies focused upon building site planning design. May be convened with 503.

404. Architecture and Planning in Mexico (3) I Study of architectural development in Mexico during the prehispanic, Spanish colonial and contemporary periods, with emphasis on design ideas from each period. May be convened with 504. (Identical with LA S 404).

412. Topics in Design Communication (3) I II [Rpt./2] Directed studies in advanced design communications. Topics vary. Selected topics may include rendering, design publications, public relations, portfolio preparation. Other topics may be introduced. P, 222, 301. May be convened with 512.

413. Architecture and the Arid Region (2) I Studies of the relationship between architecture and the climatic characteristics of arid regions with emphasis on passive cooling techniques. P, 302. May be convened with 513.

414. History of American Architecture (3) I Development in American architecture from the colonial to the early modern period. P, 6 units of art history or architectural history. Nonmajors may petition to enroll. May be convened with 514.

418. Concrete and Masonry Structural Systems (3) I Analysis and design of structural components and systems constructed of concrete and masonry including slabs, joists, beams, columns, retaining walls, and foundations. Analysis and design of members under single and combined loads using working stress and ultimate strength procedures. Examination of the behavior of individual elements and the total system.

422. Urban Communications (3) [Rpt./6 units] II Study of design communication in urban settings including perception, way finding and systems of signage. Class project of a specific urban area required. P, 222, 301; upper-division standing. May be convened with 522.

424. Modern Architecture (3) I II Study of recent architectural developments throughout the world, focusing on the personalities, theories and issues influencing built form since 1945. P, 334 or by permission of instructor; upper-division standing. May be convened with 524.

427. Field Methods in Environmental Psychology (3) I II (Identical with PSYC 427) May be convened with 527.


432. Video and Media in Design Communications (3) [Rpt./1] I Introduction to video and other media in architectural design communication with emphasis on photographic reproduction, graphic design, desktop publishing, slide photography, slide presentations, and video production. Personal presentations based upon communication psychology and theory. May be convened with 532.

433. Lightweight Construction Techniques (3) III Survey of lightweight construction techniques, including pneumatic, tensile membranes, three-dimensional cable nets, grid
shells and flexure stiff plates. May be convened with 533.

432. Architectural Photography (II) Theory and practical techniques for the varied use of photography in the field. Emphasis on the "daily use" of 35mm equipment and color slide films for self expression, documentation (exteriors/interiors), copywork, scale models and simulation. Introductory hands-on exploration of large format photography with polaroid film. May be convened with 542.

443. Architecture in the Mediterranean (S) Summer study tour of the Mediterranean focusing on architecture. Includes Greece and the Greek islands. Seminars and graphic and written projects and assignments. Emphasis on field investigation. May be convened with 543.

444. Site Planning (II) Studies relating to design determinants for development of outdoor space. Lectures and exercises dealing with individual design criticism including topography, hydrology, climate, and vegetation. Final project summarizing and applying all criteria to a realistic development project is required. P, 302. (Identical with PLNG 444) May be convened with 544.

451. Emphasis Areas in Architecture (I, II) Studio work emphasizing one of the following: desert architecture, community design, historic preservation, design communication, computer aided design, entrepreneurial design, architectural programming and evaluation. Offerings are limited by faculty availability, and all topics may not be offered each year. Other topics may be introduced. Fee. P, 334, 335, 336, 402, 428. May be convened with 551.

452. Senior Project (6) I II Studio-based project demonstrating a synthesis of knowledge or development of theoretical concepts. Fee. P, 451.

452H. Honors Senior Project (6) I II Studio-based honors project demonstrating a synthesis of knowledge or development of theoretical concepts. P, 451, admission into Honors Program.

459. Ethics and Practice (3) I Standards and values of architectural services and professional project and practice management. P, 270 and 402. May be convened with 559.

462. Design Communication (3) [Rpt./I] I Advanced topics in design communication. P, 402. May be convened with 562.


473. Introduction to the Conservation of Cultural Resources (III) I An overview of the Historic Preservation movement in America, including discussion of concepts, rationale for, and methods of resource utilization and documentation of plans, legislation, etc. Field trips. May be convened with 573.

480. Computer Applications in Architecture (III) I Introduction to the theory, techniques, and applications of computer-based architectural presentations and color renderings. Focusing on generating photo realistic architectural images and fly-throughs that are assembled in a finished multimedia presentation. Intensive experience on graphic work stations. P, 470.


484. Planning the Built Environment (II) I A lecture survey dealing with the origins and implications of the physical manifestations of communal ordering systems. An analytic vociferous of desert architecture with such current and historic settlement patterns are visually compared to discover spatial attributes as a dimension of human experience. P, 302 and 334. (Identical with PLNG 484) May be convened with 584.

487. Space: A Social-Cultural View (3) [Rpt./I] I II 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 enrollment. May be convened with 587.

496. Seminar a. Readings in Architectural Theory (2-4) [Rpt.] I II Open to majors only. May be convened with 596a.

497. Workshop a. Special Projects in Architecture (1-3) [Rpt./6 units] I II I S Consult college before enrolling. May be convened with 597b.

b. Community Design for Non-Designers (3) I Field trips. Open to nonmajors only. (Identical with L AR 497I and PLNG 497I) May be convened with 597I.

501. Systems Approach in Architectural Design (6) For a description of course topics, see 401. Graduate-level requirements include additional programming documentation demonstrating theoretical understanding of systems theory in design. Fee. May be convened with 401.

502. Topics in Architectural Design (6) For a description of course topics, see 402. Graduate-level requirements include additional documentation of the understanding of the impact of complex buildings on human experience. Fee. 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 and Planning in Mexico (3) I For a description of course topics, see 404. Graduate-level requirements include an additional research paper focusing on a particular aspect of Mexican architecture with 5040. May be convened with 404.

512. Topics in Design Communication (3) [Rpt./2] I For a description of course topics, see 412. Graduate-level requirements include a research paper on one aspect of state-of-the-art design communication techniques. May be convened with 412.

513. Architecture and the Arid Region (2) I For a description of course topics, see 413. Graduate-level requirements include a research paper focusing on a particular passive cooling strategy. May be convened with 413.

514. History of American Architecture (3) 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. Nonmajors may petition to enroll. May be convened with 414.

522. Urban Communication (3) [Rpt./6 units] I II For a description of course topics, see 422. Graduate-level requirements include an in-depth research paper or project. May be convened with 422.

524. Modern Architecture (3) I For a description of course topics, see 424. Graduate-level requirements include an additional in-depth research paper or project. May be convened with 424.

527. Field Methods in Environmental Psychology (3) I For a description of course topics, see 427. Graduate-level requirements include an additional in-depth research paper or project. May be convened with 427.

530. Video and Media in Design Communication (3) [Rpt./10 II For a description of course topics, see 430. Graduate-level requirements include an in-depth research paper or project. May be convened with 430.

533. Lightweight Construction Techniques (3) I For a description of course topics, see 433. Graduate-level requirements include an additional project demonstrating a comprehensive grasp of one lightweight construction technique. May be convened with 433.

534. History of the American House (3) I For a description of course topics, see 434. Graduate-level requirements include an addi-
Advanced Computer Energy Analysis (3) [Rpt./1] I For a description of course topics, see 483. Graduate requirements include a research paper or project. May be convened with 483.

Planning the Built Environment (2) I For a description of course topics, see 484. Graduate-level requirements include an additional research paper that focuses on and develops one of the major themes of the course. (Identical with PLNG 584) May be convened with 484.

Space: A Social-Cultural View (3) [Rpt./1] I For a description of course topics, see 487. Graduate-level requirements include an additional research paper that focuses on and develops one of the major topics of the course. May be convened with 487.

Seminar a. Readings in Architectural Theory (2-4) [Rpt.] I II Open to majors only. May be convened with 496a.

Interdisciplinary Environment-Behavior-Design (3) I (Identical with ENV 596u, which is home) May be convened with 496a.

Workshop a. Architecture (3-8) [Rpt. /6 units] I II Open to nonmajors only. (Identical with ARH 596u) May be convened with 496a.

b. Special Projects in Architecture (1-3) [Rpt. /6 units] III S Consult college before enrolling. May be convened with 497b.

c. Community Design for Non-Designers (3) I Field trips. Open to nonmajors only. (Identical with L AR 597i and PLNG 597i) May be convened with 497i.

Training in Research (3) I For a description of course topics, see 498. Graduate requirements include an in-depth research paper or project. May be convened with 498.

Arid Lands Resource Sciences (ARL)
845 N. Park Avenue, Room 102
(602) 621-1955
Graduate Interdisciplinary Program in Arid Lands Resource Sciences
Committee:
Professors Paul G. Bartels (Plant Sciences), Robert B. Bechtel (Psychology), Michael E. Bonine (Near Eastern Studies), Herbert E. Carter (Emeritus), Dennis C. Cory (Agricultural and Resource Economics), Stanley N. Davis (Emeritus), Peter F. Fouilliott (Renewable Natural Resources), Martin M. Fogel (Renewable Natural Resources), Kenneth E. Foster (Arid Lands), Roger W. Fox (Agricultural and Resource Economics), Lay J. Gibson (Geography and Regional Development), C. Vance Haynes (Geosciences), Helen M. Ingram (Political Science), Paul S. Martin (Geosciences/Emeritus), Fred S. Matter (Architecture), Eric A. Monke (Agricultural and Resource Economics), James W. O'Leary (Plant Sciences), Stanley J. Olsen (Anthropology), Richard W. Reeves (Geography and Regional Development), Michael B. Schiffer (Anthropology), Donald C. Slack (Agricultural and Biosystems Engineering), Thomas Weaver (Anthropology)
Associate Professors Charles F. Hutchinson, Chair (Arid Lands), D. Robert Altschul (Geography and Regional Development), Bonnie C. Colby (Agricultural and Resource Economics), Owen K. Davis (Geosciences), Michael J. Donoghue (Ecology and Evolutionary Biology), Katherine K. Hirschboeck (Laboratory of Tree-Ring Research), Joseph J. Hoffmann (Arid Lands), Stuart E. Marsh (Arid Lands), John W. Olsen (Anthropology), Thomas K. Park (Anthropology), Dennis T. Ray (Plant Sciences), Robert H. Robichaux (Ecology and Evolutionary Biology), Steven E. Smith (Plant Sciences), Barbara N. Timmermann, Vice-Chair (Arid Lands), James C. Wade (Agricultural and Resource Economics), Donovan Wilkin (Renewable Natural Resources)
Assistant Professors Lisa J. Graumlich (Laboratory of Tree-Ring Research), Steven P. McLaughlin (Arid Lands), Thomas W. Swetnam (Laboratory of Tree-Ring Research), Thomas L. Thompson (Soil and Water Science)

The Graduate Interdisciplinary Program in Arid Lands Resource Sciences offers a program of graduate study leading to a Doctor of Philosophy degree with a major in arid lands resource sciences. The program is interdisciplinary and provides an academic environment in which to examine the ecological, economic and social factors which influence the sustainable use of arid and semiarid lands. Interested students should request additional information from the program chairman. For admission and degree requirements, please see the Graduate Catalog.

Remote Sensing for the Study of Planet Earth (3) III 1993-94 (Identical with REM 490) May be convened with 490.

Economic Policy in Developing Countries (3) II (Identical with AREC 512)

Physical Climatology (3) II (Identical with AMR 512)

Hydrology (3) I (Identical with C E 523)

Anthropology and Development (3) II (Identical with ANTH 531)

Water Management in Dryland Ecological Systems (3) I (Identical with WS M 535)

Economic Botany of Arid Lands (3) I 1993-94 (Identical with PL S 541)

Geomorphology (4) I (Identical with GEOS 550)

The Arid and Semiarid Lands (3) I (Identical with GEOG 564)
Art (ART/ARH/ARE)

Art Building, Room 104
(602) 621-7570


Assistant Professors Jeanne M. Carrigan, David Christiana, Pia Cuneo, Lynn Galbraith, Paul Ivey, Ellen McMahon, Barbara Penn, Sheila Pitt, Julie Plax, Alfred Quiroz, Jovy Saunders, Stacie G. Widdifield, Jane Welch Williams

The Department of Art provides a broad spectrum of theoretical, historical, and creative programs of instruction designed to prepare students for professional careers in studio art, graphic design and illustration, art history, and art education.

The department offers the following degrees: Bachelor of Fine Arts with majors in studio art and art education, and Bachelor of Arts in Art with a major in art history. The graduate degrees of Master of Fine Arts and Master of Arts are also available. For graduate admission and degree requirements, please consult the Graduate Catalog.

The major in studio art is for students planning professional careers as creative artists. The Bachelor of Fine Arts degree requires 45 units to be taken outside of the major department, including the general education requirements described under the College of Arts and Sciences/Faculty of Fine Arts in this catalog. All BFA students are also required to take at least one 3-unit course specifically focused on gender, race, ethnicity, or non-western civilization. In addition, the student must complete 80 units in art, at least 18 of which must be at the University of Arizona. These 80 units in art are subdivided as follows:

- Foundations requirements—15 units: 101, 102, 104, ARH 117, 118
- Upper-division requirements for the Bachelor of Fine Arts degree described under the College of Arts and Sciences/Faculty of Fine Arts in this catalog, the following major area of study requirements must be met: Foundations courses and Distribution courses as described in the major in studio art requirements above. Students must take 10 units in art education concepts and methods, along with 12 units of upper-division art education and/or studio and art history upon approval of art education advisor. The prerequisites for entry into the art education program include the following: acceptance both by the Art Department and the College of Education, passing scores on College of Education designated admission test, an interview and portfolio review. TTE 300, and EDUC 350 are prerequisites for the 10 units of art education concepts and methods. The candidate for the degree with this major must also complete other required College of Education units (see Teaching and Teacher Education) and student teaching (TTE 493b). A teaching minor is not required, but those students anticipating employment in areas where a teaching minor might be advantageous should consult with their advisor. The student should also consult with his or her advisor regarding any possible changes in certification requirements and consequent adjustments to degree requirements. Minimum total units required for the degree with this major—126.

The major in art history is for students planning professional careers in art history or seeking an essentially cultural undergraduate education. This program provides an appropriate basis for advanced study of art history at 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.

In 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 student must complete a 34-unit major and a 20-unit minor. The following requirements for the major must be met: ART 101, ARH 117, 118 and 18 units of upper-division art history, and 7 units of elective art courses—14 units in the last two areas shall be upper-division courses. (See the Faculty of Fine Arts section of this catalog for more information.)
on single or split minors). Minimum total units required for the degree with this major—125.

Art Minors: The Art Department offers two minors: studio art and art history. A minor consists of 20-24 units with a minimum of 9 units from upper-division courses.

Within the studio art minor, areas of concentration are available in painting, drawing, printmaking; photography; 3-D studio, and graphic design. Course work in each area is listed as follows:

Painting, drawing, printmaking: Required courses include 101, 102. Courses from which the minor student may choose are 205, 305, 405; 280, 380, 480; 285, 385, 485; 250, 350; 251, 351; 253, 353; 255, 355, 356, 456.


3-D Studio: Required courses are 101, 102, 104, and 6 credits from 271, 273, 276, 287, and 9 units of upper division course work in one area (ceramics, sculpture, fibers, metals).

Graphic Design: Required courses include 101, 102, 104, 265, 266, and 3 courses from 363, 364, 365, 465, 469, ARH 118.

For the art history minor, required courses are ARH 117, 118, and 15 upper-division units in art history.

Writing-Emphasis Course: A writing-emphasis course may be selected from specifically designated 400 level art history courses. Students must have passed the writing proficiency examination or completed work in lieu of a passing score, before enrolling in the designated 400 level writing-emphasis courses. Consult advisor before selection. (See “Writing-Emphasis Courses” in the Academic Policies and Graduation Requirements section of this catalog.)

The Department of Art participates in the Honors Program.

Studio (ART)

101. Drawing I (3) I II Visual perception and the principles of composition presented through various drawing problems and materials. 6S. Fee.

102. Color and Design I (3) I II Elements and principles of two-dimensional composition, with emphasis on color mixing, interaction and control. 6S. Fee.

104. Three-Dimensional Design I (3) I Study of volume, mass, and space relationships through modeling, casting, carving, and construction. 6S. Fee.

205. Figure Drawing I (3) I II Drawing from the model and other subjects to develop pictorial and perceptual skills. 6S. Fee. P. 101.

223. New Genre I (3) Video used creatively to work through ideas in an improvisational manner. In-class, collaborative projects combine video with creative writing, performance art and audio experiments.

241. Beginning Photography (3) [Rpt./2] I II Familiarization with basic photographic processes and aesthetics. 2R, 2S. Field trips. Fee. (Identical with M AR 241)

250. Relief Printmaking I (3) I II Introductory course in the fundamental techniques and aesthetics of relief printmaking. 6S. Fee. P, 101, 102.

251. Intaglio I (3) I II Introductory course in the fundamental techniques and aesthetics of intaglio printmaking with emphasis on etching. 6S. Fee. P, 101, 102, or permission of department.

253. Alternative Methods in Printmaking I (3) I II Introductory course in the nontraditional approaches to printmaking. Montotype, industrial techniques, and handmade paper. 6S. Fee. P, 101, 102, or permission of department.

255. Lithography I (3) I II Introductory course in the fundamental techniques and aesthetics of black and white, and color lithography. Stone and metal plate processes are covered. 6S. Fee. P, 101, 102, or permission of the department.

257. Materials Science of Art and Archaeological Objects I (3) (Identical with MSE 257)


266. Beginning Illustration I (3) I II Exploration of techniques, styles and media for illustration. 6S. Fee. P, 102, 105.


273. Beginning Ceramics I (3) I II Introduction to the basic clay processes of hand construction, potter's wheel, surface decoration and glaze application, kiln firing and ceramic history. 1R, 4S. Fee. P, 104.

276. Beginning Fibers I (3) I II Structural development of fibers into woven forms, using the frame loom; fiber as a fine arts medium. 6S. Fee. P, 104.

280. Painting I (3) I II Elementary course in the methods and techniques of painting with oils and/or acrylics. 6S. Fee. P, 101, 102.


287. Beginning Sculpture I (3) I II Introduction to fundamentals of sculpture process through carving, fabrication and casting, to develop personal approaches to dimensional composition. 6S. Fee. P, 104.

305. Figure Drawing II (3) [Rpt./2] I II Intermediate course in drawing problems using the model. 6S. Fee. P, 205.

312. Video Art in America (3) I II 1993-94 (Identical with M AR 312)

322. New Genre Studio and Theory (3) Exploration of a range of contemporary art practice and theory. Projects in a variety of media including performance, installation, and in-class video work.

341a-341b-341c. Intermediate Photography (3-3-3) I II Principles and processes of photography. 341a: Introduction for artists to the principles of natural light and documentary photography. 341b: Creating untrue narratives, students are challenged to deconstruct the familiar photo essay and create new ways of telling stories. 341c: Introduction to principles of synchronized color slide-audio tape production for artists. 341a is not prerequisite to 341b, etc. 2R, 2S. Fee. P, 241, acceptance by portfolio.

341e. Intermediate Photography: The Self Portrait (3) [Rpt./6 units] Explores a variety of approaches and modes of the photographic self portrait as an expressive process. 2R, 2S. Fee. P, acceptance by portfolio.

342. Photography Since 1950 (3) I II Slide presentations and discussions of major photographers since 1950.

343a-343b. Photographic Techniques (3-3) I II 343a: Fundamentals of exposure and development control, print control, studio and portrait lighting, slide copying and view camera operation. 343b: Manipulation and extension of boundaries of traditional photography using polarization, appropriation, montage, toning and bleaching. 343a is not prerequisite to 343b. 2R, 2S. Fee. P, 241.


349. Intermediate Artists’ Video (3) I Students will produce individual projects using video as a creative, self-expressive tool. The class will take an exploratory approach to experimental, fictional and documentary genres. 2R, 2S. Fee. P, 341, acceptance of portfolio.

350. Relief Printmaking II (3) I II Intermediate course in the techniques and aesthetics of relief printmaking. Continuation of 250. 6S. Fee. P, 250.

351. Intaglio II (3) I II Intermediate course in techniques and aesthetics of intaglio printmaking. Continuation of 251. 6S. Fee. P, 251.


355. Lithography II (3) I II Intermediate course in stone and metal plate lithography. Continuation of 255. 6S. Open to majors only. Fee. P, 255.

356. Intermediate Printmaking (3) [Rpt./6 units] I II Intermediate course in printmaking with emphasis on format aesthetics and personal expression. 6S. Open to majors only. Fee. P, 250, 251, 253, or 255.
363. Typographic Design (3) I II GRD The study of letters and their appropriate and effective use in visual communications, from a historical as well as from a contemporary perspective. 65. Fee. P, 265, acceptance of portfolio.

364. Production Problems in Graphic Design (3) [Rpt./1] I II Preparation of visual material for reproduction by various printing processes. 65. Fee. P, 265, 266, and acceptance of portfolio.

365. Intermediate Graphic Design (3) [Rpt./1] I II Further exploration of design as a communications tool. Solutions to realistic promotional programs are executed from rough to comprehensive stage. 65. Fee. P, 102, 205, 265, acceptance of portfolio.

366. Rendering Techniques (3) [Rpt./1] I Drawing and rendering techniques with various media in the creation of editorial and advertising illustration. 65. Fee. P, 265, 266, acceptance of portfolio.


373. Intermediate Ceramics (3) [Rpt./4] I II Continuation of form investigation, using hand construction and wheel; studio problems in clay and glaze formulation, kiln firing and ceramic history. 1R, 4S. Fee. P, 273.

376. Intermediate Fibers I (3) [Rpt./3] I Twodimensional fiber techniques including four-harness loom weaving (loom and weaver-controlled weaves) and tapestry weaving (cartoon as well as spontaneous methods). Emphasis on individual interpretation of traditional woven techniques. 65. Fee. P, 276.


380. Painting II (3) [Rpt./2] I II Intermediate course in developing expressive and pictorial skills in oil and/or acrylic media. 65. Fee. P, 280.


387b. Intermediate Sculpture/Metal and Wood Fabrication (3) I II In-depth exploration of the media and concepts of sculpture through metal and wood fabrication processes. 65. Fee. P, 287.

387c. Intermediate Sculpture/Carving (3) I II In-depth exploration of the subtractive process with direct carving versus specific imagery. 65. Fee. P, 287.

405. Figure Drawing III (3) [Rpt./5] I II Advanced drawing with emphasis on personal expressive development. 65. Fee. P, 6 units of 305.

409. Drawing Critique (3) [Rpt./5] I Individual exploration and development of visual concepts through drawing, accompanied by individual and class critiques. P, 6 units of 405.


413. Experimental Color Photography (3) [Rpt./1] I Nontraditional approaches to color photography including the use of black-and-white and color negatives, manipulation of the negative, dyes and paints added to the print. Development of personal vision encouraged. 2R, 25. Fee. P, 341a, 341b or 341c; 346; acceptance by portfolio. May be convened with 546.

417. Advanced Ceramics II (3) [Rpt./4] I II Advanced problems in creation, firing and presentation of ceramic works. P, 9 units of fibers courses.

421. Advanced Ceramics III (3) [Rpt./4] I II Advanced study of the various ceramic media and techniques. May be convened with 573.

422. Advanced Fibers I (3) [Rpt./5] I II Advanced exploration of fiber and textile art and technology. 65. Fee. P, 387, acceptance of portfolio. May be convened with 566.


427. Advanced Sculpture/Metal and Wood Fabrication (3) [Rpt./2] I II An in-depth exploration of advanced processes and concepts of sculpture through metal and wood fabrication processes. 65. Fee. P, 387.

428. Advanced Sculpture/Metal and Wood Fabrication (3) [Rpt./2] I II An in-depth exploration of advanced processes and concepts of sculpture through metal and wood fabrication. 65. Fee. P, 387.

428b. Advanced Sculpture/Metal and Wood Fabrication (3) [Rpt./2] I II An in-depth exploration of advanced processes and concepts of sculpture through metal and wood fabrication. 65. Fee. P, 387.

429. Advanced Sculpture/Carving (3) [Rpt./2] I II In-depth exploration of advanced processes and concepts of sculpture through direct carving versus specific imagery. 65. Fee. P, 387.


487f. Advanced Sculpture/Site Specific Concepts (3) [Rpt./2] II The exploration and research of specific sites and the ramification of sculptural placements within these sites. Models will be constructed. 65. Fee. P, 387.

487g. Advanced Sculpture/Kinetik (3) [Rpt./2] II An in-depth exploration of the techniques and concepts of kinetic sculpture as applied to personal directions. 65. Fee. P, 387.

497. Workshop

a. Professional Practices in Art (3) I II 12 units of studio or art history. May be convened with 597a.

b. Professional Experiences in Art (3) [Rpt. 9 units] I II 12 units of studio or art history. May be convened with 597a.

505. Graduate Figure Drawing (3) [Rpt./5] II Special problems in drawing, using the classroom model and outside sources as references for personal expression. 65. Fee.

509. Graduate Drawing Critique (3) [Rpt./5] I II Individual exploration in drawing media and visual concepts. Classroom and individual critiques.

514. Advanced Photography (3) [Rpt./1] I II For a description of course topics, see 441. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Fee. P, 341, acceptance of portfolio. May be convened with 441.

516. Experimental Color Photography (3) [Rpt./1] I For a description of course topics, see 446. Graduate-level requirements include more rigorous grading and expectation. 2R, 2S. Fee. May be convened with 446.

547. Mixed Media Book (3) [Rpt./1] I II For a description of course topics, see 447. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Field trips. P 12 units of upper-division studio art courses. May be convened with 447.

548. Video for Artists (3) [Rpt. 2] I II For a description of course topics, see 448. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Field trips. P, admission by portfolio. May be convened with 448.

549. Advanced Artists’ Video (3) [Rpt./1] I II For a description of course topics, see 449. Graduate-level requirements include projects that demonstrate conceptual and technical accomplishment. May be convened with 449.

550. Graduate Relief Printmaking (3) I II Relief printmaking with emphasis on individual research, personal direction and professional standards. 65. Fee.

551. Graduate Intaglio (3) I II Intaglio printmaking with emphasis on individual research, personal direction and professional standards. 65. Fee.

553. Graduate Alternative Methods in Printmaking (3) I II Nontraditional approaches to printmaking with emphasis on individual research, personal direction and professional standards. 65. Fee.

554. Graduate Lithography (3) I II Lithography with emphasis on individual research, personal aesthetic, and professional standards. 65. Fee.

555. Graduate Graphic Design Problems (3) [Rpt./1] I II Two- and three-dimensional design considerations with emphasis on conceptualization and presentation. 65. Field trips. Fee. Acceptance of portfolio.

566. Editorial Illustration (3) [Rpt./1] I 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. Fee. P, 9 units of illustration courses and approval of portfolio. May be convened with 466.

567. Graduate Illustration (3) [Rpt./1] II Exploration of any optical material or phenomenon as a possible solution to illustration problems. 65. Fee. P, 466, acceptance of portfolio.

569. Portfolio Preparation (3) [Rpt./1] II For a description of course topics, see 469. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Fee. P, 9 units of graphic design courses and approval of portfolio by Portfolio Committee. May be convened with 469.

571. Advanced Jewelry and Metalsmithing I (3) [Rpt./4] I II For a description of course topics, see 471. Graduate-level requirements include an in-depth studio research project. Fee. P, 9 units of metalwork. May be convened with 471.

572. Advanced Jewelry and Metalsmithing II (3) [Rpt./1] II I For a description of course topics, see 472. Graduate-level requirements include an in-depth studio research project. Fee. P, 471. May be convened with 472.

573. Advanced Ceramics (3) [Rpt./5] I II For a description of course topics, see 473. Graduate-level requirements include an in-depth studio research project. Fee. P, 472. May be convened with 473.

576. Advanced Fibers (3) [Rpt./5] I II For a description of course topics, see 476. Graduate-level requirements include an in-depth studio research project. P, 276. 9 units of intermediate fibers. May be convened with 476.

578. Graduate Two-Dimensional Fiber Techniques (3) [Rpt./9] I II Advanced fiber technique course for graduate students who wish to develop further their strengths in special technical areas. Stresses two-dimensional work. 65. P, consult department before enrolling.

579. Graduate Three-Dimensional Fiber Technique (3) II Advanced fiber technique course for graduate students who wish to develop further their strengths in special technical areas. Stresses three-dimensional work. 65. P, consult department before enrolling.

580. Graduate Painting (3) [Rpt./1] I II Graduate study in painting with an emphasis on the development of a personal imagery and body of work. 65.

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. 65.

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.

585. Graduate Watercolor Painting (3) [Rpt./5] I II High level experimentation in personal expression with watercolor and related media. Demonstration and critique.

587a. Sculpture/Casting Materials (3) [Rpt./3] II An in-depth exploration of the techniques and concepts of casting. Advanced process of mold making as applied to individual directions. 65. Fee.

587b. Sculpture Materials/Metal and Wood Fabrication (3) [Rpt./3] II An in-depth exploration of advanced processes and concepts of sculpture through metal and wood fabrication. 65. Fee.

587c. Sculpture Materials/Carving (3) [Rpt./3] I II Advanced processes of subtractive thinking through direct carving versus specific imagery. 65. Fee.

587d. Sculpture Materials/Glass Casting and Slumping (3) [Rpt./3] II I Advanced research and studio work in materials and processing of glass casting and slumping. 65. Fee.

587e. Sculpture Materials/Experimental and Combined Media (3) [Rpt./3] II In-depth advanced-level exploration of concepts, processes and personal direction through combining media and experimental sculpture processes. 65. Fee.

587f. Sculpture Materials/Site Specific Concepts (3) [Rpt./3] I II The development and research of specific sites and the ramification of sculptural placements within these sites. Students will develop plans and models that reflect individual concepts. 65. Fee.

587g. Sculpture/Kinetic Materials (3) [Rpt./3] I II An in-depth exploration of the techniques and concepts of kinetic sculpture as applied to individual directions. 65. Fee.

596. Seminar

a. Photography and Language (3) [Rpt./1] II 2R, 2S. Open to majors only.

s. 3-D Concepts (3) [Rpt./2] I II

597. Workshop

a. Professional Practices in Art (3) I II 12 units of studio or art history. May be convened with 497a.

b. Professional Experiences in Art (3) [Rpt. 9 units] I II 12 units of studio or art history. May be convened with 497b.

600. Painting Concepts (3) [Rpt./2] I II Presentation of one's painting concepts and the concepts of others, citing parallels, influences, research, related ideas and implications for highly concentrated student and faculty discussion.

642. Studio Photography Critique (3) [Rpt./5] I II Investigation of practical methods of critique and their influence on an artist's developing body of work. Limited to art majors with photography concentration.

656. Graduate Printmaking (3) [Rpt./18 units] I II Printmaking with emphasis on aesthetics,
conceptualization, technical competency, artistic literacy, and personal direction. 65. Fee. P; consult department before enrolling.

671. Graduate Jewelry and Metalsmithing (6-10) [Rpt./6] I II Graduate study in all phases of jewelry and metalwork. 12 to 205.

673. Graduate Studio in Ceramics (3-10) [Rpt./6] I II S Studio research and instruction with emphasis on personal creative development. 12 to 205. Field trips. Fee. P. 473.

676. Graduate Fiber Studies (6-10) [Rpt./6] I II Graduate experimentation in all aspects of fiber work, with emphasis on the development of a personal style within the medium. 12 to 205.

680. Graduate Studio (6-10) [Rpt./6] I II P, 12 units of graduate credit in art.

687. Graduate Problems in Sculpture (3) [Rpt./4] I II Emphasis on aesthetics, conceptualization, technical competency, artistic literacy, and personal direction. 65. Fee. P; consult department before enrolling.

Art Education (ARE)

130. Appreciating the Visual Arts (3) I II Introduction to techniques for describing and analyzing works of art utilizing relevant material from history and aesthetics. 2R. 2S.

306. Images and Ideas in the Visual Arts (3) I II S Art heritage, aesthetics, art criticism, and knowledge of various art media. P. 130.


338L. Secondary School Art (3) II Carries credit in education only. (Identical with TTE 338L)

361. Creative Arts Methods (3) Prepares elementary education students to teach art in the self-contained classroom. Various art education methodologies through participating in classroom activities; planning art lessons; presenting art lesson to the class. Class is meant to build on the theoretical base each student has already acquired in previous arts classes. P. 130.

400. Art for Exceptional Learners (3) Adaptation of structured art curricula to exceptional learner populations. P. previous course work in art and/or special education. May be convened with 500.

431. The Teaching of Art (3) I II Exploration of art education curricula and instructional methodology in the elementary school. P. TTE 300, TTE 350; CR, 338L, and 400. May be convened with 531.

496. Seminar I II S current Issues in Art Education Theory and Practice (3) [Rpt./12 units] I II May be convened with 496.

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 The identification of problems in art education at various curricular levels; examination of related research with possible implications for practice.

693. Internship I II Credit may be based on the successful completion of an internship under the supervision of a qualified art educator. 1-3L. P, 532; consult department before enrolling.

Art History (ARH)

110. Art in Society (3) Introduction to social, cultural, and political themes in the history of world art. Intended for non-majors only.

117. Survey of World Art. Prehistoric-Gothic (3) I II The art and architecture of Western civilizations through the Gothic era, and of world prehistoric and primitive cultures.

118. Survey of World Art. Renaissance-20th Century (3) I II The art and architecture of Western civilization, Renaissance through the 20th century.

319. Introduction to American Art (3) I II Survey of American architecture, painting, sculpture, photography, and the decorative arts from colonial times to present.

320. Introduction to European Modern Art (3) I II Painting and sculpture in Europe from about 1886 to recent times.

321. Introduction to Contemporary Art (3) I II Survey of contemporary art in the United States and Europe since the 1960s. P. 118.

322. Introduction to Prehispanic, Hispanic, and Chicano Art (3) Survey of the native, prehispanic arts of Mexico, Central and South America; art since the conquest of Mexico, Central and South America; and Hispanic Arts of the Southwest and contemporary Chicano art. (Identical with LA S 322)

329. Art History of the Cinema (3) I (Identical with CLAS 329)

334. Art and Archaeology of Ancient Egypt (3) I II 1993-94 (Identical with CLAS 334)

339. Introduction to African and African-American Art (3) I II Chronological, metaphor-ethno-aesthetic overview of continental African culture groups and individual African diaspora artists/styles/movements; covers slavery, reconstruction, Harlem renaissance, civil rights and contemporary developments. 3L, 1D. Field trip (Identical with AAS 339).

340a-340b. Introduction to Classical Art and Archaeology (3-3) 1993-94 (Identical with CLAS 340a-340b)

412a-412b-412c-412d. Medieval Art (3-3-3-3) The history of art and architecture in Western Europe and Byzantium between c. 300 and c. 1300. 412a: Early Christian and Byzantine Art. 412b: Early Medieval Art. 412c: Romanesque Art. 412d: Gothic Art. 412a is not prerequisite to 412b, etc. May be convened with 512a-512b-512c-512d.

413a-413b-413c. Renaissance Art in Italy (3-3-3) Painting, sculpture and architecture in Italy. 413a: 13th-14th centuries. 413b: 15th century. 413c: 16th century. 413a is not prerequisite to 413b or 413c. May be convened with 513a-513b-513c.

414a-414b. Northern Renaissance Art (3-3) 414a: Development of Northern Renaissance painting during the late 14th through the 15th centuries. 414b: Art of the Reformation (16th century) in Germany and the Netherlands. P. 6 units of history or art history. 414a is not prerequisite to 414b. May be convened with 514a-514b.

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 517a-517b.

418a-418b. 20th-Century Art (3-3) Painting and sculpture in Europe. 418a: 1886 to World War I. 418b: Between the World Wars. P. 6 units of history or art history. 418a is not prerequisite to 418b. May be convened with 518a-518b.

422a-422b. Pre-Columbian Art (3-3) 422a: Art of the high cultures of Mesoamerica, with particular attention to the Andean area. 422b: Pre-Columbian art of Central and South America, with particular attention to the Andean area. 422a is not prerequisite to 422b. (Identical
with ANTH 422a-422b and LA S 422a-422b
May be convened with 522a-522b.

423a-423b. The Art of Mexico (3-3) I II 423a: The art of Colonial Mexico, from the early 16th century to the late 18th century. The effects of the Spanish conquest on native traditions; public, private, and sacred patronage; the effects of the Bourbon reforms. Painting, sculpture, architecture, graphic and minor arts. 423b: The art of Modern Mexico, from the late 18th century to the early 20th century. The Independence Period, the National Period, and the Revolutionary Period. Painting, sculpture, architecture, graphic and minor arts. 423a is not prerequisite to 423b. May be convened with 523a-523b.

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. 424a is not prerequisite to 424b. May be convened with 524a-524b.

529a-529b-529c-529d. American Art (3-3-3-3) Art in the United States. 529a: 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.

434. History of the American House (3) I (Identical with ARCH 434) May be convened with 534.

534. History of the American House (3) I (Identical with ARCH 534) May be convened with 434.

535. History of Prints (3) For description of course topics, see 435. Graduate students will have additional reading assignments and must submit a paper of at least 10 pages, the topic of which must first be cleared with the instructor. P, ARH 117 or 118. May be convened with 435.

539a. African Art (3) I For description of course topics, see 439a. Graduate-level requirements include a research paper on approved topic. Field trip. P, 339. May be convened with 439a.

539b. African Art (3) II For description of course topics, see 439b. Graduate-level requirements include a research paper on approved topic. Field trip. P, 339. May be convened with 439b.

596a). Seminar
a. Ancient Art and Archaeology (3) [Rpt./30 units] (Identical with CLAS 596a)
b. Problems in Renaissance-Baroque (3) [Rpt./2] II
c. Studies in Medieval Art (3) [Rpt./2] I II
d. Pre-Columbian Art (3) [Rpt./4] I Consult instructor before enrolling. (Identical with ANTH 596e)
e. History of Photography (3) [Rpt./4] I II P 424a or 424b.
g. Issues in Contemporary Theory and Criticism (3) [Rpt./6 units] I II Consult department before enrolling.

596b. Issues in Contemporary Theory and Criticism (3) [Rpt./6 units] I II Consult department before enrolling.
Astronomy (ASTR)

933 N. Cherry Avenue, Room N204 (602) 621-2288

Professors Peter A. Strittmatter, Head, J. Roger Angel, W. David Arnett, John Black, Adam Burrows, Thomas Gehrels (Lunar and Planetary Laboratory), William F. Hoffmann, J. R. Jokipii, Robert C. Kennicutt, Jr., James W. Liebert, Frank J. Low, George H. Rieke, Elizabeth Roemer, Thomas L. Swihart, Rodger I. Thompson, William G. Tiff, Neville J. Woolf

Astronomer Craig B. Foltz
Associate Professors Willy Benz, John Bieging, William J. Cocks, Christopher Impey, Fulvio Melia, Andrzej G. Pacholczyk, Marcia Rieke, Gary D. Schmidt, Raymond E. White
Assistant Professors Jill Bechtold, Christopher Walker
Associate Astronomers Donald W. McCarthy, Jr., Erick T. Young

The Department of Astronomy offers several introductory general education courses, as well as Bachelor of Science, Master of Science, and Doctor of Philosophy degree programs. For graduate admission and degree requirements, consult the Graduate Catalog.

Major: The B.S. in Astronomy major is designed to prepare students for graduate work or professional employment in astronomy, astrophysics, and related fields. The curriculum combines courses and research in astronomy and astrophysics with a strong foundation in courses in physics and mathematics. The major requires 33 units. Required courses are ASTR 300a-300b, 302, 400a-400b, and 499 (senior research project); PHYS 410, 415a, 425, and 435; and a 3-unit course in mathematics, statistics, or computational techniques, selected from a list approved by the department. (Students pursuing a double major with physics may substitute other upper-division courses in astronomy, mathematics, physics, or planetary science for the physics courses listed above.) Prerequisites to the required courses include MATH 125a-125b, 223, 254, and PHYS 111a-111b, 112a-112b (or 110, 116, 121, 330). As explained below, these prerequisites may be used to fulfill the minor requirement. A theoretical astrophysics concentration is also available to majors in this department. This concentration is an informal program of mentoring and research opportunities for students with high academic standing. Interested students should contact their department advisor for information about this program.

Prospective students should be aware that the curriculum for this major is very demanding, and requires solid preparation in high school mathematics and science. A student who lacks such preparation should expect to take longer than four years to complete the degree requirements.

Minors: For department majors, an optional structured minor consisting of MATH 125a-125b, 223, and 254, and PHYS 111a-111b (or 110, 116, 121, 330). As explained below, these prerequisites may be used to fulfill the minor requirement. A theoretical astrophysics concentration is also available to majors in this department. This concentration is an informal program of mentoring and research opportunities for students with high academic standing. Interested students should contact their department advisor for information about this program.

Prospective students should be aware that the curriculum for this major is very demanding, and requires solid preparation in high school mathematics and science. A student who lacks such preparation should expect to take longer than four years to complete the degree requirements.

100.* Essentials of Astronomy (3) I II S A survey of astronomy, with attention to its interdisciplinary aspects and its relationships to other sciences. Planetarium work and some night-time observing sessions and field trips supplement class lectures. Primarily for non-science majors.

101L. Astronomy Laboratory (1) I II S Projects, telescope observing, planetarium work, discussions. Can be taken alone or with 100. Combination is equivalent to 110a. Labwork includes frequent mathematical calculations using basic algebra. Recommended preparation is satisfactory completion of the University entrance requirement in mathematics.

105. The Universe and Humanity: Origin and Destiny (3) I II (Identical with PTYS 105)

106. Survey of the Solar System (4) I II (Identical with PTYS 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. 110b: P, 100 or 110a. Labwork includes frequent mathematical calculations, using basic algebra. Recommended preparation is satisfactory completion of the University entrance requirements in mathematics.

*Credit will be allowed for only one of the following: 100 or 110a.

300a-300b. Astronomy and Astrophysics (3-3) I, II A quantitative approach to astronomy and astrophysics. P, MATH 125a; PHYS 110 or 111a.

302. Introduction to Observational Astronomy (3) II Observational applications of coordinate systems and time; basics of astronomical instruments, photodetectors, measuring equipment and reduction techniques. Practice in observing. 2R, 3L. P, MATH 125a.

320. Philosophical and Historical Aspects of Astronomical Thought (3) II Historical development of astronomical concepts and the scientific method; cosmological concepts from ancient times to the present; controversies in astronomy in the recent past and at present.

400a-400b. Theoretical Astrophysics (3-3) I, II Stars, interstellar matter, galaxies, radio sources, cosmology. P, MATH 254, 6 units upper-division physics. 400a is a Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

403. Introduction to the Solar System (3) I 1993-94 (Identical with PTYS 403) May be convened with 503.

418. Modern Astronomical Instrumentation and Techniques (3) I 1993-94 Radiant energy; signals and noise; detectors and techniques for imaging, photometry, polarimetry and spectroscopy. Examples from stellar and planetary astronomy in the x-ray, optical, infrared and radio. (Identical with PTYS 418) May be convened with 518.

502. Astronomical Instrumentation Project (3) II 1993-94 Design, construction, and testing of an astronomical instrument chosen by each student under the guidance and supervision of the instructor. Regular class sessions are devoted to discussing techniques and reporting progress and problems.

503. Introduction to the Solar System (3) I 1993-94 (Identical with PTYS 503) May be convened with 403.

515. Interstellar Medium and Star Formation (3) II 1994-95 Derivation of physical conditions from spectral data. Ionized, atomic and molecular clouds, interstellar dust and mag-
netic fields. Ionization equilibrium, heating and cooling, shocks, dynamics, collapse and fragmentation, outflows and protostellar evolu-

518. Modern Astronomical Instrumentation and Techniques (3) I 1993-94 For a course of topics, see 418. Graduate-level re-

requirements include an in-depth research paper. (Identical with PTYS 518) May be convened with 418.

522. Atomic and Molecular Astrophysics (3) I 1994-95 Interpretation of astronomical spectra: basic aspects of atomic and molecular spectra and processes that enable one to infer physical conditions in astronomical environments from analysis of their electromagnetic spectra. Familiarity with basic quantum mechanics is assumed.

523. Statistical Mechanics in the Space Sciences (3) I 1994-95 (Identical with PTYS 523)

535. Stellar Structure (3) II 1993-94 Equations of stellar structure, virial theory, energy transport, equations of state, opacities, nuclear reactions, stellar models, evolution of low and high mass stars, observational tests, rotation and magnetic fields, binary evolution.

540. Structure and Dynamics of Galaxies (3) I 1994-95 Observational properties of galaxies; structure, kinematics, star and gas content. Structure of our own galaxy. Dynamics of stellar systems: equilibria, instabilities, internally and externally driven evolution.

541. Extragalactic Astronomy and Cosmology (3) II 1994-95 The structure, origin and evolution of the physical universe from theory and observations of systems outside our own galaxy. Relativistic cosmology; galaxy evolution and clustering; active galaxies and quasars; the microwave background; galaxy formation; gravitational radiation, synthesis of elements in the first stars and black holes. Observational tests, rotation and magnetic fields, binary evolution.

545. Stellar Atmospheres (3) I 1993-94 Radiative transfer, gray atmosphere, opacity, line formation, non-LTE, curves of growth, stellar hydrodynamics, planetary applications. (Identical with PTYS 545)


551. Extragalactic Astronomy and Cosmology (3) II 1994-95 The structure, origin and evolution of the physical universe from theory and observations of systems outside our own galaxy. Relativistic cosmology; galaxy evolution and clustering; active galaxies and quasars; the microwave background; galaxy formation; gravitational radiation, synthesis of elements in the first stars and black holes. Observational tests, rotation and magnetic fields, binary evolution.

555. Remote Sensing of Planetary Surfaces (3) II 1994-95 (Identical with PTYS 555)

556a-556b. Electrodynamics of Conducting Fluids and Plasmas (3-3) 1994-95 (Identical with PTYS 556a-556b)

575. General Relativity and Cosmology (3) II 1994-95 General relativity with application to celestial mechanics, stellar structure, gravitational radiation, black holes, gravitational lensing and cosmology. (Identical with PTYS 575)

582. High Energy Astrophysics (3) II 1993-94 Radiation mechanisms, synchrotron radiation, charged particle acceleration, pulsars, black holes, accretion disks, X-ray binaries, gamma-ray sources, radio galaxies, active galactic nuclei. (Identical with PHYS 582 and PTYS 582)

589. Topics in Theoretical Astrophysics (3) [Rpt.] I (Identical with PHYS 589)

Atmospheric Sciences

(AMO)

Physics-Atmospheric Sciences Building, Room 542
(602) 621-6831

Professors E. Philip Krider, Head, George A. Dawson (Emeritus), Robert E. Dickinson, Benjamin M. Herman, A. Richard Kassander (Emeritus), Richard M. Schotland, William D. Sellers, Dean O. Staley (Emeritus)

The Department of Atmospheric Sciences offers the Bachelor of Science degree, with a hydrometeorology option, and the Master of Science and Doctor of Philosophy degrees. For graduate admission and degree requirements, consult the Graduate Catalog.

The major: 30 upper-division units in atmospheric sciences. The following courses are required: MATH 124 or 125a, 125b, 223, 254; STAT 361 or ATM 462; ENGR 141 (FORTRAN); PHYS 110, 116, 121, CHEM 103a-103b, 104a-104b; ATM 300a-300b, 350, 411a-411b, 451a, 471, 472. Students selecting the hydrometeorology option do not need to take CHEM 103b-104b, but must take HWR 250, 440, and 445, which will count as 7 of the 30 upper-division units in atmospheric sciences.

The undergraduate minor for atmospheric science majors: The department offers a structured minor consisting of MATH 124 or 125a, 125b, 223, 254 and PHYS 110, 116, 121.

The undergraduate minor in atmospheric sciences: 20 units in atmospheric sciences, including ATM 300a-300b.

The undergraduate earth science teaching major: Students interested in teaching secondary school earth science, which includes atmospheric sciences, should see the list of required courses under the Department of Geosciences.

The department participates in the honors program.

171. Introduction to Meteorology and Climatology (3) I II An introduction to weather processes and climate, including discussions of fronts and cyclones, precipitation processes, the wind systems of the world, severe storms, and weather modification. P, MATH 116R/S, (Identical with GEOG 171)

171L. Introduction to Meteorology and Climatology Laboratory (1) I II Quantitative exercises illustrating the physical and chemical behavior of the atmosphere and the fundamental concepts used in weather analysis and forecasting. P, CR, MATH 171.


300a-300b. General Meteorology (3-3) Survey of physical (300a) and dynamic (300b) meteoro-

logy. Recommended for students wanting a more quantitative approach to meteorology than provided in 171. 300a: P, CR, MATH 125b, 300b: P, CR, MATH 223, recommended ATM 171.

336. Weather, Climate and Society (3) I The effects of weather on society, including its in-

fluence on history, comfort and health, and music and art.

350. Atmospheric Measurements (3) II The theory and use of meteorological instruments; laboratory and field demonstrations and practices. 2R, 3L, Field trip. P, PHYS 103a-103b, or 116 and 121, MATH 254. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

421. Physical Climatology (3) II Heat and water balances of the earth-atmosphere system viewed from both the local and global scales, scale effects, modeling and theories of climatic change, man's impact on climate. P, 171. May be convened with 521.

440. Air Pollution Meteorology (3) II 1994-95 Theoretical description and experimental practice relating to the dispersion and chemistry of gases and particulate matter in the atmosphere. Attention given to the scales of dispersion and the scales of atmospheric turbulence as related to local, regional and global pollution. P, 300a, PHYS 121, MATH 254, CHEM 103a, or consult department before enrollment. May be convened with 540.

441a-441b. Dynamic Meteorology (3-3) Thermodynamics and its application to planetary atmospheres, hydrostatics, fundamental concepts and laws of dynamic meteorology. P, PHYS 121, MATH 254. (Identical with PTYS 441a-441b) May be convened with 541a-541b.

451a-451b. Introduction to Physical Mete-

orology (3-3) Introduction to atmospheric physics that includes the composition and chemical composition of the atmosphere, kinetic theory, the mechanics of ideal and real fluids, aerodynamics, atmospheric acoustics, atmospheric radiation, scattering, radiative transfer, atmospheric optics, cloud physics, and atmospheric electricity. P, PHYS 121, MATH 254. May be convened with 551a-551b.


462. Computer Methods in the Atmospheric Sciences (3) II Introduction to computer methods for solving physical and statistical problems in atmospheric sciences. P, 300a, ENGR 141 (FORTRAN). May be convened with 562.

463. Advanced Statistical Methods in the At-

mospheric Sciences (3) I Time series analysis, interpolation methods, objective analysis, statistical weather forecasting, forecast evaluation, and introduction to chaos theory. P, 462 or equivalent. May be convened with 563.
465. Mesoscale Analysis (3) II Description, analysis, and dynamics of weather systems of the mesoscale. Topics include fronts, thunderstorms, gravity waves, lake effect storms, and sea breezes. P, 441b, 471. May be convened with 565.

471. Synoptic Meteorology (3) I Principles of meteorological analysis; fundamental concepts of dynamic meteorology. Structure and dynamics of midlatitude cyclones and fronts. Use of computer-driven graphical displays. P, 511b. Knowledge of FORTRAN or a similar programming language. P, 350 and 462 or STAT 361; CR, 441a or 300b. May be convened with 571.


490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.

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. (Identical with AR L 521) May be convened with 421.

530. Micrometeorology (3) I 1993-94 Theoretical aspects of atmospheric turbulence, including discussions of laminar flow, turbulent flow, the mechanical energy equations, and the shearing stress and the wind profile. P, 441b.

533. Air/Sea Interactions (3) I 1994-95 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, 300b.

540. Air Pollution Meteorology (3) II 1994-95 For a description of course topics, see 440. Graduate-level requirements include more difficult homework and project assignments that require a deeper understanding of the material and more comprehensive examinations. P, 500a, PHYS 121, MATH 254, CHEM 103a, or consult department before enrolling. May be convened with 440.

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. (Identical with PTYS 541a-541b) May be convened with 441a-441b.

544. Physics of High Atmospheres (3) II 1993-94 (Identical with PTYS 544)


551a-551b. Introduction to Physical Meteorology (3-3) For a description of course topics, see 451a-451b. Graduate-level require-
ments include a more quantitative and thorough understanding of the subject matter. P, PHYS 121, MATH 254. May be convened with 451a-451b.


562. Computer Methods in the Atmospheric Sciences (3) II For a description of course topics, see 462. Graduate-level requirements include an additional project. P, 300a, ENGR 101 (FORTRAN) or equivalents. May be convened with 462.

563. Advanced Statistical Methods in the Atmospheric Sciences (3) I For a description of course topics, see 463. Graduate-level requirements include an additional project. P, 562. May be convened with 463.

565. Mesoscale Analysis (3) II For a description of course topics, see 465. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. P, 541b, 571. May be convened with 465.

567. Inverse Problems in Geophysics (3) I (Identical with GEOS 567)

571. Synoptic Meteorology (3) I For a description of course topics, see 471. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. P, 121, 511. Knowledge of FORTRAN or similar programming language. P, 350 and 462 or STAT 361, CR, 541a or 300b. May be convened with 471.

572. Weather Analysis and Forecasting (3) II For a description of course topics, see 472. Graduate-level requirements include a survey paper on some aspect of weather prediction. P, 571. May be convened with 472.

583. Remote Sensing Instrumentation and Techniques (3) II (Identical with ECE 583)

585. Tropospheric Chemistry (3) I 1993-94 Tropospheric chemistry of both the natural and polluted atmosphere. Topics include biogeochemical cycling of major constituents, urban air pollution and measurement techniques. P, 500a.

589. Atmospheric Electricity (3) II 1993-94 An introduction to the sources and chemistry of atmospheric ions, fair weather electricity, the global circuit, electrical structure of clouds, thunderstorm electrification, lightning, lightning electromagnetic fields, and lightning protection. P, MATH 322, PHYS 116. (Identical with ECE 589)


595a. Atmospheric Measurement Techniques (1-3) II 1993-94

b. Global Climate Change (2) I P, strong quantitative background in HWR, ATMO, GEOS or RNR. (Identical with GEOS 595b and HWR 595b)

c. General Circulation Observations and Modelling (3) II P, ENGR 101 (FORTRAN). (Identical with GEOS 595c and HWR 595c).

614. Theoretical Meteorology (3) I Methods of solution of the hydrodynamic equations; identification and analysis of acoustic, gravity, Kelvin-Helmholtz, inertial, barotropic and baroclinic waves. P, 541b.


656a-656b. Atmospheric Radiation and Remote Sensing (3-3) 1994-95 Theory of atmospheric radiative transfer processes; specific methods for solving the relevant equations; applications to problems in radiative transfer; theoretical basis for remote sensing from the ground and from space; solutions to the "inverse" problem. P, MATH 254. (Identical with OPT 656a-656b)

Biochemistry (BIOC)

Biological Sciences West Building, Room 357
(602) 621-5770

Professors Michael A. Wells, Head, Hans J. Bohnert (Molecular and Cellular Biology, Plant Sciences), Don P. Bourque (Molecular and Cellular Biology), Michael F. Brown (Chemistry), Herbert E. Carter (Emeritus), Michael A. Cusanovich, Leslie S. Forster (Emeritus), Eugene W. Gerner (Radiation Oncology), Darrel E. Goll (Animal Sciences), William J. Grimes, Richard B. Hallick, David J. Hartshorne (Animal Sciences), Mark R. Haussler, John G. Hildebrand (Molecular and Cellular Biology, Division of Neurobiology/ARL), Victor J. Harby (Chemistry), Richard G. Jensen, Henry Koffler (Microbiology and Immunology, Molecular and Cellular Biology), John H. Law, John W. Little, David W. Mount (Molecular and Cellular Biology), David F. O'Brien (Chemistry), John A. Rupley, Eugene G. Sander, Marc E. Tischler, Gordon Tollin, Henry I. Yamamura (Pharmacology/ARL),

Associate Professors Danny L. Brower (Molecular and Cellular Biology), Louise M. Canfield, Carol L. Dieckmann, Robert J. Gillies, Jennifer D. Gillies, Michael F. Brown (Chemistry), Herbert E. Carter (Emeritus), Michael A. Cusanovich, Leslie S. Forster (Emeritus), Eugene W. Gerner (Radiation Oncology), Darrel E. Goll (Animal Sciences), William J. Grimes, Richard B. Hallick, David J. Hartshorne (Animal Sciences), Mark R. Haussler, John G. Hildebrand (Molecular and Cellular Biology, Division of Neurobiology/ARL), Victor J. Harby (Chemistry), Richard G. Jensen, Henry Koffler (Microbiology and Immunology, Molecular and Cellular Biology), John H. Law, John W. Little, David W. Mount (Molecular and Cellular Biology), David F. O'Brien (Chemistry), John A. Rupley, Eugene G. Sander, Marc E. Tischler, Gordon Tollin, Henry I. Yamamura (Pharmacology/ARL),

Assistant Professors Mark S. Dodson, Roger L. Miesfeld, William R. Montfort

Biochemistry provides the fundamentals for study of the molecular principles in biology, medicine, and the health sciences and agricultural sciences. Teaching and research in biochemistry are carried out in several locations in the University.
The faculty members listed above constitute the University Department of Biochemistry, which is responsible for instruction in biochemistry in the Colleges of Agriculture, Arts and Science, and Medicine. These programs serve as an excellent background for graduate study in biochemistry or the many health-related sciences, including a well-prepared professional program for qualification for professional schools of medicine, dentistry and osteopathy.

The University Department of Biochemistry offers the Bachelor of Science, Bachelor of Science in Agriculture, 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 Ph.D. programs terminate early.

The major for the B.S.: CHEM 103a-103b, 104a-104b, or 105a-105b, 241a-241b, 243a-243b, 480a and 480b or 481, MATH 125a-125b, 223, PHYS 104a-104b, BIOC 181, 182, 411, 462a-462b, 494, 496a (2 units), and 6 upper-division units in biology, chemistry, mathematics, or physics, exclusive of individual studies. All students will participate in a senior research practicum (494) for a minimum of six units after taking 462a-462b and 411. 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, 241a-241b, 243a-243b, 480a; MATH 125a; PHYS 102a-102b; BIOC 181, 182, 462a-462b, 411, 496a (2 units), 499 (one unit), and 6 upper-division units in biology, chemistry, mathematics, or physics, exclusive of individual studies. All B.A. students will sign up for BIOC 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 CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b, MATH 124 or 125a plus the following core sequences in Biochemistry: 1) BIOC 462a (3), BIOC 462b (3), and BIOC 411 (3); or, 2) BIOC 460 (5) plus one other course approved by a faculty member.

Biochemistry teaching major. Students interested in teaching secondary school biology, which includes biochemistry, should see the list of required courses under the Department of Ecology and Evolutionary Biology.

The department participates in the honors program.

181. Introductory Biology I (4) I (Identical with MCB 181)

182. Introductory Biology II (4) II (Identical with ECOL 182)

195. Colloquium
   a. Great Experiments in Microbiology (1) I II (Identical with MIC 195a, which is home)
   b. Biotechnology (1) I II (Identical with MIC 195b and MCB 195c).
   c. Society and Science (1) I II (Identical with ECOL 195c, MCB 195c, MIC 195c)

295. Colloquium
   a. Opportunities in Biological Science (1) [Rpt/4 units]

296. Proseminar
   a. Biological Chemistry (1) I (Identical with CHEM 296a, which is home)

410. Cell Biology (3) II (Identical with MCB 410)

411. Molecular Biology (3) II (Identical with MCB 411) May be convened with 511.

416. Computer Analysis of Sequences (3) II (Identical with MCB 416) May be convened with 516.

433. Research Animal Methods (3) I (Identical with V SC 443) May be convened with 553.

455. Developmental Mechanisms (3) I (Identical with MCB 455)


462a-462b. Biochemistry (3-3) Introduction to the properties and metabolism of proteins, nucleic acids, enzymes, carbohydrates and lipids. Designed primarily for majors and minors in chemistry, biochemistry and biology. P, CHEM 241b, CR, CHEM 322, 325. For MCB students, MCB 410 is prerequisite to 462b. (Identical with CHEM 462a-462b, MCB 462a-462b, and TOX 462a-462b). Honors section available for (4) honors credits. May be convened with 562a-562b.

463. Biochemistry Laboratory (2) II Introduction to experimentation with biochemical systems, processes and compounds of biochemical importance. 1R, 5L, P, 460 or 462a, and CR 462b. May be convened with 563.

473. Recombinant DNA Methods and Techniques (4) II (Identical with MCB 473)

496. Seminar
   a. Biochemistry (1) [Rpt/1] I II Open to majors only. P, 462a or CR. Consult department before enrolling. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).


505. Eukaryotic DNA Replication (3) [Rpt/1] I 1994-95 (Identical with CBIO 505)

510. Plant Molecular Biology (3) II 1994-95 (Identical with PL 510)

511. Molecular Biology (3) II (Identical with MCB 511) May be convened with 416.

516. Computer Analysis of Sequences (3) II (Identical with MCB 516) May be convened with 416.

520. Pathways and Signals in Cells (3) II Objectives are to outline various mechanisms of intracellular signaling. This includes the chemical and structural bases for the action of second messengers, e.g. calcium and cyclic nucleotides.

543. Research Animal Methods (3) I (Identical with MCB 543)

545. Concepts in Genetic Analysis (3) I (Identical with MCB 545)

555. Molecular Mechanisms of Development (3) II (Identical with MCB 555)

560. General Biochemistry (5) I II For a description of course topics, see 460. Graduate-level requirements include additional in-depth material. Open to nonmajors only. P, CHEM 241b. (Identical with CHEM 560 and TOX 560). May be convened with 460.

561a-561b. Introduction to Biochemical Literature (1) I II Discussion of the biochemical literature aimed at helping the student evaluate and report the published literature. Primarily for first year graduate students planning a career in biochemistry and desiring to prepare themselves for continued study. P, CR 462a-462b. 561a is not prerequisite to 561b. (Identical with CHEM 561a-561b)

562a-562b. Biochemistry (3-3) For a description of course topics, see 462a-462b. Graduate-level requirements include additional in-depth material. P, CHEM 241b, CR, CHEM 322, 325. (Identical with CHEM 562a-562b and TOX 562a-562b) May be convened with 462a-462b.

563. Biochemistry Laboratory (2) II For a description of course topics, see 463. Graduate-level requirements include additional in-depth material. P, 460 or 462a, and CR 462b. May be convened with 463.

565. Enzymes (3) I Advanced consideration of enzyme structure and function. P, 462a, CHEM 480b. (Identical with CHEM 565)

566. Nucleic Acids (4) I Chemistry, structure, and function of nucleic acids; replication, transcription translation, gene organization, regulation of gene expression and organellar nucleic acids. Both prokaryotic and eukaryotic systems will be considered. P, BIOC 411/511, MCB 411/511, or an equivalent introductory molecular biology course, or permission of the instructor. (Identical with GENE 568, MCB 568 and N FS 568)

569. Topics in Gene Regulation (2) II 1994-95 Behavior of gene regulatory systems in prokaryotes and eukaryotes, Knowledge of
mechanisms is assumed and discussed when needed, but emphasis is on regulatory circuitry. Most lectures will be student presentations. (Identical with MCB 569) Pr. 568 or permission of instructor.

572. Biological Regulation (4) I Advanced treatment of the biochemical aspects of biological regulation in eukaryotic cells. Topics to be discussed include regulation of cellular metabolism, growth and cell division in both plant and animal cells. Pr. 462A-462B or consult department before enrolling (Identical with MCB 572)

574. Advances in Mammalian Genetics (2) [Rpt./1] I 1994-95 Student participation in the presentation and discussion of current literature covering recent advances in the molecular analysis of mammalian genetic loci. Pr. undergraduate courses in genetics and molecular biology. (Identical with GENE 574 and MCB 574)

573. Biomedical Structure II (3) II 1993-94 Advanced study of macromolecular structure; theory, methods, and results of x-ray crystallography and NMR. Pr. Pr. 585 or permission of instructor.

585. Biological Structure (4) II Introduction to the current understanding and methods used for study of the structure, thermodynamics, and dynamics of proteins, nucleic acids, and membranes. Pr. CR, 462A-462B, CHEM 480A-480B. (Identical with CHEM 585)

586. Intracellular Messengers (2) I 1993-94 (Identical with NRSC 586)

588. Principles of Cellular and Molecular Neurobiology (4) I (Identical with NRSC 588)

597. Workshop
a. Recombinant DNA Techniques (2) S Open to high school biology teachers only. R/L (Identical with MCB 597a)

612. Biological Electron Microscopy (4) I (Identical with MCB 612)

621. Molecular, Plant, Microbe Interaction (3) II 1994-95 (Identical with PL P 621)

665. Analysis & Purification of Proteins (3) II 1993-94 (Identical with AN S 665)

681. Introduction to Biophysical Research (1-2) [Rpt./3 units] I II S Supervised research experiences in the labs of individual faculty members. 3-6L. Open only to first-year majors.

696. Seminar
a. Biophysics I (1-2) [Rpt./8 units] I Open to majors only.
b. Biophysics II (1-2) [Rpt./8 units] II Open to majors only.

Biomedical Engineering

1326 E. Mabel Street
(602) 626-7559

Committee on Biomedical Engineering

Professors Peter H. Bartels (Optical Sciences), Paul C. Johnson (Physiology), Murray A. Katz (Internal Medicine), Kenneth C. Mylrea (Electrical and Computer Engineering), Timothy W. Secomb (Physiology), Bruce R. 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 and include A ME 466, A ME 566; ECE 415, 415, 415; CH E 485, 586; PSIO 418, 419 and SIE 551. Additional courses in biomedical engineering are being developed, and supporting course work in the life sciences is also available. Collaborative research projects permit the student to participate in interdisciplinary associations which can enhance progress in the fields of biology, medicine, and engineering. Individual programs are determined by the student and an engineering departmental advisor.

For additional information contact Dr. Bruce Simon, Aerospace and Mechanical Engineering, or Dr. K. C. Mylrea (Electrical and Computer Engineering) Director, Clinical Engineering.

Biophysics (BIP)

Graduate Interdisciplinary Program in Biophysics

Committee:

At the time of publication of this catalog, the Graduate Interdisciplinary Program in Biophysics was undergoing programmatic changes. For current information, contact R. Grueen, 621-8368.

578a-578b. Introduction to Biophysics (3-3) Introduction to the structure of cells and the chemistry of macromolecules, followed by a survey of the principal areas of biophysics: molecular biophysics, membrane and cellular biophysics, and systems biophysics. Pr. PHYS 415b, CHEM 480A-480B.

681. Introduction to Biophysical Research (1-2) [Rpt./3 units] I II S Supervised research experiences in the labs of individual faculty members. 3-6L. Open only to first-year majors.

696. Seminar
a. Biophysics I (1-2) [Rpt./8 units] I Open to majors only.
b. Biophysics II (1-2) [Rpt./8 units] II Open to majors only.

Business Administration

McClelland Hall 417
(602) 621-2165

Committee on Business Administration

Professors: William B. Barrett (Vice Dean), Chair, Andrew D. Bailey, Jr. (Accounting), Lee Roy Beach (Management and Policy), Edward A. Dyl (Finance and Real Estate), Elizabeth Hoffman (Associate Dean)

Associate Professors Christopher P. Puto (Marketing), Sudha Ram (Management Information Systems), Stanley Reynolds (Economics)

Assistant Professor Asoo J. Vakharia (Management Information Systems)

The graduate program in business administration is designed to meet the demand for professors, consultants, and management personnel trained in the application of scientific research to business problems. Both the Master of Business Administration and the Doctor of Philosophy in Management degrees are offered. For admission and degree requirements, please see the Graduate Catalog.
Cancer Biology—Chemical Engineering

Arizona Health Sciences Center, Room 0914
(602) 626-7479

Graduate Interdisciplinary Program in Cancer Biology

Committee:

Professors G. Tim Bowden, Chair (Radiation Oncology), David S. Alberts (Internal Medicine), Harris Bernstein (Microbiology and Immunology), Eugene W. Gerner (Radiation Oncology), William J. Grimes (Biochemistry), Evan M. Hersh (Internal Medicine), Junetsu Ito (Microbiology and Immunology), John W. Little (Biochemistry), Neil Mendelson (Molecular and Cellular Biology), David W. Mount (Molecular and Cellular Biology), Raymond B. Nagle (Pathology), Garth Powis (Pharmacology), Sydney E. Salmon (Internal Medicine), Nobuyoshi Shimizu (Molecular and Cellular Biology), I. Glenn Sipes (Pharmacology and Toxicology), Raymond Taetle (Internal Medicine), Samuel Ward (Molecular and Cellular Biology), Ronald Weinstein (Pathology)

Associate Professors Danny L. Brower (Molecular and Cellular Biology), Louise M. Cantfield (Biochemistry), Anne E. Cress (Radiation Oncology), William S. Dalton (Internal Medicine), Carol Dieckmann (Biochemistry), Harinder S. Garewal (Internal Medicine), Helen Gensler (Radiation Oncology), Robert Gillies (Biochemistry), Jennifer D. Hall (Molecular and Cellular Biology), Mary J. C. Hendrix (Anatomy), Siraj Mufti, Research Associate Scientist (Pharmacology and Toxicology)

Assistant Professors Alison E. Adams (Molecular and Cellular Biology), Kit S. Lam (Internal Medicine), Daniel C. Liebler (Pharmacology and Toxicology), Alan E. List (Medicine), Jesse D. Martinez (Radiation Oncology), Roger L. Meisfeld (Biochemistry), Marianne Powell (Internal Medicine), Charles W. Taylor (Internal Medicine), Ted Weinert (Molecular and Cellular Biology)

Scientists from various departments comprise the interdisciplinary Program on Cancer Biology which offers programs leading to the Master of Science and Doctor of Philosophy degrees with a major in cancer biology. The curriculum of the cancer biology graduate program is designed to introduce students to the body of knowledge that has been derived from experiments on the production, properties, and therapy of cancer and to assure that the students have the necessary background in one or more areas of related fundamental science to enable them to do original research.

For more information concerning admissions and degree requirements, see the Graduate Catalog.

505. Eukaryotic DNA Replication (3) [Rpt./1] I 1994-95 Molecular and biochemical aspects of DNA replication in mammalian cells will be described in conjunction with discussions of recent journal articles on selected topics. Includes the regulation of S phase within the eukaryotic cell cycle, nuclear organization during DNA synthesis; DNA replication enzymes; viral, yeast and embryo models of DNA replication; the initiation of DNA replication; DNA replication origins and the reconstitution of DNA replication complexes. P, BIOP 4521 (Identical with BIOP 503, MCB 503, and MBIM 505). Gerner

551. Molecular Mechanisms of Carcinogenesis (3) I 1994-95 Physical and chemical carcinogenesis. Special emphasis will be upon molecular aspects of the interaction of the carcinogenic agents with mammalian cells and the subsequent mutagenic and metabolic consequences of such interactions. The topics of oncogene activation and tumor suppressor gene inactivation induced by carcinogens during multi-stage carcinogenesis will be emphasized. The molecular biology techniques used in the study of carcinogenesis will also be covered. P, consult program before enrolling. (Identical with MBIM 551 and RONC 551). Bowden

555. Cancer Biology (3) II 1993-94 Fundamental biological aspects of neoplastic growth at the organ, cellular and molecular levels, emphasis on the etiology, behavior, and therapy of neoplasms. (Identical with ANAT 503, IMED 555, MBIM 555 and RONC 555)


956. Seminar h Cancer Biology Series (1) I (Identical with RONC 596h)


896. Seminar h Cancer Biology Series (1) I (Identical with RONC 896h)

*Available on both 500 and 800 levels.

Chemical Engineering (CHE)

Geology Building, Room 120
(602) 621-2591

Professors Thomas W. Peterson, Head, Milan Bier, Joseph F. Gross (Emeritus), Richard M. Edwards (Emeritus), Alan D. Randolph, Thomas R. Rehm, Farhang Shadman, Raymond A. Si-erka (Civil Engineering), Jost O. L. Wendt, Donald H. White (Emeritus)

Associate Professors Robert Arnold (Civil Engineering), Curtis Bryant (Civil Engineering), William P. Cosart, Bruce E. Logan (Civil Engineering)

Assistant Professors James Baygents, Roberto Z. Guzman-Zamudio, Kimberly Ogden

Chemical engineering is concerned with utilization and application of scientific theory and principles to develop safe, environmentally and economically sound manufacturing processes in which chemical and/or physical changes take place. The curriculum prepares the student for employment in the research, development, design and operations aspects of the chemical, petroleum, microelectronics, metals, plastics, food, pharmaceutical, energy and related industries.

The department offers the following degrees: Bachelor of Science in Chemical Engineering, Master of Science and Doctor of Philosophy with a major in chemical engineering. For graduate admission and degree requirements, consult the Graduate Catalog.

The major requires 137 units of science, engineering and humanities social science courses as shown in the College of Engineering and Mines section of this catalog. No minor is required but opportunity for specialization is offered through a number of technical electives options.

201. Elements of Chemical Engineering (4) I Chemical engineering calculations and principles of energy and material behavior. 2ES, 2ED. P, CHEM 103a-103b, 104a-104b, MATH 124/125a, ENGR 100a, 100b.

202. Introductory Engineering Analysis (3) II Application of selected mathematical and numerical procedures to the formulation and solution of chemical engineering problems. 2ES, 2ED. P, MATH 223, EGR 100a, 100b.

203. Chemical Engineering Heat Transfer and Fluid Flow (3) II Theory and calculations in the unit operations of fluid flow, heat transfer, and evaporation. 2ES, 2ED. P, 201.
Chemical Engineering Mass Transfer (3) I Theory and practice in the unit operations of distillation, gas absorption, extraction, drying, and filtration. 1.5ES, 1.5ED. P, 201, 203.

Chemical Engineering Operations Laboratory (3) II Design project from scoping and process equipment. 1.5ES, 1.5ED. P, 201, 203.

Chemical Engineering Transport Phenomena (3) II Theory and calculations pertaining to fundamental transport processes. 3ES. P, 201, 402.

Chemical Engineering Science Laboratory (3) I Practical verification of fundamental principles of thermodynamics, kinetics, and transport phenomena. 3ES. P, 201, 304, 305, 326; CR, 420.

General Thermodynamics (2) I Properties and equations for solids, liquids, gases and vapors; first law energy balance; second law entropy balance; heat cycles, compressors, engines. 2ES. P, 201, CR, CHEM 480A.

Chemical and Physical Equilibrium (3) II Applications of thermodynamics to equilibrium processes; chemical and physical equilibrium in multicomponent systems. 3ES. P, 316, CHEM 480A.

Intermediate Engineering Analysis (3) I Solution of complex chemical engineering problems utilizing both analytical and numerical techniques. 1.5ES. P, MATH 254, CH E 202, CR, 303.

Process Control and Simulation (3) I Theory of automatic control as applied to elementary chemical engineering processes. Use of continuous system simulation languages for study of practical control problems in the process industries. 1.5ES, 1.5ED. P, CR, 402.

Physiology for Engineers (4) I (Identical with PSIO 418)

Physiology Laboratory (2) (Identical with PSIO 419)

Chemical Reaction Engineering (3) I Application of thermodynamic and kinetic fundamentals to the analysis and design of chemical reactors. 1.5ES, 1.5ED. P, 201, 326. May be convened with 520.

Topics in Real-Time Computing (3) I Introduction to microcomputer- and minicomputer-based real-time computing for data acquisition and process control. Includes study of various languages and operating systems. 2R, 3L. 1.5ES. 1.5ED. May be convened with 521.

Chemical Engineering Industrial Methods (2) II Practical aspects of design and manufacturing methods in the chemical process industry; management of personnel problems. 2ED. P, 304.

Corrosion and Degradation (3) II (Identical with MSE 435) May be convened with 535.

Chemical Engineering Design Principles (3) I Preliminary economic, environmental, safety, and design principles associated with chemical process equipment. 3ED. P, 201, 203, 303, 304, 305; CR, 420.

Chemical Engineering Plant Design (3) II Design project from scoping and process selection, through material and energy balances, equipment design and sizing, safety and environmental considerations, to economic analysis of capital cost and operating expense. 3ED. P. 442.

Chemical and Physical Fundamentals of Air Pollution (3) II Study of the kinetics, transport phenomena and phase equilibria of urban air pollution problems. 3ES. P, 305, 420. May be convened with 551.

Space Manufacturing (3) I Basics of producing high value added materials in microgravity, as well as commodities for use in space from extraterrestrial resources. May be convened with 553.

Law for Engineers/Scientists (3) II Topics covered in this course include patents, trade secrets, trademarks, copyrights, product liability contracts, business entities, employment relations, and other legal matters important to engineers and scientists. (Identical with ENGR 454) May be convened with 554.

Aerosol Science and Engineering (3) I 1993-94 Physics, chemistry, mechanics and optics of aerosol particles. Topics include formation, dynamics, nucleation and growth, coagulation, scattering and absorption of radiation, deposition and aerosol technology. (Identical with ATMO 460 and ECE 460) May be convened with 560.

Chemical Process Simulation (2) II Use of existing large, modular computer programs for computer-aided process design and analysis; program structure, convergence accelerators and control blocks. 2ED. P. 442. May be convened with 561.

Fundamentals of Polymeric Materials (3) II Fundamental chemical, physical, and mechanical properties of organic plastics, fibers, coatings, adhesives, and elastomeric polymers. 1.5ES, CHEM 241B, MSE 331R, CR, CHEM 480B. May be convened with 570.

Bioseparation Techniques for Engineers (3) II Methods of separation for purification of bioprocess products—amino acids, proteins, nucleic acids, carbohydrates, lipids, cells. 3ES. P, CHEM 243a-243b. May be convened with 580.

Bioreactor Engineering (3) I Introduction to biotechnology; chemistry of microorganisms; design of bioreactors to include cellular and enzyme reactors of all types; transport phenomena and control of bioreactors, instrumentation and measurement in bioreactors. 3ES. P, MATH 254, CHEM 241a, CHEM 480A. May be convened with 581.

Biomedical Transport Phenomena (3) I 1994-95 Transport processes in the cardiovascular system, hemorheology, pharmacokinetics, enzyme kinetics, extracorporeal mass transport devices, biocompatible materials. 3ES. P, 305 or A ME 331a, and MATH 223. May be convened with 585.

Practicum a. Senior Project (1-3)


Advanced Chemical Engineering Transport Phenomena (3) I Momentum, energy and mass transport in continua, solution of multidimensional laminar flow problems, turbulence, boundary layer theory. P, 305.

Advanced Chemical Engineering Thermodynamics (3) I Advanced applications of First and Second Laws, nonideal gases and liquids and their mixtures, principles of chemical equilibrium, and molecular theory. P, 326.


Chemical Reaction Engineering (3) I For a description of course topics, see 420. Graduate-level requirements include an in-depth research paper on a current topic. May be convened with 420.

Topics in Real-Time Computing (3) I For a description of course topics, see 421. Graduate-level requirements include a special project. May be convened with 421.


Solid-Fluid Reactions (3) I Characterization of solid structural properties; principles of heterogeneous reactions involving a fluid and a reacting solid. P, 326 and 420, or MSE 450R and 412. (Identical with MSE 532)

Corrosion and Degradation (3) II (Identical with MSE 535) May be convened with 435.

Industrial Energy and Power Management (3) II (Identical with NEE 541)

Combustion Generated Air Pollution (3) II (Identical with A ME 548)

Chemical and Physical Fundamentals of Air Pollution (3) II For a description of course topics, see 451. Graduate-level requirements include a special project. P, 305, 420. May be convened with 451.

Space Manufacturing (3) I For a description of course topics, see 453. Graduate-level requirements include an additional paper. May be convened with 453.

Law for Engineers/Scientists (3) II For a description of course topics, see 454. Graduate-level requirements include an in-depth research paper on a current topic. (Identical with ENGR 554) May be convened with 454.

Aerosol Science and Engineering (3) I 1993-94 For a description of course topics, see 460. Graduate-level requirements include a special project. (Identical with ATMO 560 and ECE 560) May be convened with 460.

Space Manufacturing (3) II For a description of course topics, see 461. Graduate-level requirements include a special project. P, 442. May be convened with 461.

Fundamentals of Polymeric Materials (3) II For a description of course topics, see 470.

Advanced Chemical Engineering Transport Phenomena (3) I Momentum, energy and mass transport in continua, solution of multidimensional laminar flow problems, turbulence, boundary layer theory. P, 305.
Graduate-level requirements include a special project. P, CHEM 241b, MSE 331R, CR, CHEM 480a. May be convened with 470.

580. Bioseparation Techniques for Engineers (3) II For a description of course topics, see 480. Graduate-level requirements include a special project. P, CHEM 243a-243b. May be convened with 480.

581. Bioreactor Engineering (3) I For a description of course topics, see 481. Graduate-level requirements include a special project. P, MATH 254, CHEM 241a, CHEM 480a. May be convened with 481.

583. Remote Sensing Instrumentation and Techniques (3) II (Identical with ECE 583)

585. Biomedical Transport Phenomena (3) I 1994-95 For a description of course topics, see 485. Graduate-level requirements include a special project. P, 305 or A ME 331a, and MATH 223. May be convened with 485.

586. Advanced Biomedical Engineering (3) II 1993-94 Analytical methods applied to problems in biochemical and biomedical engineering. Course includes invited lecturers, journal critiques, and preparation of an original paper. P, MATH 223.


645. Advanced Solar Engineering (3) II (Identical with NEE 645)


969. Seminar
a. Chemical Engineering (1) [Rpt./6] I II
b. Combustion (1) [Rpt./6] I II
c. Kinetics (1) [Rpt./6] I II
d. Pollution Control (1) [Rpt./6] I II
e. Fluid Mechanics (1) [Rpt./6] I II
g. Biomedical (1) [Rpt./6] I II
h. New Developments (1) [Rpt./6] I II

Chemistry (CHEM)
Old Chemistry Building, Room 221 (602) 621-6354


Associate Professors Michael F. Burke, Eugene A. Mash, Jr., John V. Rund, Mark A. Smith, G. Krishna Vemulapalli, David E. Wigley

Assistant Professors Ludwik Adamowicz, Steven W. Buckner, Daniel P. Dolata, Jacquelyn Gervay, Robin L. Holt, S. Scott Saavedra

Lecturer Walter B. Miller III

The Department of Chemistry provides both general and professional training, giving a strong foundation upon which to base a career in the fields of medicine and related health sciences, in secondary education, or leading to industrial work or graduate specialization in chemistry.

The degrees of Bachelor of Science and Bachelor of Arts with a major in chemistry, and Bachelor of Science in Education and Bachelor of Arts in Education with a teaching major or minor in chemistry are offered. A Master of Arts, Master of Science and Doctor of Philosophy with a major in chemistry are also available, as is a Master of Education with a teaching major in chemistry.

The major for the B.S.: The Bachelor of Science degree in chemistry is for students planning careers as professional chemists and is also the degree for students planning on post-graduate study in chemistry. The curriculum for the B.S. degree meets the professional requirements of the American Chemical Society. The following courses are required: 103a-103b and 104a-104b, or 105a-105b and 106a-106b; 201a-201b or 202a-202b; 241a-241b or 242a-242b; 243a-243b or 244a-244b; 399, or 499. Consult your chemistry advisor for additional information on this program.

MATH 124, 125b, and 223; and PHYS 104a-104b and 180a-180b are prerequisite to courses in the major. Completion of the above Math and Physics courses meets the requirements for a Math-Physics split minor. Other minors may be chosen with the approval of the chemistry advisor.

The major for the B.A.: The Bachelor of Arts degree in chemistry is intended for students who do not plan to pursue post-graduate study in chemistry and are planning on a non-laboratory career. The degree affords a broader exposure to chemistry than the B.S. degree, and is intended for students needing this type of background for careers in business, law, medicine, etc. Students following the B.A. program may choose any language to satisfy the foreign language requirement. The following courses are required: 103a-103b and 104a-104b, or 105a-105b and 106a-106b; 201a-201b or 202a-202b; 241a-241b or 242a-242b; 243a-243b or 244a-244b; 325; 326; 396 or 396H; and one of the following pairs of courses: 462a-462b or 470-470b; 480b; 480b (in place of 480b); and one of the following pairs of courses: 462a-462b or 470-470b.

MATH 124 and 125b; PHYS 104a-104b and 180a-180b are prerequisite to courses in the major for the B.A. At least two additional units in mathematics or physics are needed to complete the Math-Physics split minor. These units should be chosen in consultation with the chemistry advisor.

The chemistry minor: 103a-103b, 104a-104b, or 105a-105b and 106a-106b, and any additional chemistry courses at the 200 level or higher to give a minimum of twenty units of credit. At least two of these additional units must be laboratory courses. CHEM 296, 396, and 302 are not acceptable for the first twenty units of the minor.

The chemistry teaching major: Students wishing to acquire a B.S. degree in education with a teaching major in chemistry enroll in the College of Arts and Sciences as pre-education chemistry majors for the freshman and sophomore years. In the sophomore year students apply for admission and subsequently transfer to the College of Education to complete their junior and senior years. Students should consult with their chemistry advisor and also with a pre-education advisor in the College of Education to plan their course work.

The chemistry teaching major curriculum is designed to provide depth in the fundamentals of chemistry as well as breadth in mathematics and other basic sciences. Students following the teaching major program should consider...
Spanish for the foreign language requirement. The following courses are required: 103a-103b and 104a-104b or 105a-105b, and 106a-106b; 241a-241b or 242a-242b; 243a-243b or 245a-245b; 325, 326, 403, 433, and 480a-480b; MATH 124, 125b; PHYS 104a-104b and 180a-180b; PHYS 433 or BIO 433; MCB 181-182 or GEOS 101-102-103.

The chemistry teaching minor: 103a-103b and 104a-104b, or 105a-105b and 106a-106b; 241a-241b or 242a-242b; 243a-243b or 245a-245b; 325 or 322; 326 or 323, 433 is also recommended.

The double major in chemistry and biochemistry: A student may earn a B.S. degree with majors in chemistry and biochemistry by successful completion of the appropriate required courses. Students seeking such a degree must consult with advisors in the Departments of Chemistry and Biochemistry to plan a suitable program.

The double B.S. degree in chemistry and biochemistry: A student may earn B.S. degrees in both fields by successful completion of the appropriate required courses. Students seeking these two degrees must consult with advisors in the Departments of Chemistry and Biochemistry to plan a suitable program.

The department participates in the honors program.

101a-101b. Lectures in General Chemistry (3-3) 101a: An introduction to chemical principles designed for students with a minimal background in science and mathematics. 101b: Application of chemical principles presented in 101a to problems of interest to prenursing and allied health majors.

101c: Application of chemical principles presented in 101a to problems of interest to non-science majors. A modular approach is used with case studies of "real world" problems. Credit is allowed for only 101b or 101c, not for both. These courses are designed for nontechnical students and are not prerequisites for higher level chemistry courses. P, algebra recommended; CR, 102 encouraged.

102a-102b. General Chemistry Laboratory (1-1) An introduction to the chemical laboratory with an emphasis on development of laboratory skills and techniques, observation of chemical phenomena, data collection, and the interpretation and reporting of results in formal laboratory reports. Fees. P, CR, the corresponding 101 lecture class.

103a-103b. Fundamentals of Chemistry (3-3) Essential concepts and problem-solving techniques, with emphasis on chemical bonding, structure and properties, stoichiometry, kinetics, equilibria, and descriptive organic and inorganic topics. 103a: P, completion of MATH 117R/S or an equivalent level of proficiency as demonstrated by the student's score on the MATH Readiness Test; CR, 104 encouraged. Both 103a and 103b are offered each semester. For Honors listing, see 105a-105b.

104a-104b. Fundamentals of Chemistry Laboratory (1-1) An introduction to the chemical laboratory with an emphasis on development of laboratory skills and techniques, observation of chemical phenomena, data collection, and the interpretation and reporting of results in formal laboratory reports. Fees. P, CR, the corresponding 101 lecture class.

105a-106b. Honors Fundamentals of Chemistry (3-3) Fundamental concepts of chemistry, with emphasis on theoretical and physical principles; atomic and molecular structure and theory, properties of gases, liquids and solids, thermodynamics and equilibria, kinetics, descriptive inorganic chemistry. Open to students who have had high school chemistry and physics and received acceptable scores on the ACT tests. 105a: P, CR, the corresponding 103 lecture class. Both 105a and 105b are offered each semester. For Honors listing, see 106a-106b.

106a-106b. Honors Fundamentals of Chemistry Laboratory (2-2) II The experiments are designed to complement the principles concurrently presented in the corresponding lecture class and require knowledge of the lecture material to interpret. Fees. P, CR, the corresponding 103 lecture class. Both 104a and 104b are offered each semester.

109a-109b. Honors Fundamentals of Chemistry Laboratory (2-2) II The experiments are offered each semester. For Honors listing, see 110a-110b.

110a-110b. Honors Fundamentals of Chemistry Laboratory (2-2) II The experiments are designed to complement the principles concurrently presented in the corresponding lecture class and require knowledge of the lecture material to interpret. Fees. P, CR, the corresponding 103 lecture class. Both 104a and 104b are offered each semester.

117R/S or an equivalent level of proficiency as established by the ACT tests. 105a: P, CR, MATH 124.

241a-241b.** Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P, 241b or 242b, 325 or 322. CR, 323 or 326 encouraged.

242a-242b.** Honors Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P, 241b or 242b, 325 or 322. CR, 323 or 326 encouraged.

242a-243a.** Organic Chemistry Laboratory (2-2) I Similar to 243a-243b. Designed for chemistry and biochemistry majors and chemical engineers. Fees. 6L. P, CR, 241a-241b or 242a-242b.

296. Seminar a. Biological Chemistry (1) II Open to introductory students in chemistry or the life sciences and premedical students. P, 103b or 104b, or 105b and 106b; Identical with BIOC 296k.

302. Scientific Glassblowing (1 to 2) I I Methods of design and construction of scientific glass apparatus. Fees. 6L.

322.** Principles of Analysis I (2) II Principles of modern quantitative analysis. Open to nonmajors only. P, 103b or 104b, or 105b and 106b; CR, 323 encouraged.

323.** Principles of Analysis I Laboratory (1) II Experiments in modern quantitative analysis. Open to nonmajors only. Fees. 3L. P, CR, 322 or 325.

325.** Analytical Chemistry (2) II i Principles of modern quantitative analysis, including consideration of stoichiometry, equilibrium principles, treatment of experimental data, titrimetric and photometric analysis, and analytical separation processes. P, 103b and 104b, or 105b and 106b; CR, 323 or 326 encouraged.

326.** Analytical Chemistry Laboratory (2) II Experiments in modern quantitative analysis. Designed for chemistry majors. Fees. 6L. P, CR, 325.


396H. Honors Proseminar (3) II P, 245b.

400a-400b. Chemical Measurements Laboratory (2-2) I I Laboratory work in modern chemical measurements and instrumentation. Fees. 1R, 6L. P, 245a or CR, 400a; 400b. Writing-Emphasis Course (400a), P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

410. Inorganic Chemistry (3) Fundamentals of inorganic chemistry. P, 480a or CR.

412. Inorganic Preparation (3) I I Standard inorganic laboratory preparations, including coordination compounds, isomeric compounds, and compounds typing the groups of the periodic table. Fees. 9L. P, two semesters of laboratory experience 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 or 242b, 325 or 322, or 102, 180b.

440. Qualitative Organic Analysis (3) II The systematic classification and identification of organic compounds. Fees. 6L. P, 241b or 242b, 425b or 425a, 325 or 322.

446. Organic Preparations (3) I Special experimental methods for the synthesis of organic compounds. Fees. 1R, 6L. P, 241b or 242b, 425b or 425a, 325 or 322.

450.** General Biochemistry (5) I I (Identical with BIOC 460) May be convened with 560.
462a-462b. **Biochemistry (3-3) (Identical with BIOC 462a-462b)** Honors section available for (4) honors credits. May be convened with 562a-562b.

**Credit is offered only for one course or sequence in each of the following groups:** 101b or 241a-241b or 242a-242b; 102b or 243a-243b or 245a-245b; 325 or 322; 326 or 323; 460 or 462a-462b.

**800-800b. Physical Chemistry (3-3) Fundamental principles of physical chemistry. P, 103b and 104b, or 105b and 106b; MATH 125b; PHYS 102b or 104b or 116 or 118.

481. Biophysical Chemistry (3) II Topics in physical chemistry pertinent to the biological sciences, including chemical dynamics, transport processes, thermodynamics, bonding, and spectroscopy. P, 480a.

491. Preceptorship

- a. College Teaching (1) [Rpt./2 units] I II S May be convened with 491a.
- b. Chemistry Course Development (1) [Rpt./2 units] I II S May be convened with 491b.
- c. Professional Service (1) [Rpt./2 units] I II S May be convened with 491c.

Note: A combination of 491a, 491b, or 491c may be taken up to a total of 6 units.


503. Intermediate Physical Chemistry (3) I General survey of physical chemistry, including thermodynamics, structure, kinetics and electrochemistry. P, 480b.

504. Intermediate Inorganic Chemistry (3) I Principles of modern inorganic chemistry, including synthesis, structure, physical properties, and reactivity of inorganic compounds and materials.

507. Radiochemistry and Radiation Detection (3) I (Identical with NEE 507)

510a-510b. Advanced Inorganic Chemistry (3-3) II I Survey at the advanced level of the chemistry of the elements. P, 410.

512. Advanced Inorganic Preparations (2 to 4) II Modern inorganic syntheses, including instruction in the use of high pressure, temperature, and vacuum techniques and in the manipulation of unstable compounds. 6 to 12L.

517. Structural Chemistry (3) II Introduction to the determination of structures of complex molecules by X-ray crystallography; the evaluation of structural information; current topics in structural chemistry. 2R, 3L.


521. Advanced Instrumental Analysis (3) I Topics in spectrophotometry, emission spectrometry, chromatography, electroanalysis, principles of instrumentation and data acquisition at an advanced level. P, 424, 480b.

522. Electroanalytical Methods (3) II Principles of electrochemistry and electroanalysis, including topics on electrochemical equilibrium and kinetics, potentiometry, voltammetry, amperometry, coulometry, chronopotentiometry, and modern cyclic and pulse methods. P, 480b.


524. Chemical Instrumentation (4) II Data acquisition and experiment control by analog and digital techniques; design of chemical instrumentation. 3R, 3L. P, 424.

525. Chemistry of Metal Chelates (3) I Theory underlying the application of chelating reagents in chemical analysis. P, 523.


527. Analytical Separations (3) I Fundamentals of separation processes—single and multistage; differential migration methods.

528. Advanced Instrumental Laboratory (2) I Laboratory experiments in spectrophotometry, emission spectroscopy, chromatography and electroanalysis. 6L. P, CR, 521.

540. Organic Syntheses (3) I Organic reactions and the methods by which they are applied to synthetic problems in organic chemistry. P, 241b, 480b.


560. General Biochemistry (5) I II (Identical with BIOC 560) May be convened with 460.

561a-561b. Introduction to Biochemical Literature (1-1) (Identical with BIOC 561a-561b)

562a-562b. Biochemistry (3-3) (Identical with BIOC 562a-562b) May be convened with 462a-462b.

565. Enzymes (3) I (Identical with BIOC 565)

580. Introduction to Quantum Chemistry (3) I An introduction to quantum mechanics, with applications to atomic structure and spectra, the nature of chemical bonding and molecular structure. P, 480b.

581. Chemical Thermodynamics (3) II Advanced concepts in both classical and modern thermodynamics, with particular emphasis on thermodynamics in solution. P, 480b.

582. Statistical Thermodynamics (3) I Introduction to classical and quantum statistical thermodynamics with application to ideal gases and simple solids; equations of state and elementary solution theory. P, 480b.

583. Chemical Kinetics (3) II Classical and modern techniques in studies of chemical reactions. P, 480b.

584. Practical NMR Spectroscopy (3) I The basic principles of nuclear magnetic resonance (NMR) spectroscopy; the operation of Fourier transform NMR spectrometers and interpretation of NMR spectra. P, 480b.

585. Biological Structure (4) II (Identical with BIOC 585)

587. Introduction to Molecular Spectroscopy (3) II Modern molecular spectroscopy including rotational, vibrational, and electronic spectroscopy and their various combinations. P, 480a-480b or consult department before enrolling.

591. Preceptorship

- a. College Teaching (1) [Rpt./2 units] I II S May be convened with 491a.
- b. Chemistry Course Development (1) [Rpt./2 units] I II S May be convened with 491b.
- c. Professional Service (1) [Rpt./2 units] I II S May be convened with 491c.

Note: A combination of 591a, 591b, or 591c may be taken up to a total of 6 units.


614. Organometallic Compounds (3) I Compounds containing carbon-to-metal bonds, with emphasis on those of the transition elements, and the determination of their structures. P, 410.

615. Coordination Chemistry (3) I 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, 510b or CR.

618. Computations in Chemistry (3) [Rpt./1] State-of-the-art computational methods in chemical research, including approximate and ab initio electronic structure methods, molecular mechanics, and molecular modeling graphics. 2R, 3L. P, consult department before enrolling.


642a-642b. Polymer Chemistry (3-3) II I Synthesis, stereochemistry, and mechanisms of formation of high polymers. 642a: Condensation and ring-opening polymers. 642b: Vinyl polymers. P, 540. 642a is not prerequisite to 642b.

644. Heterocyclic Compounds (3) I The behavior of the more important heterocyclic systems. P, 540.


646. Advanced Organic Chemistry (3) [Rpt./] II Advanced topics in organic chemistry, such as peptide chemistry, computer simulations, bio-organic chemistry, and other topics characterized by faculty expertise. Topics will vary each semester. P, consult department before enrolling.
Civil Engineering and Engineering Mechanics

Civil Engineering Building,
Room 206

Professors Dinshaw N. Contractor, Acting Head; Donald A. DePippo, Chandrakant S. Desai, Martha W. Gilliland, Achintya Haldar, David J. Hall (Emeritus), Simon Ince (Hydrology and Water Resources), Rudolf A. Jimenez, James D. Krieh (Emeritus), Emmett M. Laursen (Emeritus), Allan J. Mallick, Haaroon A. Miklofsky (Em-eritus), Richmond C. Nef (Emeritus), Philip B. Newlin (Emeritus), Ralph M. Richard (Emeritus), Raymond A. Sierka, Ernest T. Smedro.

Associate Professors Robert G. Arnold, Donald J. Baumgartner, Curtis W. Bryant, Muniruddin Buddh, Mohammad R. Ehsani, Donald B. Hawes (Emeritus), Panos D. Kiousis, Tribikram Kundu, Bruce E. Logan, Margaret S. Petersen (Emerita), Robert H. Wortman.

Assistant Professors Sonia H. Armaleh, George N. Frantziskonis, William M. Isenhower, Kevin E. Lansay, Hamid 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 (CE)

210. Engineering Graphics (3) I II S GRD Representations and analysis of systems of orthographic projection and graphical methods used in engineering design and production, correlated with technical sketching. 1R, 6L, 2ES, 1ED.

214. Statics (3) I II S GRD Equilibrium force systems, equilibrium, geometric properties of areas and solids; friction, virtual work, potential energy. Honors section is available. 3ES, P, PHYS 110, MATH 125b.

217. Mechanics of Materials (3) I II S GRD Material behavior; relationship between external forces acting on elastic and inelastic bodies and the resulting behavior; stress and deformation of bars, beams, shafts, pressure vessels; stress and strain, combined stresses; columns. Honor section is available. 3ES, P, 214.

251. Elementary Surveying (3) I II S GRD Theory of measurements and errors; vertical and horizontal control methods; topographic surveys; land and construction surveys; use of surveying instruments. 2R, 3L, 2ES. P, 217, MATH 118.


307. Contracts, Specifications and Engineering Ethics (3) I II S Law as applied to engineering contracts and contract documents, including specifications, and ethics in engineering. Writing-Emphasis Course. P, Satisfactory grade on the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

320. Fluid Mechanics Laboratory (1) I Open-channel and closed conduit studies of basic flow phenomena, with emphasis on continuity, conservation of momentum, and exchange of energy; calibration of flow-measuring devices. 3L, 1ES, CR, 321, A ME 250.

321. Civil Engineering Hydraulics (3) I II S Hydrostatics, continuity, irrotational flow, pressure distributions, and applied hydrology. 3L, 1ES, CR, 321, A ME 250.

322. Water Resources Engineering (3) I II Open-channel flow, natural streams and waterways, hydrometric analysis, fluid measurement apparatus, hydraulic models; economic aspects of water resources. 1.5ES, 1.5ED. P, 321, A ME 250.

330. Structural Engineering I (3) I II S Analysis of statically determinate structures, including beams, frames and trusses; influence lines, virtual work, moment area and conjugate beam; Betti's theorem and Castigliano's theorem. 3ES, P, 217.

331. Structural Engineering II (3) I II S Analysis of statically indeterminate beams, frames, and trusses; use of computer programs. 3ES, P, 330, CR, 331.

334. Structural Design in Steel (3) I II S Design of steel members, connections and simple structures, including tension members, laterally supported and unsupported beams, columns, beam-columns, bolted and welded connections; introduction to load and resistance factor design. 3ED, P, 330, CR, 331.

335. Structural Design in Concrete (3) I II S Introduction to reinforced concrete design. 3ED, P, 330.

340. Soil Engineering (4) I II Physical and mechanical properties of soils, shear strength, consolidation, settlement, lateral earth pressures, and bearing capacity. 3R, 3L, 3ES, 1ED. P, 217, CHEM 103b.

360. Transportation Engineering (3) I II SCDT Basis for planning, design, and operation of transport facilities; transport modes discussed include mass transit, passenger cars, bicycles, and pedestrian movement. 1ES, 2ED, P, 251, SIE 265, A ME 250.

361. Highway and Airport Engineering (3) I II SCDT Materials, construction and structural design of highways and airports. 1ES, 2ED, P, 340.

370. Water Supply and Wastewater Systems (3) I II SCDT Design of water distribution and wastewater collection systems and fundamental principles of unit process treatments. 1.5ES, 1.5ED. P, 321.

371. Water and Wastewater Treatment Process (3) I II SCDT Analysis of processes controlling water quality in natural water systems and design of water and wastewater treatment systems. 1.5ES, 2ED, P, 370.

380. Materials Laboratory (2) I II SCDT Mechanical properties of concrete, concrete aggregates, and steel, and other metals as engineering materials. 1R, 3L, 2ES. P, 217, CHEM 103b.

394. Practicum a. Junior Field Trip (1) I II S Fee. Students are urged to take this trip in the junior year. Fee.

400. Civil Engineering Design (3) I II SCDT Integration of accumulated background in civil engineering course work for application to specific design projects. Interaction with practicing engineers to develop design methodologies. 3ED, P, at least four of: 322, 337, 340, 360, 370.

402. Introduction to Finite Element Methods (3) I II SCDT Theory and formulation procedures: energy and residual. One-dimensional problems: stress analysis in axial structures, steady and transient fluid and heat flow, consolidation, wave-propagation, beam-column. Two-dimensional problems: field and plane/axisymmetric, use of computer codes for solu-
417. Mechanics of Materials II (3) II Three dimensional analysis of stress and strain. Castigliano's theorems, curved beams, asymmetric bending, shear center, torsion of thin-walled sections, beams on elastic foundation, nonlinear material behavior, membrane stresses in shells. 2ES, 1ED. P. 302. May be convened with 502.

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. 2ES, 1ED. P, 321. (Identical with HWR 423) May be convened with 523.

424. Hydraulic Engineering Design (3) II Application of principles of hydraulic analysis to the design of hydraulic systems. Applications will vary and include hydropower systems, stilling basins, open channel distribution and collection systems, open networks and pumping systems, drainage problems and other topics. P. 322. May be convened with 524.

427. Computer Applications in Hydraulics (3) I Computer modeling of surface water hydrology, flood plain hydraulics and water distribution systems. Theoretical basis. Application and design studies. 1ES. 2ED. (Identical with HWR 427). May be convened with 527.

428. Introduction to Coastal Engineering (3) II Hydrodynamics of the coastal zone; coastal sediment processes and their interaction with structures; discussion of coastal waters and marine outfall design; coastal zone management. 1ES, 2ED. P, 321. May be convened with 528.

432. Advanced Structural Design in Steel (3) I Advanced problems in the analysis and design of steel structures including beam columns, plate girders, composite construction, multi-story buildings; static and dynamic lateral and vertical loads; connections; computer applications. 3ED, P, 336. May be convened with 532.

434. Design of Wood and Masonry Structures (3) Determination of gravity and lateral loads on structures. Design of wood structures for axial load and bending; structural wood panels, diaphragms and shear walls. Types of masonry construction. Design of masonry structures for gravity and lateral loads. 3ED, P, 331, CR, 337. May be convened with 534.

441. Earth Structures in Geotechnical Engineering (3) I Stability analysis for earth slopes including planar, circular, piece-wise linear, and composite-surface methods: analyses for static and steady-flow conditions; earth pressure theories and calculations for generalized conditions; design of rigid and flexible retaining structures; design of braced and tie-back shoring systems; design of reinforced earth walls; computer-aided design and analysis. 1ES, 2ED, P, 340. May be convened with 541.

444. Soil Stabilization (3) I Purpose of soil stabilization; stabilization using mechanical means, cement, asphalt, lime, salt and resins; factors governing stabilization techniques; special application. P, 340. May be convened with 544.

452. Engineering Surveys (3) I CDT Solar and Polarizations observations; mineral, public, and private land surveys; route surveying, curves, and earthwork; triangulation, photogrammetry, and modern engineering surveys. 2R, 3L, 15ES, 15ED, P. 251. May be convened with 552.

455. Irrigation Engineering (4) II (Identical with ABE 455) May be convened with 555, 3R, 3L, 2ED. P.


462. Bituminous Materials (3) II Manufacture and evaluation tests for the control of bituminous materials used in highway construction and maintenance. 2R, 3L, 0.5ES, 2.5ED, 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. 3ED, 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, configuration, capacity, access and terminals. Field trips. 3ED, 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 general and special purpose manual and computer-based simulation and gaming as an engineering and planning tool. 0.5ES, 2.5ED, P, senior standing in civil engineering or consult with department. May be convened with 565.

466. Urban Transportation Planning (3) II CDT Transportation planning in relation to urban development; techniques and procedures for developing long-range regional plans. 3ED, P, 360 or consult department before enrolling. (Identical with PLNG 465) May be convened with 568.

476R. Chemistry of Environmental Engineering (3) I Chemistry of natural waters and water and wastewater treatment processes. Chemical thermodynamics, equilibria and kinetics are applied to environmental systems. 3ES, P, CHEM 103b, MATH 254. May be convened with 576R.

476L. Environmental Chemistry Laboratory (1) I Laboratory exercises emphasizing the chemistry of natural waters, water and wastewater including related analytical methods. 3L, 1ES, CR, 476R. May be convened with 576L.

478. Introduction to Hazardous Wastes (3) II Management, planning, legal and engineering aspects of liquid and solid hazardous waste treatment and disposal. 2ES, 1ED, P, 370 or consult department before enrolling. May be convened with 578.

479. Environmental Air Pollution (3) I Air pollution sources and pollutant control, with special consideration of the meteorological, urban, rural, industrial, and health aspects. 2.5ES, 0.5ED. May be convened with 579.

481. Construction Methods (3) II Introduction to estimating; construction planning and methods; selected topics of fundamental importance in construction, including the Critical Path Method and PERT. 2R, 3L, 3ED, P, 337, 380.

486. Fundamentals of Industrial Hygiene (3) I (Identical with OSH 486) May be convened with 586.

487. Advanced Industrial Hygiene and Safety (3) II (Identical with OSH 487) May be convened with 587.

497. Seminar I 1994-95 River

502. Introduction to Finite Element Methods (3) II For a description of course topics, see 402. Graduate-level requirements include research paper on a single aspect of the finite element method. P, 302. (Identical with E.M. 502) May be convened with 402.

503. Subsurface Fluid Dynamics (3) I (Identical with HWR 503)

504. Numerical Methods in Subsurface Hydrology (4) II (Identical with HWR 504)

511. Computer-Aided Geometric Design (3) I (Identical with A ME 511)

517. Mechanics of Materials II (3) II For a description of course topics, see 417. Graduate-level requirements include research report on a special problem. P, 217. May be convened with 417.


523. Hydrology (3) I For a description of course topics, see 423. Graduate-level requirements include research paper on a single aspect of the finite element method. P, 321. (Identical with HWR 523 and AR I 523) May be convened with 423.

524. Hydraulic Engineering Design (3) II For a description of course topics, see 424. Graduate-level requirements include research paper and/or a design project. P, 322. May be convened with 424.

525. Water Quality Modeling (3) 1994-95 I Deterministic and stochastic modeling of sur-
526. Water Quality Management (3) II (Identical with HWR 526)

527. Computer Applications in Hydraulics (3)

528. Introduction to Coastal Engineering (3) II For a description of course topics, see 428. Graduate-level requirements include a term paper. May be convened with 428.


532. Advanced Structural Design in Steel (3) I For a description of course topics, see 432. Graduate-level requirements include a comprehensive design project. P. 336. May be convened with 432.

533. Plastic Analysis and Design (3) I 1994-95 Material and member behavior to full plastification; redistribution of forces; plastic design of continuous beams and frames; influence of axial and shear forces; deflections and rotations; alternating plasticity; shakedown analysis. P. 432 or consult department before enrolling.

534. Design of Wood and Masonry Structures (3) II 1993-94 For a description of course topics, see 434. Graduate-level requirements include a comprehensive design project. P. 331, CR 337. May be convened with 434.

536. Prestressed Concrete Structures (3) I 1994-95 Behavior, analysis, and design of statically determinate and indeterminate prestressed concrete structures. P. 337.

537. Advanced Structural Design in Concrete (3) II 1994-95 For description of course topics, see 437. Graduate-level requirements may include a research paper or a comprehensive design project. May be convened with 437.

540. Foundation Engineering (3) II For a description of course topics, see 440. Graduate-level requirements include the development of computer codes for the solution of specified foundation problems or an in-depth research paper on a specific aspect of foundation engineering. P. 340. May be convened with 440.

541. Earth Structures in Geotechnical Engineering (3) I For a description of course topics, see 441. Graduate-level requirements include a research paper and/or a comprehensive design project. P. 340. May be convened with 441.

544. Soil Stabilization (3) I 1994-95 For description of course topics, see 444. Graduate-level requirements include a research paper and/or a comprehensive design project. May be convened with 444.

547. Seepage and Earth Dams (3) I 1993-94, II 1994-95 Principles of flow in porous media; analytical and approximate solutions of confined and unconfined flow; seepage, erosion, piping and filter design; earth and rock fill dam construction and design; stability analyses. P. 340.

548. Numerical Methods in Geotechnical Engineering (3) II 1993-94 Brief statements and applications of numerical methods based on closed-form solutions, finite difference, finite element and boundary element methods for problems involving soil structure interaction such as piles, retaining walls, group piles, underground works; seepage; and consolidation. P. 340, 402 or 502.

552. Engineering Surveys (3) I CDT For a description of course topics, see 452. Graduate-level requirements include a comprehensive surveying project. P. 251. May be convened with 452.

555. Irrigation Engineering (4) II (Identical with ABE 555) P. CE 321 or A ME 331a. May be convened with 455.

558. Drainage of Irrigated Lands (3) II (Identical with ABE 558) May be convened with 458.

562. Bituminous Materials (3) II For a description of course topics, see 462. Graduate-level requirements include an in-depth research paper. P. 340 or consult department before enrolling. May be convened with 462.

563. Traffic Engineering (3) I For a description of course topics, see 463. Graduate-level requirements include a research paper or project. P. 360. May be convened with 463.

564. Airport Planning and Design (3) II 1994-95 For a description of course topics, see 464. Graduate-level requirements include a research paper or project. P. 360. May be convened with 464.

565. Project Planning and Modeling (3) II For a description of course topics, see 465. Graduate-level requirements include a research paper or project. P. senior standing in civil engineering or consult with department. (Identical with PLNG 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 PLNG 568) May be convened with 468.

570. Biodegradation of Hazardous Organic Compounds (2-3) I Chemical and microbiological considerations which affect the thermodynamics and kinetics of transformations of hazardous organic compounds in treatment facilities and in natural settings. 1R, 3L. P. 577; or consult with department.

573. Biodegradation of Hazardous Organic Compounds (2-3) I Chemical and microbiological considerations which affect the thermodynamics and kinetics of transformations of hazardous organic compounds in treatment facilities and in natural settings. 1R, 3L. P. 577; or consult with department.

574. Environmental Transport Processes (3) I Engineering concerns in toxic and hazardous waste management of nonpoint distributed chemical transport between air, water and soil systems, and microbial degradation processes in natural and engineered environment.

575. Microbiology of Environmental Engineering (3) I Microbiological concepts and their application to natural and engineered systems for upgrading water and wastewater quality. 2R, 4L. P. 370.

576. Soil Biochemistry (4) II For a description of course topics, see 476. Graduate-level requirements include a paper on the properties of a chemical pollutant of environmental interest and application of computer models for chemical equilibrium computations. May be convened with 476R.

576L. Environmental Chemistry Laboratory (1) I For a description of course topics, see 476L. For graduate-level requirements, see 576R. 3L. CR. 576R. May be convened with 476L.

577. The Physiological Bases of Microbial Treatment Processes (3) II Principles of bacterial physiology including morphology, metabolism and genetics. Applications of importance to waste treatment and environmental quality. P. 370, or consult with department.

578. Introduction to Hazardous Wastes (3) II For a description of course topics, see 478. Graduate-level requirements include a report on an in-depth review of interdisciplinary aspects of an existing project (with a nonuniversity project engineer). P. 370 or 471, or consult department before enrolling. May be convened with 478.

579. Environmental Air Pollution (3) I For a description of course topics, see 479. Graduate-level requirements include a research project on a particular aspect of air pollution. May be convened with 479.

581. Environmental Air Pollution (3) II For a description of course topics, see 479. Graduate-level requirements include a comprehensive design project. P. 579.

582. 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.

586. Fundamentals of Industrial Hygiene (3) I (Identical with OSH 586) May be convened with 486.

587. Advanced Industrial Hygiene and Safety (3) II (Identical with OSH 587) May be convened with 487.

596. Seminar a. Environmental Engineering (1-3) II b. Geomechanics/Mechanics Structures (1) [Rpt./2] III (Identical with EM 596b) c. Hydraulics and Water Resources (1) I II

597. Seminar w. Advanced Cadastral Survey (1-4) II (Identical with RNR 597w) May be convened with 497w.

610. Probability in Civil Engineering (3) II Outlines the extent of uncertainties under which civil engineering designs and decisions are made. Theory and application. Advanced topics in risk-based engineering design. System reliability concepts. Statistical decision theory and its application in civil engineering. Identifying and modeling nondeterministic problems in engineering in understanding many recently issued engineering codes. P. consult department before enrolling.

613. Theory of Elastic Stability (3) II 1993-94 Bending and buckling of prismatic bars, beams, rings, curved bars, thin shells, and thin plate under axial and lateral loads. P. 417 or EM 613 and CE 412, or consult department before enrolling.

621. Sediment Transportation (2) II 1993-94 Erosion, transportation and deposition of sediments by flowing water; sediment properties and their measurement; bed load and suspended load movement; river behavior and control. P. 321.


626. Vibrations and Dynamic Analysis (3) I 1993-94 II 1994-95 Analysis of vibration problems including hyperelasticity, hyperelasticity, rate type models, plasticity, review, hardening, volume change and dilatancy, softening, inherent and induced anisotropy, laboratory testing and implementation. P, EM 505, 529, or consult department before enrolling. (Identical with EM 563)


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 (including CLAS 350a-350b) in classical art and archaeology, classical literature, and civilization. Latin or Greek. The program of study should be planned in consultation with an advisor.

The supporting minor should be chosen in consultation with the major advisor.

The teaching minor: 25 units in Latin, including LAT 101, 102, 201, 202, and 9 units at the 400 level.

For information on the graduate degrees, please see the Graduate Catalog.

The department participates in the honors program.

Classical Art and Archaeology (CLAS)

329. Art History of the Cinema (3) I Survey of major artistic movements, including academicism, expressionism, cubism, and surrealism, and their influence on film in Germany, Italy, America, and France. (Identical with ARH 329, T AR 329)

334. Art and Archaeology of Ancient Egypt (3) II 1993-94 Art and archaeology of the Egyptian civilization from the beginning of the Pharaonic Period to the Alexandrian Age. (Identical with ARH 334 and ANTH 334)

340a-340b. Introduction to Classical Art and Archaeology (3-3) 1993-94 An archaeological survey of Greece and Italy through the study of major excavations and monuments, with emphasis on cultural developments and relationships. 340a is not prerequisite to 340b. (Identical with ANTH 340a-340b, ARH 340a-340b.)

341. Ancient Greek Monuments (3) Rpt.2 1993-94 Firsthand study of the monuments and material culture (sculpture, vase painting, minor arts, etc.) of the ancient Greeks; reading from history, philosophy and literature in English translation. Five-week tour in Greece.

355. Ancient Egyptian Architecture (3) Architecture of ancient Egypt with special emphasis on its relationship to the social, religious and political needs of the culture. A two-week study tour in Egypt follows the end of the semester.

434a-434b. Archaeology of Neolithic and Bronze Age Greece (3-3) History, art and culture of prehistoric Greece through the study of archaeological excavation and artifacts. 434a: emphasizes the "Minoan" culture of Crete. 434b: emphasizes the Mycenaean culture of the Greek mainland. 434a is not prerequisite to 434b. P: 6 units in classics, history, or anthropology. (Identical with ANTH 434a-434b). May be convened with 543a-543b. 

452. Etruscan Art and Archaeology (3) Surveys the art and archaeology of the Etruscans between the 7th and 1st centuries B.C. P: 340b or consent of instructor. (Identical with ARH 452) May be convened with 552.

453. Research Methods in Classical Archaeology (3) Analysis of various methods of research in classical archaeology emphasizing the critical use of source material, the development of independent thought, and the production of the finished, written product. P: 340a or 340b. May be convened with 553. Writing-Emphasis Course


546. Greek and Roman Painting (3) Greek vase painting from the Dipylon vases of the geometric period in Athens to the Orientalizing animal styles of Corinth and the black and red figured Attic style. Also, survey of ancient Roman painting and mosaics. P: 340a-340b. (Identical with ARH 456) May be convened with 556.

547. Greek Architecture (3) A survey of the architecture and architects of Greece from the Bronze Age through the Hellenistic period including such sites as Mycenae, Pylos, Delphi, Athens and Corinth. P: 340a-340b. (Identical with ARH 457) May be convened with 557.

548. Greek and Roman Provincial Archaeology (3) Survey of classical archaeology in ancient Tunisia, Cyprus, Portugal and Turkey. P: 340a or 340b. May be convened with 558.

461. Greek Pottery 1200-400 B.C. (3) The development of Greek pottery from the collapse of the Mycenaean empire to the close of the classical period. Special attention to shapes, decoration, function, and artistic and technical skills. (Identical with ARH 461) May be convened with 561.

463. Classical Field Archaeology (6) Rpt.1 Field training and lecture program for students beginning in archaeology; includes trench supervision, stratigraphy, locus theory, and oral and written reports on field techniques. Offered on several archaeological sites in the Mediterranean area. P, consult department before enrollment. (Identical with ANTH 463). May be convened with 563.

481. Archaic Greek Sanctuaries (3) Archaeology of the sanctuary sites from the Archaic Period in Greece, both those which became panhellenic and those associated with individual states. Relationships between the polis and the local sanctuary. May be convened with 581.

484. Roman Art and Architecture (3) The origin and development of Italian art and architecture from Etruscan beginnings through the Republic to the late Empire. P: ARH 117, 118, or 6 units of ancient history. (Identical with ARH 484) May be convened with 584.

Writing-Emphasis Courses. P: Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

543a-543b. Archaeology of Neolithic and Bronze Age Greece (3-3) For a description of course topics, see 434a-434b. Graduate-level requirements include extensive reading and an in-depth paper. 543a is not prerequisite to 543b. P: 6 units in classics, history, or anthropology. (Identical with ANTH 543a-543b). May be convened with 434a-434b.
115. The Study of English Words (3) I Vocabulary building through the systematic study of English words derived from Latin and Greek. Readings in translation.

126. Greek Mythology I (3) I The myths, legends, and folktales of the Greeks and their origins. Readings in translation. (Identical with RELI 126)

204. Ancient History: Greek History (3) I (Identical with HIST 204)

205. Ancient History: Roman History (3) II (Identical with HIST 205)

220. Classical Tradition I (3) I Surveys western civilization from the Greco-Roman perspective, beginning before the Greeks and Romans, investigating the origins of their cultures, and proceeding through Greece and Rome to the Middle Ages.

221. Classical Tradition II (3) II Surveys western civilization from the Greco-Roman perspective, covering the classical tradition from the Middle Ages to the present. 220 is not prerequisite to 221.

260. Ancient Philosophy I (3) I (Identical with PHIL 260)

285. Introduction to Humanities Computing (3) S (Identical with RELI 305)

305. Greek and Roman Religion (3) I II S (Identical with GER 305)

326. Greek Mythology II (2-4) [Rpt./5 units] II An intermediate examination of Greco-Roman mythology which focuses on source materials or the influences of classical myths. Field trip to Greece, Italy, or elsewhere.

342. Homer (3) I (Identical with PHIL 342)

349. Myths and Archetypes (3) An investigation of modern psychological theories and their relevance to ancient Greek and Roman myths. Readings in translation. (Identical with RELI 349)

350a-350b. Classical Literature in Translation (3-3) Historical survey of the major authors and works of ancient Greece and Rome. 350a: From Homer to the Greek novel. 350b: Roman literature of the Republican period and the early Empire. 350a is not prerequisite to 350b. Writing-Emphasis Course.

396H. Honors Seminar (3) II

403a-403b. History of Greece (3-3) (Identical with HIST 403a-403b)

404a-404b. History of Rome (3-3) (Identical with HIST 404a-404b)

470. Greek Philosophy (3) (Rpt./1) (Identical with PHIL 470) May be convened with 570.

472a-472b. Ancient Philosophy (3-3) [Rpt.] (Identical with PHIL 472a-472b) May be convened with 572a-572b.

485. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 485) May be convened with 585.

488. History of Byzantium (3) (Identical with HIST 488) May be convened with 588.

510A-510B. Classical Philology (1-1) Introduction to the various disciplines of classical scholarship: philology, textual criticism, papyrology, papyrology, archaeology.

570. Greek Philosophy (3) [Rpt./1] (Identical with PHIL 570) May be convened with 470.

572a-572b. Ancient Philosophy (3-3) (Rpt.) (Identical with PHIL 572a-572b) May be convened with 472a-472b.

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 585) May be convened with 485.

588. History of Byzantium (3) (Identical with HIST 588) May be convened with 488.

695. Colloquium f. Advanced Studies in Ancient History (3) [Rpt./5] II (Identical with HIST 695f, which is home)

Greek (GRK)

101. Elementary Classical Greek I (4) Introduction to ancient Greek for students of the Bible and of the classical authors.


103. Elementary Modern Greek I (4) Development of skills in conversation, composition, and reading with emphasis upon auditory practice.

104. Elementary Modern Greek II (4) Second semester modern Greek. P. 103.

201. Intermediate Classical Greek I (4) Selections from classical Greek chosen in accordance with the student's needs and interest. P. 102.


203. Intermediate Modern Greek I (4) Pronunciation, grammar, and vocabulary of modern Greek; development of skills in conversation, composition, and reading; emphasis on aural skills. P. 104.


402. Greek Reading Course (3) [Rpt.] Readings in major Greek authors including Homer, Plato, and the historians and dramatists. P. 202. May be convened with 502. Writing-Emphasis Course.

412. Readings in Greek Philosophy (3) [Rpt./1] Extensive readings in Greek in one of the following areas of Greek philosophy: the pre-Socratics, Plato's ethics and epistemology, Aristotle's Nicomachean Ethics. P. 202. (Identical with PHIL 412) May be convened with 512. Writing-Emphasis Course.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
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<tbody>
<tr>
<td>401</td>
<td>Latin Selections</td>
<td>Readings in Latin from the Roman historians and biographers. May be repeated without duplication of readings. P. 400. May be convened with 526. Writing-Emphasis Course.</td>
</tr>
<tr>
<td>402</td>
<td>Greek Lyric Poetry</td>
<td>For a description of course topics, see 420. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 532. Writing-Emphasis Course.*</td>
</tr>
<tr>
<td>403</td>
<td>Greek Orators</td>
<td>For a description of course topics, see 431. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 431.</td>
</tr>
<tr>
<td>404</td>
<td>Literature of Archaic Greece</td>
<td>For a description of course topics, see 432. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 432.</td>
</tr>
<tr>
<td>405</td>
<td>Latin Orators (3)</td>
<td>For a description of course topics, see 432. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 432.</td>
</tr>
<tr>
<td>406</td>
<td>Latin Reading Course</td>
<td>For a description of course topics, see 401. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 401.</td>
</tr>
<tr>
<td>407</td>
<td>Latin Paleography</td>
<td>For a description of course topics, see 401. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 401.</td>
</tr>
<tr>
<td>408</td>
<td>Latin Lyric Poetry</td>
<td>For a description of course topics, see 420. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 401.</td>
</tr>
<tr>
<td>409</td>
<td>Greek Lyric Poetry</td>
<td>For a description of course topics, see 420. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 401.</td>
</tr>
<tr>
<td>410</td>
<td>Greek Orators</td>
<td>For a description of course topics, see 431. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 431.</td>
</tr>
<tr>
<td>411</td>
<td>Literature of Archaic Greece</td>
<td>For a description of course topics, see 432. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 432.</td>
</tr>
<tr>
<td>412</td>
<td>Latin Orators (3)</td>
<td>For a description of course topics, see 431. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Greek. May be convened with 431.</td>
</tr>
<tr>
<td>413</td>
<td>Latin Paleography</td>
<td>For a description of course topics, see 401. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 401.</td>
</tr>
<tr>
<td>414</td>
<td>Latin Lyric Poetry</td>
<td>For a description of course topics, see 420. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 401.</td>
</tr>
</tbody>
</table>
The teaching minor requires 24 units:

1. An introduction to basic communication concepts: 100, 102, 103, 104, 106, 200, 280, or 281; (3) lower-division course from 103, 105, 106, 112, 113; (2) 200, 280, 281; (3) 20 units of upper-division course, including 300, 318 and 325.

The major requires 36 units in communication, 20 of which must be upper-division course work, excluding all "university-wide house numbered" courses except 396, 496, and 499. All majors must meet the following course requirements: (1) 100, 104, and one additional course from 103, 105, 106, 112; (2) 200, 280, 281; (3) 20 units of upper-division courses, including 300, 318 and 325.

The teaching major requires 36 units: 100, 102, 103, 104, 106, 200, 280 or 281, 300, 309, 318, 325, 403, 417 and 493.

The teaching minor requires 24 units: 100, 102, 103, 104, 106, 200, 280 or 281, 300 and 493.

Communication (COMM)
Speech Building, Room 209
(602) 621-1366

Professors William D. Crano, Head, Judee K. Burgoon, Michael H. Burgoon, Henry L. Ewbank, Klonda Lynn (Emerita), Alethea S. Mattingly (Emerita)
Associate Professors David B. Buller, Sally A. Jackson, Curtis S. Jacobs, Henry C. Kenski (Political Science), Robert W. Sankey, David A. Williams Assistant Professor Calvin K. Morrill Lecturer William E. Bailey

The Department of Communication offers courses to promote understanding of the functions of communication at all levels of society, from interpersonal communication to the social effects of mass media. Because communication is the most basic social behavior and the means by which the individual functions in society, the study of communication is relevant to all academic and career interests.

The degrees offered by the department are the Bachelor of Arts; the Master of Arts, including an interdisciplinary option in organizational communication; and the Doctor of Philosophy, all with a major in communication. Students should consult the College of Arts and Sciences section of this catalog for the undergraduate program requirements for the Bachelor of Arts degree. For graduate admission and degree requirements, students should consult the Graduate Catalog.

The major requires 36 units in communication, 20 of which must be upper-division course work, excluding all "university-wide house numbered" courses except 396, 496, and 499. All majors must meet the following course requirements: (1) 100, 104, and one additional course from 103, 105, 106, 112; (2) 200, 280, 281; (3) 20 units of upper-division courses, including 300, 318 and 325.

The teaching major requires 36 units: 100, 102, 103, 104, 106, 200, 280 or 281, 300, 309, 318, 325, 403, 417 and 493.

The teaching minor requires 24 units: 100, 102, 103, 104, 106, 200, 280 or 281, 300 and 493.

The department participates in the Honors Program.

100. Fundamentals of Communication (2) I II S Introduces beginning students to the scope of the discipline of communication. CR, 102, 103, 104, 105, 106, or 112.

102. Public Communication (2) I II S Introduction to modes of public communication with an emphasis upon public speaking as a prototype.

103. Communication in Small Groups (2) I II S Introduction to small group communication with practice and exemplification of principles in small group discussion. P or CR, 100.

104. Interpersonal Communication (2) I II S Study and application of basic communication concepts to the description and analysis of interpersonal communication transactions. P or CR, 100.

105. Introduction to Nonverbal Communication (2) I II S Study and application of basic communication concepts to the description and analysis of nonverbal cues. P or CR, 100.

106. Communication of Literature (2) I II S Introduction to the performance of literature, with emphasis on the sound and gesture and the emotional and intellectual meanings of the texts of prose, poetry, and drama. P or CR, 100.

111. Critical Thinking in Communication (3) I II Argument identification and evaluation in a variety of communication contexts. Argumenat preparation and presentation in written and oral situations.

112. Introduction to Organizational Communication (2) I II S Analysis of the structure and function of communication in complex organizations. Interpersonal, group, and public communication experiences are provided. P or CR, 100.

125a. Communication Activities in Debate and Forensics (1) [Rpt.] I II S Student participation in intercollegiate debate and forensics. Open only to members of the university forensics team. Approval of the instructor is required prior to admission to this offering. No more than 3 units of 125 credit (a or b taken in any combination) may count toward graduation.

125b. Communication Activities in Interpreters' Theatre (1) [Rpt.] I II S Student participation in Interpreters' Theatre. Open only to students cast in departmental shows. Approval of the instructor is required prior to admission to this offering. No more than 3 units of 125 credit (a or b) may count toward graduation.

200. Fundamentals of Analysis of Communication Behavior (3) I II S Study and application of principles of analysis to communication functions operating to structure social groups and social systems.

280. Laboratory Methods in Communication Research (3) I II S Introduction to laboratory methods in communication research to enable students to understand communication research literature.

300. Introduction to Communication Theory (3) I I S Origin and development of basic con-
cepts in communication theory and research; survey and analysis of theories and models in research. P or CR, 280 and 281, or permission of instructor. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).


312. Small Group Decision Making (3) I II S A practical and theoretical study of decision making, conflict management, and communication interaction in task-oriented work groups.

318. Persuasion (3) I II S Theories of audience analysis and the motivation of human conduct: the study of rhetorical devices. P or CR, 280 and 281, or permission of instructor.

325. Argumentation (3) I II S Study of the philosophy, theory and practice of argumentation; analysis and comparison of classical and contemporary models of advocacy and evidence; examination of argument in public policy, legal, and debate settings. P or CR, 280 and 281 or permission of instructor.

396H. Honors Proseminar (3) I II

403. Theories of Small Group Communication (3) I II Theory and research on social control and deviance in groups from the perspective of communication behavior. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 503.

408. Parliamentary Procedure (3) I II Theory, strategy, and practice of decision-making procedure in democratic organizations. P or CR, 300, 318 and 325, or permission of instructor. (Identical with POL 408).

409. Theories of Mass Communication (3) I II An in-depth analysis of theories of the social effects of various mass media sources on society. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 509.

410. Struggle for 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. P or CR, 300, 318 and 325, or permission of instructor. (Identical with POL 410) May be convened with 510.

411. Communication and Conflict Management (3) I II Consideration of theory and research pertaining to the handling of conflict across diverse contexts. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 511.

412. Organizational Communication (3) I II S Analysis of interpersonal and group communication practices affecting goal achievement in business, governmental, and professional organizations. Not available for credit toward a major in communication.

414. Verbal Communication (3) I II Theory and research on verbal messages. Topics include patterns of conversational interaction, processes of message construction and interpretation, functions and contexts of messages. P, 300. May be convened with 514.

415. Nonverbal Communication (3) I II Theory and research on nonverbal communication codes (kinetics, touch, voice, appearance, use of space, time and artifacts) and social functions (impression formation and management, relational communication, emotional expressions, regulation of interaction, social influence). P or CR, 300, 318 and 325, or permission of instructor. May be convened with 515.

417. Relational Communication (3) I II The relational communication process and messages people use to define interpersonal relationships, including dominance-submissiveness, affection, involvement and similarity. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 517.

418. Advanced Persuasion Theory (3) I II Examination of philosophical and theoretical assumptions in persuasion in individual, institutional and societal contexts. P or CR, 300, 318 and 325, or permission of instructor.

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. P or CR, 300, 318 and 325, or permission of instructor. (Identical with SOC 420) May be convened with 520.

421. Political Campaign Communication (3) I II Investigation and analysis of communication principles and practices in contemporary campaigns for elective office. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 521.

422. Presidential Leadership and Communication (3) I II Examination of presidential leadership and communication strategies of the modern presidents from Kennedy to the present. P, upper-division standing. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 522.

423. Topics in Rhetorical Theory and Criticism (3) [Rpt./1] Intensive reading and analysis of the works of major rhetorical theorists. Each semester will focus on a specific era or perspective. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 523.

424. Media and Politics in America (3) I Survey of field; media in political campaigns; media coverage of leaders, issues and institutions; leadership strategies to influence media. May be convened with 524.

425. Scientific Argument in Public Discourse (3) I Advanced argumentation theory focused on examination of scientific argument in public decision-making. Topics include general theory of fallacies and special fallacies related to scientific reasoning. P, 325. May be convened with 525.

428. Communication Research Methods (3) I II Theories of communication and their research backgrounds; research methodology in communication behavior studies. P or CR, 300, 318 and 325, or permission of instructor. 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 or CR, 300, 318 and 325, or permission of instructor.

446. Communication of Fiction (3) I II Analysis of short stories and selected short novels, with emphasis on point of view, tone, and characterization in preparation for performance. P or CR, 300, 318 and 325, or permission of instructor.

447. Projects in the Performance of Literature (3) I Study in forms, styles, and aesthetics of Readers Theatre, Chamber Theatre, and the documentary; examination of essay, biography, short fiction, novel, and dramatic literature for group reading. P or CR 300, 318, and 325 or permission of instructor.

450. Communication and Cognition (3) I II Interrelations between human communication and cognitive processes. Emphasis on theory and research in social cognition. P or CR, 300, 318 and 325 or permission of instructor. May be convened with 550.

462. Communication and Human Relationships (3) S An advanced course enabling students to inventory, evaluate, and develop oral communication skills in the interpersonal, group, and organizational dimensions of their lives. P, senior standing. May be convened with 562.

496. Seminar a. Research in Contemporary Issues in Communication (3) P or CR, 300, 318, and 325 or permission of instructor.

503. Theories of Small Group Communication (3) I II For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper on a single aspect of macro-communication patterns in groups. May be convened with 403.

509. Theories of Mass Communication (3) I For a description of course topics, see 409. Graduate-level requirements include an in-depth theoretical paper on social effects of the mass media. May be convened with 409.

510. Struggle for the Presidency (3) I For a description of course topics, see 410. Graduate-level requirements include an in-depth research project. (Identical with POL 510) May be convened with 410.

511. Communication and Conflict Management (3) I II For a description of course topics, see 411. Graduate-level requirements include an in-depth research paper of communication in some conflict situation. May be convened with 411.

514. Verbal Communication (3) I II A description of course topics, see 414. Graduate students will be required to write a final paper. May be convened with 414.

515. Nonverbal Communication (3) I II For a description of course topics, see 415. Graduate-level requirements include an in-depth research project on nonverbal communication. May be convened with 415.

517. Relational Communication (3) I II For a description of course topics, see 417. Graduate-level requirements include an in-depth research project or theoretical paper on some issue in the management of interper-
sonal relationships. May be convened with 417.

520. Communication and the Legal Process (3) I For a description of course topics, see 420. Graduate-level requirements include an in-depth research project on a single aspect of communication in some legal context. (Identical with SOC 520) May be convened with 420.

521. Political Campaign Communication (3) I II For a description of course topics, see 421. Graduate-level requirements include an in-depth research project or theoretical paper on some issue in a recent campaign. May be convened with 421.

522. Presidential Leadership and Communication (3) I II For a description of course topics, see 422. Graduate-level requirements include an in-depth research paper or project. May be convened with 422.

523. Topics in Rhetorical Theory and Criticism (3) [Rpt./3] I For a description of course topics, see 423. Graduate-level requirements include an in-depth research project or rhetorical criticism of a selected speaker or issue. May be convened with 423.

524. Media and Politics in America (3) I For course descriptions, see 424. Graduate students are required to produce a 15 to 20 page research paper involving the application of two major, competing theories to a study of nightly network news. May be convened with 424.

525. Scientific Argument in Public Discourse (3) I For a description of course topics, see 425. Graduate students are required to complete a controversy-centered literature review. May be convened with 425.

528. Communication Research Methods (3) II For a description of course topics, see 428. Graduate-level requirements include an in-depth research project demonstrating ability to design and conduct research and to analyze data. May be convened with 428.

550. Communication and Cognition (3) I II For a description of course topics, see 450. Graduate-level requirements include an in-depth research project on a single issue in communication and cognition. May be convened with 450.

562. Communication and Human Relationships (3) S For a description of course topics, see 462. Graduate-level requirements include an in-depth research project on some single aspect of communication and human relations and additional examination questions. May be convened with 462.

576. Field and Observational Methods (3) II (Identical with SOC 576)

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 development of interpersonal relationships.

620. Communication Theory II (3) II An overview of historical and theoretical perspectives on communication strategies used in social influence attempts from interpersonal to mass media contexts.

621. Theory Construction in Communication (3) I Theoretical and meta-theoretical positions in the discipline of communication with an emphasis on approaches to analyzing and developing original theories.

660. Research Methodologies I (3) I An introduction to research methods and designs used in contemporary communication research.

670. Research Methodologies II (3) II Advanced study of research design and statistical analysis in contemporary communication research.


696. Seminar a. Non-Verbal Communication (3) [Rpt./3] I II
c. Rhetorical Theory and Criticism (3) [Rpt./3] I II
d. Social Influence (3) [Rpt./3] I II
e. Mass Media (3) [Rpt./3] I II
f. Linguistic Investigations and Applications (3) [Rpt./3] I II (Identical with LING 596h, which is home)
g. Message Analysis (3) [Rpt./3]
h. Organizational Communication (3) [Rpt./3] I II
i. Interpersonal Communication (3) [Rpt./3] I II
j. Information Processing and Management (3) [Rpt./3] I II
k. Research Methods (3) [Rpt./3] I II

Comparative Cultural and Literary Studies (CCLS)

1239 North Highland Avenue Building 431a (602) 626-8693

Graduate Interdisciplinary Program in Comparative Cultural and Literary Studies Committee:

Professors Barbara A. Babcock, Chair (English), J. Douglas Canfield (English, jane H. Hill (Anthropology), Herbert N. Schneider (English), Joseph H. Stauss (Family and Consumer Resources), Charles M. Tatum (Spanish and Portuguese)

Associate Professors Karen S. Anderson (History), Melanie R. Wallendorf (Marketing), Marvin Waterstone (Geography and Regional Development) Assistant Professors Eileen R. Meehan (Media Arts)

Adjunct Lecturer James S. Griffith (English)

Comparative Cultural and Literary Studies explore similarities and differences within and among national cultures and literatures, as well as in the work of individuals, using a variety of methods from the humanities and social sciences. Such interdisciplinary studies focus on the production, circulation, and interpretation of meaning and value in all cultural activity.

The Program offers the M.A. and Ph.D. degrees with a major in comparative cultural and literary studies. Students pursue a core of theoretical courses and study at least two primary discourses. Courses are taught by faculty from a variety of cooperating departments and programs. A list of affiliated faculty is available from the program office. The master's degree is considered primarily as leading to the Ph.D. degree.

For admission and degree requirements, please consult the Graduate Catalog.

195. Colloquium a. Encounters in Cultural Studies (1) II Interpretations of culture, in its broadest sense, from local to global perspectives. Topics vary.

200. Critical Concepts in Western Culture (3) [Rpt./9 units] I II S Analyzes concepts in art, literature, and other cultural forms that have shaped western ideology. Juxtaposes traditional and nontraditional, elite and popular, western and nonwestern materials.

503. Introduction to Comparative Cultural and Literary Studies (3) I Strategies of interpretation taught through practical critique.

549a-549b. Folklore (3-3) (Identical with ENGL 549a-549b)

550a-550b. Modern Theories of Cultural Studies (3-3) Historical precedents and contemporary thought in cultural studies from sociological to feminist theory. 550a: from such theorists as Marx, Bakhtin, and Foucault to contemporary postcolonial theorists. 550b: from Frankfurt school to contemporary theorists of political economy.

561. Linguistics and the Study of Literature (3) II 1994-95 (Identical with LING 561)

596. Seminar a. Comparative Cultural and Literary Studies (3) [Rpt./4] I II

Computer Engineering

(See Electrical and Computer Engineering)

Computer Science (CSC)

Gould-Simpson Building, Room 721 (602) 621-6613


Associate Professors Saumya K. Debray, Peter J. Downey, Stephen R. Manney,
Larry L. Peterson, Richard D. Schlichting, Richard T. Snodgrass
Assistant Professors Mary L. Bailey, Sampath K. Kannan, Todd A. Proebsting
Lecturer Beth Weiss

Computer science is the body of knowledge dealing with the design, analysis, implementation, efficiency, and application of algorithmic processes that transform information. The baccalaureate program prepares students for careers developing computer applications and computer systems in science and industry, and prepares students for graduate study in computing.

The department offers the following degree programs: Bachelor of Science, Master of Science, and Doctor of Philosophy with a major in computer science. For graduate admission and degree requirements, consult the Graduate Catalog.

Admission to the major: Students must complete a minimum of 30 pre-major units, of which at least 3 are university credit in courses for which computer science (C SC) is listed as the home-department, before applying for admission to the major. Students should declare Pre-Computer Science as their major while completing the pre-major requirements. All pre-major units taken will serve to fulfill existing major, minor, or general education requirements for the B.S. degree. The 30 units include five required pre-major courses: 115, 227, MATH 124 or 125a, MATH 125b and 4 units of a department approved laboratory science (as of fall 1992 these include PTYS 106, PHYS 111a, PHYS 110, or CHEM 103a, 104a.) Students typically apply for the computer science major in their sophomore year. Admission to the major will be selective and competitive due to limited faculty and laboratory resources. All students who have completed the pre-major may apply but only the most qualified applicants will be admitted. Students who do not have a cumulative GPA of at least 3.0 and grades of "B" or better in all required pre-major courses are not likely to be admitted. To receive a degree in computer science students must be admitted to the program and complete at least 30 units of their program as a fully admitted major.

The major: Students must complete the general education requirements of the College of Arts and Sciences, along with specified major and minor requirements.

The major requirements total 40 units including: 115, 227, 237, 342, 344, 372, 430, 445 or 473, 452 or 453, and nine units of 400-level computer science electives. The minor requirements total 21 units including MATH 124 or 125a, 125b, 243, and 3 upper-division units of mathematics electives. The balance of the minor units may be chosen from mathematics (a mathematics minor) or an approved computing-related discipline (a split minor).

The minor in computer science requires a minimum of 20 units in computer science. The student's major advisor approves the course selection. Two options have been developed to provide a minor in computer science. Option one (21 units) includes 115, 227, 237, MATH 243, 342 and one of the following: 344, 372, 430, or ECE 369. Option two (20 units) includes 115, 227, MATH 243, 342, 344 and one of the following: 445 or 473.

Honor: The department participates in the Honors Program. All honors students in computer science complete 6 units of 498H and 3 units of the 400-level computer science elective requirement.

115. Computer Science Principles (4) I II S (Identical with MIS 351)
227. Program Design and Development (4) I II S (Identical with MIS 342)
331. Database Management Systems (3) I II S (Identical with MIS 331)
342. Data Structures and Algorithms (3) I II S (Identical with MIS 342)
344. Foundations of Computing (3) I II S (Identical with MIS 344)
372. Comparative Programming Languages (3) I II S (Identical with MIS 372)
421. Advanced Systems Modeling and Simulation (3) I (Identical with MIS 421)
422. Principles of Concurrent Programming (5) I I II S (Identical with MIS 422)
430. Case Studies in Software Design (3) I II S (Identical with MIS 430)
443. Theory of Graphs and Networks (3) I (Identical with MIS 443) May be convened with 343.
452. Principles of Operating Systems (4) I Concepts of operating systems; process synchronization and communication; resource allocation; kernels; deadlock; memory management; file systems. P, 344, 372, 430. May be convened with 352.
453. Compilers and Systems Software (4) I Basic concepts of compilation and related systems software. Topics include lexical analysis, top-down parsing, semantic analysis, code generation; assemblers, loaders, linkers, debuggers. P, 344, 372, 430.
472a-472b. Continuous-System Simulation (3-3) I (Identical with ECE 472a-472b) May be convened with 572a-572b.
480. Mathematical Logic (3) I 1993-94 (Identical with MATH 480) May be convened with 480.
482. Principles of Concurrent Programming (5) I I II S (Identical with MATH 482)
474a-474b. Computer-Aided Logic Design (3-3) II (Identical with ECE 474a-474b) May be convened with 574a-574b.

475a-475b. Mathematical Principles of Numerical Analysis (3-3) (Identical with MATH 475a-475b)

479. Game Theory and Mathematical Programming (3) II 1993-94 (Identical with MATH 479) May be convened with 579a-579b.

508. Computational Linguistics (3) I (Identical with LING 488) May be convened with 588.

*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.


520. Principles of Programming Languages (3) I Important programming language concepts, including types, control and data abstraction, denotational semantics, declarative and object-oriented languages, implementation issues. P, 453.

521a-521b. Advanced Systems Modeling and Simulation (3-3) (Identical with MIS 521a-521b)

522. Principles of Concurrent Programming (3) II For a description of course topics, see 422. Graduate-level requirements include more extensive problem sets and different examinations. P, 344, CR, 452. May be convened with 422.

525. Principles of Computer Networking (3) II Theory and practice of computer networks, emphasizing the principles underlying the design of network software and the role of the communications system in distributed computing. Topics include routing, flow and congestion control, multicast, data representation and architecture. P, 452.

530. Case Studies in Software Design (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, 337 or ECE 274; 342. May be convened with 430.

533. Computer Graphics (3) I For a description of course topics, see 433. Graduate-level requirements include more extensive and challenging programming assignments. P, 344, 430. May be convened with 433.

541a-541b. Computer-Aided Information Systems Analysis and Design (3-3) (Identical with MIS 541a-541b)

543. Theory of Graphs and Networks (3) II (Identical with MATH 543) May be convened with 443.

545. Design and Analysis of Algorithms (3) I Time, space complexity; recurrence; algorithm design techniques; lower bounds; graph, matrix, set algorithms; sorting; fast Fourier transform; arithmetic complexity; intractable problems. P, 445, 473, MATH 362.

550. String and List Processing (3) II For a description of course topics, see 450. Graduate-level requirements include more extensive problem sets and different examinations. P, 344, 372, 430. May be convened with 450.

552. Advanced Operating Systems (3) I Operating system design, implementation and modeling; deadlock and memory management models; protection mechanisms; operating systems for parallel and distributed systems. P, 452.


560. Database Systems (3) I For a description of course topics, see 460. Graduate-level requirements include more extensive problem sets and different examinations. P, 344, 372, 430. May be convened with 460.

571a-571b. Digital Systems Design (3-3) (Identical with ECE 571a-571b)

572a-572b. Continuous-System Simulation (3) I (Identical with ECE 572a-572b) May be convened with 472a-472b.

573. Theory of Computation (3) II Chomsky hierarchy, undecidability; general recursive functions; recursion theory; computational complexity theory, NP-complete and provably intractable problems. P, 473. (Identical with MATH 573)

574a-574b. Computer-Aided Logic Design (3-3) I II (Identical with ECE 574a-574b) May be convened with 474a-474b.

575a-575b. Numerical Analysis (3-3) (Identical with MATH 575a-575b)


578. Computational Methods of Algebra (3) I II (Identical with MATH 578)

579. Game Theory and Mathematical Programming (3) II 1993-94 (Identical with MATH 579) May be convened with 479.

588. Computational Linguistics (3) I (Identical with LING 588) May be convened with 488.

620. Advanced Topics in Programming Languages (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.

626. Advanced Topics in Operating Systems (3) [Rpt./12 units] Operating system design, development, analysis, and performance; specific topics to be determined by current literature and faculty and student interest.

630. Advanced Topics in Software Systems (3) [Rpt./12 units] Problems in design and development of large systems of programs; specific topics to be determined by current literature and faculty and student interest.

645. Advanced Topics in Algorithm Analysis (3) [Rpt./12 units] II Design and analysis of algorithms; specific topics to be determined by current literature and faculty and student interest.

Counseling and Guidance
(See Family and Consumer Resources)

Critical Languages (CRL)
1230 N. Park Avenue, Suite 214
(602) 621-3387

Committee on Critical Languages
Professors David Chisholm (German), Miguel M. Mendez (Spanish and Portuguese)

Associate Professors Alexander Dunkel, Director (Russian and Slavic Languages), Marie C. Chan (East Asian Studies), Richard Jensen (Emeritus)

The critical languages program, a unit within the Faculty of Humanities, provides tape-intensive instruction in languages not offered by other language departments or committees at The University of Arizona. Criteria for the introduction of new languages are (1) student, university, or community need; (2) availability of native language tutors; (3) proper audiolingual instructional materials. Sections vary in size from four to seven students.

Languages recently offered are Hungarian, Indonesian, Kazakh, Korean, Swahili, Swedish, Turkish, Ukrainian, Urdu, and Afghan-Uzbek. Additional languages (African, North and South American, Asian, European) will be offered in response to student, university or community need. For further information, contact the critical languages program.

101. Elementary Language Study (4) [Rpt.*] I II S Introduction to the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly tutorial reviews. 2R, 6L. Fee.

102. Elementary Language Study (4) [Rpt.*] I II S Continued introduction to the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly tutorial reviews. 2R, 6L. Fee. P, 101.

201. Intermediate Language Study (4) [Rpt.*] I II S Continuing study of the language with emphasis on its spoken aspects utilizing tape-
Intensive preparations with biweekly reviews. 2R, 6L. Fee: P. 101.

202. Intermediate Language Study (4) [Rpt.] I II S Continuing study of the language with an emphasis on its spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 6L. Fee: P. 201.

301. Advanced Language Study (3) [Rpt.] I II Continuing study of the language with an emphasis on developing reading and writing skills, continuing practice with spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 4L. Fee: P. proficiency at 202 level.

302. Advanced Language Study (3) [Rpt.] I II Continuing study of the language with an emphasis on developing reading and writing skills, continuing practice with spoken aspects utilizing tape-intensive preparations with biweekly reviews. 2R, 4L. Fee: P. proficiency at 202 level.

*Course may be repeated if language is different each time.

**Required for modern emphasis.

The minor: Students wishing to minor in dance must complete the core curriculum (15 units) and track curriculum (6 units). The core curriculum consists of the following dance courses: 143, one year of ballet or modern dance techniques in sequence with placement in level by audition (240a-240b or 340a-340b for ballet; 241a-241b or 341a-341b for modern dance), 245a-245b, 299, 346, and 370. The track curriculum, consisting of additional dance courses in areas of special interest and demonstrated talent, is selected by students with the advice and approval of the undergraduate advisor for dance. Areas include ballet performance (selection from and placement in 239a-239b, 297a, four units from 343a-343b-343c-343d, 391, 439a-439b, 440a-440b, 451a-451b), modern dance performance (selection from and placement in 297a, four units from 343a-343b-343c-343d, 391, 441a-441b), jazz dance performance (placement in 244a-244b-244c-244d, 297a, four units from 343a-343b-343c-343d, 391, composition (six units from 343a-343b-343c-343d, 391, 425a, 425b, 445), introduction to teaching (297a, four units from 343a-343b-343c-343d, 391, 494a, 494b, 499). Minimum units required for the minor in dance—15.

152. Modern Dance
a. Beginning Modern Dance (1) I II S
b. Modern Dance for Beginners with Limited Experience (1) I II S

175. Theatre Dance (1) I II S Jazz movement styles for the beginning dancer; basic steps, phrases, and performance techniques for musical comedy and media dance entertainment (Identical with MUS 175)

176a. Beginning Tap Dance (1) [Rpt.] I II S

201a. Beginning Alignment-Floor Barre (1) I II S

204a. Beginning Top Dance (1) I II S


241a-241b. Dance Technique I: Performance Foundations (2-2-2) Foundational studies of human movement as an art form, including rhythmic analysis and perceptual enhancement, mechanisms of balance functions on improvisation, and origins of gesture. Wilson/Bergsohn

244a-244b-244c-244d. Jazz Dance Technique (2-2-2-2)

245a-245b. Basic Choreography (2-2) Study of the elements of time, space, and energy; basic concepts of phrasing and structure leading to dance composition. 4S. P, 143.

259. History of Dance (3) II History of dance as theater art within the western world from 1581 to the present.

291. Preceptorship
a. Dance Production (1-3) [Rpt.] I II

340a-340b. Ballet Technique II (2-2) P, CR. Jank/Hancock

341a-341b. Modern Dance Technique II (2-2) P, CR.

344a-344b-344c-344d. Dance Ensemble (2-2-2-2) a and b sections 1994-95. c and d sections 1993-94. Production preparation, rehearsal methods, repertorial development, and performance of dance, with particular emphasis on ensemble. 6L. Enrollment by audition only.


370. Human Movement in the Arts (3) Hieratic gestures and anatomical foundations of human movement from the viewpoint of the performing and visual arts. Historical development and stylistic treatment of the human figure in action.

394. Practicum
a. Dance Project (1) I II 3L
b. Production Project (1) I II 3L. P, 445.
401. Advanced Floor Barre (1) [Rpt./4 units] I II Develops deep strength, flexibility and alignment specific to all forms of dance. Building on the concepts presented in 201, this course is geared to the more advanced student, presenting exercises that are more rigorous and complex in nature. 2S. P, 201. May be convened with 501. Bromberg

439a-439b. Advanced Pointe Technique (1-1) [Rpt./4 units] I II 439a: Barre work; continuing development of strength, speed, and stamina. Introduction of advanced barre combinations. Center work; allegro en pointe; also adagio, and pirouette combinations focusing on balance. 439b: Continuation of 439a with increasing difficulty and complexity in the enchainments. 2S. P, audition. May be convened with 539a-539b.

440a-440b. Ballet Technique II (2-2) P, 340b. May be convened with 540a-540b. Hancock/Lowe

441a-441b. Modern Dance Technique III (3-3) P, 341b. May be convened with 541a-541b. Bromberg

445a-445b. Advanced Choreography (2-2) 445a: Movement, motif development for solo and group composition. 445b: Balancing the intuitive and intellectual components of the creative process to create meaningful and well-crafted dances. 4S. P, 245b. May be convened with 545a-545b. Bromberg

451a-451b. Ballet Repertoire (2-2) [Rpt./12 units] Repertoire from romantic, classical and contemporary ballets including works by Bournonville, Petipa, Ashton, Balanchine, Christensen and others. 1R, 3S. P, 340 or by audition. May be convened with 551a-551b. Hancock

460. Ballet Technique for Men (1) [Rpt./2 units] I Emphasis on physical conditioning as well as adagio movement; various pirouette, grand allegro, elevation using batterie in combinations focusing on male performance. P, Intermediate Ballet. 2S. May be convened with 560.

495. Colloquium 6a. Evaluation of Dance and Body Technique (3) I P, intermediate level ballet or modern dance techniques. (Identical with T AR 495a) May be convened with 595a.

496. Seminar 6b. Dance-Related Art Forms (3) II (Identical with T AR 496d) May be convened with 596d.

501. Advanced Floor Barre (1) [Rpt./4 units] I II For a description of course topics, see 401. Graduate-level requirements include additional written assignments. 2S. P, 201. May be convened with 401.

539a-539b. Advanced Pointe Technique (1-1) [Rpt./4 units] I II For a description of course topics, see 439a-439b. Graduate-level requirements include completion of additional exercises. P, audition. May be convened with 439a-439b.

540a-540b. Ballet Technique III (2-3) [Rpt./12 units] 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) I II [Rpt./12 units] Graduate-level requirements include an additional creative and/or research project. P, 341b. May be convened with 441a-441b. Bromberg

543. Dance Ensemble (2) [Rpt./1] I II Rehearsal methods, repertorial development, and performance of dance with particular emphasis on ensemble. 4S. P, repertory audition; intermediate level in modern and ballet (340a-b, 341a-b).

545a-545b. Advanced Choreography (2-2) I For a description of course topics, see 445a-445b. Graduate-level requirements include completion of a full-scale group composition, which will be evaluated by the dance faculty. May be convened with 445a-445b. Bromberg

546. Dance Program Administration (3) II 1994-95 Historical and current factors affecting career development in dance and dance-related fields; practical organization of programs. (Identical with T AR 546) Wilson

550. Literary Resources for Choreography (3) II 1994-95 [Rpt./1] Studies in primary world literature, in drama, and in psychology of personas as sources for choreographic themes; presentation of motifs and scenario. 6S. P, 445 (Identical with T AR 550) Wilson

551a-551b. Ballet Repertoire (2-2) II [Rpt./12 units] For a description of course topics, see 451a-451b. Graduate-level requirements include performance of classical repertoire at the professional level. P, 340 or by audition. May be convened with 451a-451b. Hancock

560. Ballet Technique for Men (1) [Rpt./2 units] I For a description of course topics, see 460. Graduate-level requirements include a higher level technical proficiency as well as a more finely tuned sense of the aesthetic in male solo performance. P, Intermediate Ballet. 2S. May be convened with 460.

595. Colloquium 6a. Evaluation of Dance and Body Technique (3) I P, intermediate level ballet or modern dance techniques. (Identical with T AR 595a) May be convened with 495a.

596. Seminar 6b. Dance-Related Art Forms (3) II 1994-95 (Identical with T AR 596d) May be convened with 496d.


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**East Asian Studies (EAS/CHN/JPN)**

Franklin Building, Room 404

(602) 621-5452

Professors Brian E. McKnight, Head, Gail L. Bernstein (History), Anoop Chandola, Robert M. Gimello, Earl H. Pritchard (Emeritus), William R. Schultz (Emeritus), Jing-shen Tao, Allen S. Whiting (Political Science)

Associate Professors Marie C. Chan, Charles H. Hedtke, Ronald C. Miao, John W. Olsen (Anthropology), Barbara Sands (Economics), Ch'iu-lin Pao-Tao

Assistant Professors J. Philip Gabriel, Donald J. Harper, Kimberly A. Jones, Donald Kinharra (Media Arts), Feng-hsi Liu, James Milward (History), Haru Yamada

Lecturer Edward D. Putzar

Director, Oriental Studies Collection Ju-yen Teng

The Department of East Asian Studies offers instruction in the study of the languages, cultures, and civilizations of China and Japan, Asian humanities and religions, and Asian-American studies. Programs of study may emphasize the language, linguistics, literature, history, thought, religion, or society, ancient or modern, of one or more cultural areas. Courses related to East Asia are also taught in the departments of Anthropology, Economics, History, Media Arts, and Political Science.

The department offers the Bachelor of Arts, Master of Arts, and Doctor of Philosophy degrees with a major in East Asian studies. Undergraduate majors may specialize in China or Japan, or in discipline-focused studies of South and East Asian subjects. Many departmental courses satisfy general education and special requirements set by other colleges, departments, and programs. Consult the *Graduate Catalog* for information on the graduate degree program.

The undergraduate major: Completion of CHN 402 or JPN 202 or equivalent Chinese or Japanese language, and a minimum of 34 units beyond the first year of language, including a 3-unit senior requirement. An East Asian studies concentration in an interdisciplinary studies major requires completion of 24 units in the department. The student's program of study for either major must be devised in consultation with the departmental undergraduate advisor according to departmental guidelines. The supporting minor may be chosen, with the consent of the advisor, from outside the department or from another area of specialization within the department.

The undergraduate minor: Completion of 20 units in the department. Minors may focus on one East Asian language or culture, on one disciplinary approach, on one theme in East Asian studies related to courses taken from one other department (split minor), or on special student needs. The program of study must be devised in consultation with the departmental undergraduate advisor.
advisor according to departmental guidelines.

A teaching minor for College of Education majors requires at least 9 units taken from among the following courses: CHN 142, 174, EAS 270, JPN 144, 272, and at least 9 additional units from the department selected in consultation with the departmental advisor.

The department participates in the honors program.

The courses listed below are grouped by areas of specialization within the East Asian Studies major.

For purposes of appropriate placement, enrollment in all language courses is based on performance in previous language courses and/or placement exams given and evaluated under the supervision of the departmental language coordinators.

East Asian Studies (EAS)

130. Asian Religions (3) I II Religions of India and the Far East. (Identical with RELI 130)

270. Modern East Asia: A History (3) II Historical survey of China and Japan during the 19th and 20th centuries, along with the factors that have influenced East Asian countries. (Identical with HIST 270)

333. Buddhist Meditation Traditions (3) I Major forms of Buddhist meditation from both the South Asian and East Asian traditions, with emphasis on the nature of meditation as a variety of religious experience. (Identical with RELI 333)

345. Hindu Religious Activities (3) I II Practical Hinduism through worship, rituals, and ceremonies based on Vedic, Puranic and folk traditions. (Identical with RELI 345)

396H. Honors Prosessenar (3) I II

427a. The Prehistory of East Asia (3) I (Identical with ANTH 427a) May be convened with 527a.

455. Hindu Mysticism (3) I For a description of course topics, see 445. Graduate-level requirements include two research papers or reports approved by the instructor. May be convened with 445.

551. The United States and East Asia: 1840 to the Present (3) II 1994-95 (Identical with HIST 551) May be convened with 451.

552. Hindu Literature (3) I For a description of course topics, see 445. Graduate-level requirements include submission of a graduate paper or presentation on a subject approved by the instructor. May be convened with 452.

563. Asian Marxism (3) I I For a description of course topics, see 463. Graduate-level requirements include a research paper on a topic concerning Marxist movements in China or Japan. (Identical with HIST 563) May be convened with 463.

564. International Relations of East Asia (3) II (Identical with POL 564) May be convened with 464.

587. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)

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.

589. Women in East Asia (3) I (Identical with HIST 589) May be convened with 489.

596 Seminar

a. Topics in East Asian Buddhism (3) 1994-95 P, reading knowledge of Chinese and/or Japanese; EAS 487a-487b/587a-587b or the equivalent.

Chinese Studies (CHN)

101. Elementary Chinese (3) I CDT Introduction to modern spoken and written Chinese (Mandarin).


142. Chinese Humanities (3) II Major trends and traditions in the arts, literatures and languages, religions, and philosophies of China. (Identical with HUM 142 and RELI 142)

174. Chinese Civilization (3) I Survey of the key elements of traditional Chinese civilization. (Identical with HIST 174)

331. Taoist Traditions of China (3) I Intellectual foundations of Taoism in its two classical sources, the Lao Tzu and the Chuang Tzu, and a sampling of the variety of religious practice which developed later. (Identical with RELI 331)

340. Masterpieces of Chinese Literature in English (3) I Early poetry and classical prose.

341. Masterpieces of Chinese Literature in English (3) II Later poetry, fiction, drama.

375. History of China (3) I Historical development of China. To 750 A.D. (Identical with HIST 375)

376. History of China (3) II Historical development of China. From 750 A.D. to 1900 A.D. (Identical with HIST 376)

401. Intermediate Modern Chinese (5) I CDT Grammar, reading, and conversation in the modern (Mandarin) language. P, 102

402. Intermediate Modern Chinese (5) II CDT Grammar, reading, and conversation in the modern (Mandarin) language. P, 401

415-416-417-418. Advanced Modern Chinese (3-3-3-3) Study of advanced modern (Mandarin) Chinese through (415) readings in social science texts, (416) composition, (417) readings in modern literature, and (418) conversation. P, 402, 416 and 418 may be repeated once for credit. May be convened with 515, 516, 517, and 518, respectively.

419. Linguistic Structure of Modern Chinese (3) I Linguistic study of the phonological, morphological, and syntactic systems of modern Chinese, with particular attention to linguistic analysis. (Identical with LING 419) May be convened with 519.

420. Linguistic Structure of Modern Chinese (3) II Linguistic study of the phonological, morphological, and syntactic systems of modern Chinese, with particular attention to linguistic analysis. P, 419. (Identical with LING 420) May be convened with 520.


427b. The Archaeology of Pre-Han China (3) II (Identical with ANTH 427b) May be convened with 527b.

429. Chinese-American Literature 1960 - Present (3) II Studies of the significant literary works by Americans of Chinese descent between 1960 and the present. (Identical with ENGL 429). May be convened with 529.

430. Law in Traditional China (3) I Survey of law in traditional China, including examination of dispute resolution processes, the development of written law codes, formal judi-
cial procedures, the theory and practice of punishment, crime and criminals, and the social role of legal process as reflected in civil law disputes (over such issues as marriage, divorce, property exchanges, and inheritance. May be convened with 530.

440. Chinese Calligraphy (2) [Rpt.] I Theory, practice, and aesthetics of Chinese brush writing, with emphasis on individual training and development. May be convened with 540.

450. Studies in Modern Chinese (3) [Rpt./1] I Grammar and readings in modern Chinese texts, with emphasis on written comprehension and translation. May be taken from CHN 415/515, 416/516, 417/517, 418/518. May be convened with 550.

460. Modern Chinese Foreign Relations (3) II (Identical with POL 460) May be convened with 560.

468. Women in China (3) I Analysis of the role of women in Chinese society with equal emphasis on traditional and modern periods. (Identical with W S 468) May be convened with 568. Writing-Emphasis Course for China specialization.*

475a-475b-475c-475d-475e. Periods in Chinese History (3-3-3-3-3) In-depth treatment of major premodern eras. 475a: Ancient and classical, to 200 B.C. 475b: Early Empire 200 B.C. - 200 A.D. 475c: Medieval 200-700 A.D. 475d: New Empire, 750-1350 A.D. 475e: Late Empire, 1350-1800 A.D. (Identical with HIST 475a-475b-475c-475d-475e) May be convened with 575a-575b-575c-575d-575e.

476. Modern Chinese History (3) Historical survey of the period since 1911 which examines the revolutionary developments shaping contemporary China. (Identical with HIST 476) May be convened with 576.

482. Social History of China (3) Formation of ancient Chinese society; organization of families and social stratification, mobility, conflict, and control in traditional China; and transformation from traditional to modern society. (Identical with HIST 482) May be convened with 582. Writing-Emphasis Course for China specialization.*

483. Confucianism: The Classical Period (3) (Identical with RELI 483) May be convened with 583. Writing-Emphasis Course for China specialization.*

484. Confucianism: The Neo-Confucian Tradition (3) (Identical with RELI 484) May be convened with 584.

490. Colloquium I Chinese History Since 1949 (3) II (Identical with HIST 495r) May be convened with 595r.

515-516-517-518. Advanced Modern Chinese (3-3-3-3) Study of advanced modern (Mandarin) Chinese through (515) readings in social science texts, (516) composition, (517) readings in modern literature, and (518) conversation. Graduate level requirements include more translations and additional readings. 516 and 518 may be repeated once for credit. P, 402. May be convened with 415, 416, 417, and 418, respectively.

519. Linguistic Structure of Modern Chinese (3) For a description of course topics, see 419. Graduate-level requirements include two presentations and one term paper. (Identical with LING 519) May be convened with 419.

520. Linguistic Structure of Modern Chinese (3) For a description of course topics, see 420. Graduate-level requirements include two presentations and one term paper. (Identical with LING 520) May be convened with 420.


522. Literary Chinese (3) I For description of course topics, see 422. Graduate-level requirements include additional assignments relating to translation skill and research methodology. P, 416/516. May be convened with 422.

523. Readings in Classical Chinese Philosophical Texts (3) [Rpt.] I For description of course topics, see 423. Graduate-level requirements include additional assignments relating to translation skill and research methodology. P, 422/522. May be convened with 423.

527b. The Archaeology of Pre-Han China (3) II (Identical with ANTH 527b) May be convened with 427b.

529. Chinese-American Literature 1960 - Present (3) II For a description of course topics, see 429. Graduate-level requirements include an additional paper than that required of the undergraduate student, one which demonstrates advanced knowledge of either American literature, literary theory or Asian studies, as well as familiarity with the relevant research tools. (Identical with ENGL 529) May be convened with 429.

530. Law in Traditional China (3) I For a description of course topics, see 430. Graduate-level requirements include additional assignments. May be convened with 430.

540. Chinese Calligraphy (2) [Rpt.] I For a description of course topics, see 440. Graduate-level requirements include an independent project assignment with instructor. May be convened with 440.

541. Chinese Historical Linguistics (3) I Historical survey of the development of the Chinese language, with particular attention to linguistic changes in phonology, morphology, and syntax. P, 402 and a course in general linguistics.

542. Chinese Historical Linguistics (3) II Historical survey of the development of the Chinese language, with particular attention to linguistic changes in phonology, morphology, and syntax. P, 541.


547. Readings in Classical Chinese Prose (3) [Rpt./2] I Readings in selected texts from literary, philosophical, and historical traditions; includes selections from the Five Classics and the great prose masters of the Han-Qing. Variable content. P, 523.

550. Studies in Modern Chinese (3) [Rpt./1] For description of course topics, see 450. Graduate-level requirements include an additional class presentation and a translation project of an essay of over 1500 words. May be convened with 450.

560. Modern Chinese Foreign Relations (3) II (Identical with POL 560) May be convened with 460.

568. Women in China (3) I For a description of course topics, see 468. Graduate-level requirements include a 15-page term paper. May be convened with 468.

575a-575b-575c-575d-575e. Periods in Chinese History (3-3-3-3-3) For a description of course topics, see 475a-475b-475c-475d-475e. Graduate-level requirements include a bibliography, reports, and a term paper similar to that required in a preliminary doctoral exam. (Identical with HIST 575a-575b-575c-575d-575e) May be convened with 475a-475b-475c-475d-475e.

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.

583. Confucianism: The Classical Period (3) May be convened with 483. (Identical with RELI 583)

584. Confucianism: The Neo-Confucian Tradition (3) May be convened with 484. (Identical with RELI 584)


596. Seminar I a. Ancient Chinese Philosophy (3) [Rpt.] I II P, 423/523 b. Classical Chinese Literature (3) [Rpt.] I II g. Modern Chinese Literature (3) [Rpt.] I II h. Premodern Chinese History and Politics (3) [Rpt.] I II i. Modern Chinese History and Politics (3) [Rpt.] I II

Japanese Studies (JPN)


144. Japanese Humanities (3) II An introductory exploration of religion, literature, art and language in Japan through primary texts in translation. Enrollment limited to freshmen and sophomores. (Identical with HUM 144 and RELI 144)

145. Popular Culture in Japan (3) I Introduction to contemporary Japanese popular cul-
ture through study of literature, theater, entertainment, advertising, film and other fields.


220. Japanese Religion (3) 1994-95 Introductory to texts, images and activities, both historical and contemporary, that comprise Japanese religion. One class each week will be a discussion session. (Identical with RELI 220)

272. Japanese Civilization (3) II (Identical with HIST 272)

310. Japanese Literature and War (3) I Experiences of Japanese men and women in the second world war as portrayed in short stories, novels, and poetry written in Japan since the end of the war. Writing-Emphasis Course

336. History of Japanese Film (3) (Identical with MAR 336)

402. Gender and Language in Japan (3) II 1994-95 Introduction to general issues of gender and language use, specific gender-related differences in the Japanese language, and gender roles in Japan. P. 202 or permission of instructor. (Identical with ANTH 402 and LING 402) May be convened with 502. Writing-Emphasis Course*


420. Japanese Discourse (3) I Introduction to Japanese discourse which integrates approaches used in linguistics and literary criticism. P, background in communication, literature, linguistics or Japanese language. May be convened with 520.

421. Advanced Readings in Japanese (3) I Reading and discussion in Japanese of a variety of advanced-level materials, including newspaper articles, short stories, and poetry. P, 416 or instructor's permission. May be convened with 521.

422. Advanced Readings in Japanese (3) II Reading and discussion in Japanese of a variety of advanced-level materials, including newspaper articles, short stories, and poetry. P. 412. May be convened with 522.


436. Japanese Sociolinguistics (3) [Rpt. /1] I Introduction to Japanese sociolinguistics; pragmatics, conversation analysis, discourse analysis, variation theory, ethography of speaking and ethnomethodology. P. 202 or instructor's permission. (Identical with ANTH 436, ENGL 436 and LING 436) May be convened with 536. Jones, Yamada

446a-446b. Classical Japanese Literature (3-3) Survey of classical Japanese literature, with readings in English translation. 446a: Ancient and medieval, to 1600. 446b: Tokugawa and Meiji, 1600-1900. May be convened with 546a-546b. Writing-Emphasis Course.*


447a-447b-447c. History of Japan (3-3-3) (Identical with HIST 447a-447b-447c) May be convened with 574a-574b-574c.

495. Colloquium
   a. Japan (3) [Rpt./2] I II May be convened with 595b.

496. Seminar
   a. Japanese Literature (3) [Rpt./3] I II May be convened with 596a.
   b. Topics in Japanese Linguistics (3) [Rpt./2] II P. 411 or 511 (Identical with LING 496c) May be convened with 596c.

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog)

502. Gender and Language in Japan (3) II 1994-95 For description of course topics, see 402. Graduate-level requirements include additional readings and reports. (Identical with LING 502) May be convened with 402.
547a-547b. Modern Japanese Literature (3-3)
II For a description of course topics, see 447a-447b. Graduate-level requirements include additional readings (in the original language when possible) and a research paper. May be convened with 447a-447b.

574a-574b-574c. History of Japan (3-3-3)
(Identical with HIST 574a-574b-574c) May be convened with 474a-474b-474c.

595. Colloquium
b. Japan (3) [Rpt./2] I II May be convened with 495b.

596. Seminar
a. Japanese Literature (3) [Rpt./3] I II May be convened with 496a.

c. Topics in Japanese Linguistics (3) [Rpt./2] II P 411 or S11 (Identical with LING 596c) May be convened with 496c.

r. Japanese History (3) [Rpt.] I II

### Ecology and Evolutionary Biology (ECOL)

Biological Sciences West Building, Room 310 (602) 621-1588


Lecturer C. William Gaddis

The Department of Ecology and Evolutionary Biology provides general and professional education for those intending to pursue graduate study or for those planning a career in fields where training in basic biological, organic, evolutionary, and environmental biology is necessary or desirable. Courses in population, community and physiological ecology, behavior, population theory, biogeography, natural history, genetics, systematics, morphology, and evolution are offered. In addition to excellent instructional facilities on campus, the department uses the Marine Biology Station at Puerto Penasco, Sonora, Mexico; the Southwestern Research Station at Portal, Arizona; the Boyce-Thompson Arboretum at Superior, Arizona and the Research Ranch at Elgin, Arizona. It also curates excellent regional collections of plants and animals.

The department administers the Bachelor of Arts and Bachelor of Science degrees with majors in ecology and evolutionary biology and the Bachelor of Science degree as a general biology. The department also administers advanced degrees, the Master of Science and Doctor of Philosophy in ecology and evolutionary biology, and botany.

The major in general biology for the Bachelor of Science degree provides a broad background covering aspects of molecular, cellular, organismic, physiological, ecological, and evolutionary biology. The requirements are: 181, 182, 302, 304, 320; MCB 410 or BIO 460 or 462a and additional upper-division units to a minimum of 35 in the major. These elective units may be selected from the departments of Ecology and Evolutionary Biology, Molecular and Cellular Biology, Microbiology, Biochemistry and other departments upon the approval of the major advisor. No more than four of these elective units may be taken as 399 or 499 (independent study).

Also required are courses for a supporting structured minor in chemistry/physics/mathematics: CHEM 103a-103b, 104a-104b; PHYS 102a-102b; MATH 117R/118, 119, and one course from 119, 123, 125a, 263.

Biology secondary education teaching major: The requirements for the major are 181, 182, 320 or PL S 312, 401, and a teaching biology laboratory, for a total of 16 units, and a minimum of 17 additional units of upper division course electives. These elective units must be selected from the following four subject matter areas: (1) biological perspectives; (2) cell/molecular; (3) organismic; (4) ecology/evolution. Three units must be taken from area 1, with selection of the remaining 14 units from at least two of the areas 2, 3 or 4. At least one of the courses must be a laboratory course. The current advisor for the undergraduate biology teaching major in the Department of Ecology and Evolutionary Biology will maintain a list of acceptable courses in each of the four elective areas. Courses currently available in area 1 are: 421, 479, MCB 404.

The teaching minor: The associated structured minor builds on the interdisciplinary prerequisite courses implicit in the biology teaching major and consists of the following courses: CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b; PHYS 102a-102b, MATH 125a-125b.

The department participates in the honors program.

100. Biology Concepts (4) I II 5 Levels of biological organization from biosphere to atoms provide a framework around which are developed concepts of diversity and unity of life forms, genetic continuity and evolutionary change, and the interdependent nature of ecosystem components. Nonscience majors orientation. 3R, 3L. Field trips.

105R. Introductory Botany (3) II Structure, function, development, and economic importance of flowering plants; brief overview of plant diversity. 3R, 105R. must be taken concurrently with 105L to satisfy general education science requirements.
105L. Introductory Botany Laboratory (1) II (Identical with MCB 181)

182. Introductory Biology II (4) II Origin, diversity and evolution of life: physiology of plants, animals and organ systems; processes of micro and macroevolution; animal behavior and ecology of populations and communities emphasizing biotic interactions and biogeography. Designed for biology majors. 3R, 3L. Field trips. (Identical with BIOL 182, MCB 182, MIC 182)

195. Colloquium c. Society and Science (1) II (Identical with BIOL 195C, which is home)

Environmental Biology (4) I Fundamentals of ecology and their relevance to human impact on natural ecosystems. Nonmajors orientation. 3R, 3L. Field trips.

Elementary Plant Physiology (4) I Functions, nutrition, metabolism, and development of higher plants. 3R, 3L. P, 181 and 182, or PL S 105, CHEM 101b, 102b.

Ecology (4) I Single species population biology, competition, predation and mutualism, community and organization, behavioral ecology and evolutionary ecology. 3R, 3L, P, 182, MATH 125a-125b.

Organismic Biology (4) II Structure, function, development, and economic value of flowering plants; structure, function, and development of animals; brief survey of the plant and animal kingdoms. 3R, 3L. P, 181 and 182, CHEM 103b-104b. Consult department before enrolling.

Genetics (4) I The principles that govern the inheritance of all living organisms including molecular, chromosomal, organismal, population and evolutionary aspects of genetics with laboratory experience and problem solving. 3R, 3L. P, 181 and 182, CHEM 103b-104b. (Identical with MCB 320)

Biological Materials (2) I Study of new methods in instruction and ideas on course content and behavioral objectives. Designed for prospective bio. teachers in secondary schools. 1R, 3L. P, 12 units of biology. May be convened with 503L.

Biology of Animal Parasites (5) I (Identical with V SC 403R) May be convened with 503R.

Parasitology Laboratory (1) I (Identical with V SC 403L) May be convened with 503L.

Aquatic Entomology (3) II 1994-95 (Identical with ENTO 405) May be convened with 505.


Research Design and Analysis (3) I Design and analysis for ecology, behavior, and morphology; inference and hypothesis tests; exploratory statistics. May be convened with 510.

Insect Behavior (3) II 1993-94 (Identical with ENTO 411) May be convened with 511.

Plants Useful to Man (2) S Lecture-demonstration course for teachers and others wishing information on the uses of plants: foods and food plants, medicinal plants, plants and industry, plants in textiles and other manufacturers. May be convened with 512.

Plants of the Desert (2) S Designed for teachers and others wishing to become familiar with common native and cultivated plants; identification, ecology, and uses. May be convened with 514.

Computer Analysis of Sequences (3) II (Identical with MCB 416). May be convened with 516.

Scientific Illustration (2 to 4—2 to 4) [Rpt.] Graphic arts techniques to meet the career demands of students. 418b: Illustration. 518b: Typography. Consult dept. before enrolling. May be convened with 518b-518b.

Evolutionary Quantitative Genetics (4) II Rigorous coverage of the inheritance and evolution of quantitative characters. Theory, estimation and design issues, and experimental results given equal coverage. P. Calculus. May be convened with 520.

Philosophy of the Biological Sciences (3) 1993-94 (Identical with PHIL 421) May be convened with 521.

Cell Biology (3) II Investigation into the structure and function of chromosomes and their role in heredity and evolution. 2R, 3L. P, 320. (Identical with GENE 423) May be convened with 523.

Microbial Genetics (3) I (Identical with PL P 428).

Environmental Physiology (2) II 1993-94 Analysis and synthesis of recent studies of the physiological responses of animals to their environments. P, 468. May be convened with 531.

Human Genetics (3) I (Identical with GENE 433) May be convened with 533.

Population Interactions (4) [Rpt.] 1994-95 Empirical and theoretical treatment of competition, exploitation, and mutualism within and between species, with emphasis on application of modern dynamics to ecological problems. Computer lab. 3R, 3L. P, 302, two semesters of calculus. May be convened with 534.

Evolution (3) I A balanced survey of the present-day concepts of the process and products of evolution, with emphasis on contrasting models and their consequences; recent techniques for the elucidation of phylogenetic pathways. P, 302, 320; MATH 125a, P or CR, 125b. (Identical with GENE 435) May be convened with 535.

Plant Ecology (4) II Dynamic processes giving rise to ecological patterns in plant populations and communities. 2R, 6L. Field trips. P, some botany and general ecology. May be convened with 536.


Biogeography (3) II The role of historical events and ecological processes in determining the past and present geographic distribution of plants and animals. P, 182 or GEOS 225. (Identical with GEOS 438) May be convened with 538.

Oceangraphy (2) I 1994-95 Introduction to the physical, chemical, geological, and biological dimensions of the oceans, with emphasis on their importance as biological environments. May be convened with 540R.

Oceangraphy Laboratory (2) I 1994-95 Field and lab investigations of the Gulf of California, with emphasis on research techniques important to biological oceangraphy. Weekend field trips. P, 440R or CR. May be convened with 540L. Writing-Emphasis Course.

Limnology (4) I (Identical with WSC 441) May be convened with 541.

Marine Ecology (6) S A field introduction to basic concepts in marine ecology with emphasis on the behavior and ecology of invertebrates and fishes and the factors affecting the diversity and community structure of marine communities. The entire course is conducted at selected sites in the Gulf of California. Optional travel fee. Consult instructor before enrolling. May be convened with 542.

Insect Ecology (3) I (Identical with ENTO 444) May be convened with 544.

Comparative Vertebrate Anatomy (4) I (Identical with V SC 458) May be convened with 558.

Comparative Vertebrate Histology (4) II (Identical with V SC 459) May be convened with 559.

Plant Physiology (4) I (Identical with PL S 460) May be convened with 560.
tion. Laboratory techniques and investigation of physiological mechanisms. 2R, 4L, P, either 437, 468; VSC 400a-400b; or PSIO 480. (Identical with MCB 466, PSIO 466, TOX 466, VSC 466) May be convened with 566.

468. Comparative Physiology (3) Ill The responses of physiological systems to the environment; energy exchanges, respiration, thermal and osmotic regulation, locomotion, behavioral regulation, and integration of responses. P, either 437, VSC 400a-400b; or PSIO 480. (Identical with PSIO 468 and VSC 468) May be convened with 568.

470. Plant Diversity and Evolution (4) I Survey of the plant kingdom, with emphasis on comparative structure and evolution of major plant divisions. 2R, 6L. Field trips. P, 4 units of biological or plant sciences. May be convened with 570.

471. Human Embryology (4) II (Identical with ANAT 471) May be convened with 571.

472. Systematic Botany (4) II Evolutionary relationships of orders and families of spermatophytes; systems of classification; collection and identification of local flora. 2R, 6L. May be convened with 572.

475. Freshwater Algae (4) II 1993-94. Systematics, ecology, and evolution of planktonic and benthic species; field techniques and laboratory culture. 2R, 6L. Field trips. P, 4 units of biology or plant sciences. (Identical with SW 475) May be convened with 575. Writing-Emphasis Course.*

478. Global Change (3) II (Identical with GEOS 478) May be convened with 578.

479. Art of Scientific Discovery (3) [Rpt.] II Techniques of posing questions and solving puzzles encountered in scientific research, with emphasis on life sciences and mathematics. P, consult with department before enrolling. May be convened with 579.

480. Invertebrate Zoology (4) I Comparative morphology, physiology, and ecology of invertebrates. 2R, 6L. Field trips. P, 182. May be convened with 580.


483. Herpetology (4) II Systematics, ecology, and evolution of the amphibians and reptiles. 2R, 6L. Field work. P, 304. (Identical with WFSC 483) May be convened with 583.

484. Ornithology (4) II Natural history of birds and its bearing upon the problems of animal behavior, distribution, and evolution. 2R, 6L. Field trips. P, one basic biology course. (Identical with WFSC 484) May be convened with 584. Writing-Emphasis Course.*


487. Animal Behavior (3) I Concepts and principles of the evolution, development, causation and function of behavior, with emphasis on the adaptiveness of behavior; discussion and films. P, 8 units of biology. May be convened with 587. Writing-Emphasis Course.*
ments include two term papers, the subject to be determined by the professor. P, 302, 320; MATH 125a, P or CR, 125b. (Identical with GENE 555) May be convened with 435.

536. Plant Ecology (4) II For a description of course topics, see 436. Graduate-level requirements include an in-depth library research paper. P, some botany and general ecology. May be convened with 436.

538. Biogeography (3) II For a description of course topics, see 438. Graduate-level requirements include a research paper. P, 182 or GEOS 225. (Identical with GEOS 538) May be convened with 438.

540R. Oceanography (2) I 1994-95 For a description of course topics, see 440R. Graduate-level requirements include a research project or literature review paper on a modern aspect of oceanography. May be convened with 440R.

540L. Oceanography Laboratory (2) I 1994-95 For a description of course topics, see 440L. Graduate-level requirements include an in-depth research project on a single aspect of the course topic. P, 540R or CR. May be convened with 440L.

541. Limnology (4) I (Identical with WFSC 541) May be convened with 441.

542. Marine Ecology (6) S For a description of course topics, see 442. Graduate-level requirements include an in-depth research project on a single aspect of the course topic. Optional travel fee. May be convened with 442.

543. Advanced Studies in Marine Biology (2) [Rpt.] II For a description of course topics, see 443. Graduate-level requirements include an in-depth research project or literature review paper on a modern aspect of marine biologic sciences.

544. Insect Ecology (3) I (Identical with ENTO 544) May be convened with 444.

545. Concepts in Genetic Analysis (3) I (Identical with MCB 545)

550. Mathematical Population Dynamics (4) II 1993-94 Ecological population dynamics, demography and human epidemiology. Emphasis on mathematical models and techniques for data analysis with particular reference to dynamical systems and chaos. 3R, 3L P, full calculus sequence, upper-level ecology course (302) or ordinary differential equations (MATH 254 or 255) (Identical with MATH 550)

558. Comparative Vertebrate Anatomy (4) I (Identical with V SC 558) May be convened with 458.

559. Comparative Vertebrate Histology (4) II (Identical with V SC 559) May be convened with 459.

560. Plant Physiology (4) I (Identical with PL S 560) May be convened with 460.

566. Physiology Laboratory (3) II For a description of course topics, see 466. Graduate-level requirements include students completing a series of directed laboratory exercises, then designing and carrying out an experiment of their own. 2R, 4L P, either 437, 468; V SC 400a-400b; or PSIO 480. (Identical with MCB 566, PSIO 566, TOX 566, V SC 566) May be convened with 460.

568. Comparative Physiology (3) II For a description of course topics, see 468. Graduate-level requirements include an additional liter-

Economics (ECON)

McClelland Hall, Room 401
(602) 621-6224


Associate Professors John Z. Drabicki, Price V. Fishback, Donald G. Hecker- man, James C. McBrearty, Stanley S. Reynolds, Barbara N. Sands, Gerald J. Swanson, Ronald J. Vogel (Public Administra-
tion and Policy)
The study of economics is designed for those who wish to concentrate in economic analysis to prepare for careers in business, government, teaching, or private research and consulting.

A Bachelor of Arts with a major in economics is available through the College of Arts and Sciences. The degrees of Bachelor of Science in Business Administration with a major in business economics, and Master of Arts and Doctor of Philosophy with a major in economics are also offered. The department participates in the Master of Business Administration and Master of Public Administration degrees as well.

The major in economics consists of a minimum of 30 units, including 200 or 201a-201b or 210, 332, 361, 339 or 376 (or STAT 451), and 15 additional upper-division units of which at least 9 units must be selected from 405, 406, 407, 411, 418, 421, 424, 425, 430, 435, 437, 442, 443, 444, 451, 460, 481, 482, and 489. All majors are required to complete MATH 123 or 124 or 125a (which are a prerequisite for 332 and 361). Students with a strong background in mathematics are encouraged to select 210, to substitute 411 for 361, to substitute MATH 464 and STAT 466 for 339, and to include 418 and 421 in the major. Such students should take, at a minimum, MATH 125a-125b and 215. It is strongly recommended that students contemplating graduate study in economics opt for this sequence and supplement it with additional mathematics courses.

The major in business economics: See the College of Business and Public Administration section of this catalog.

The nonbusiness minor consists of a minimum of 20 units in economics, including 200 or 201a-201b or 210, 332, 361, 339 or 376 (or STAT 451), and 15 additional upper-division units of which at least 9 units must be selected from 405, 406, 407, 411, 418, 421, 424, 425, 430, 435, 437, 442, 443, 444, 451, 460, 481, 482, and 489. All majors are required to complete MATH 123 or 124 or 125a (which are a prerequisite for 332 and 361). Students with a strong background in mathematics are encouraged to select 210, to substitute 411 for 361, to substitute MATH 464 and STAT 466 for 339, and to include 418 and 421 in the major. Such students should take, at a minimum, MATH 125a-125b and 215. It is strongly recommended that students contemplating graduate study in economics opt for this sequence and supplement it with additional mathematics courses.

The major in business economics: See the College of Business and Public Administration section of this catalog.

The nonbusiness minor consists of a minimum of 20 units in economics, including 200 or 201a-201b or 210, 332, 361, 339 or 376 (or STAT 451), and 15 additional upper-division units of which at least 9 units must be selected from 405, 406, 407, 411, 418, 421, 424, 425, 430, 435, 437, 442, 443, 444, 451, 460, 481, 482, and 489. All majors are required to complete MATH 123 or 124 or 125a (which are a prerequisite for 332 and 361). Students with a strong background in mathematics are encouraged to select 210, to substitute 411 for 361, to substitute MATH 464 and STAT 466 for 339, and to include 418 and 421 in the major. Such students should take, at a minimum, MATH 125a-125b and 215. It is strongly recommended that students contemplating graduate study in economics opt for this sequence and supplement it with additional mathematics courses.

The major in business economics: See the College of Business and Public Administration section of this catalog.

The nonbusiness minor consists of a minimum of 20 units in economics, including 200 or 201a-201b or 210, 332, 361, 339 or 376 (or STAT 451), and 15 additional upper-division units of which at least 9 units must be selected from 405, 406, 407, 411, 418, 421, 424, 425, 430, 435, 437, 442, 443, 444, 451, 460, 481, 482, and 489. All majors are required to complete MATH 123 or 124 or 125a (which are a prerequisite for 332 and 361). Students with a strong background in mathematics are encouraged to select 210, to substitute 411 for 361, to substitute MATH 464 and STAT 466 for 339, and to include 418 and 421 in the major. Such students should take, at a minimum, MATH 125a-125b and 215. It is strongly recommended that students contemplating graduate study in economics opt for this sequence and supplement it with additional mathematics courses.

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418.* Introduction to Econometrics (3) I II Statistical methods in estimating and testing economic models; single and simultaneous equation estimation, identification, forecasting, and problems caused by violating classical regression model assumptions. P: 339 or 376. May be convened with 518.

421.* Introduction to Mathematical Economics (3) II Comparative statics, stability, classical optimization, the Kuhn-Tucker theory, calculus of variations, linear algebra, game theory, and application of these techniques in economic analysis. P: six upper-division units in economics; MATH 125b. May be convened with 521.

424.* Topics in European, Chinese, or Japanese Economic History (3) I II Examines the economic history and development of medieval, early modern and modern Europe; the development and economic history of pre-modern and modern Japan and China. P: 300 or 361. May be convened with 524.

425.* Topics in the Economic History of the United States (3) I II Examines the economic history and development of the United States, including roles of legal and cultural institutions, changes in output mix, government regulation, income distribution, monetary policy, and demographic factors. P: 300 or 361. May be convened with 525.

430.* Monetary Economics (3) II Analysis of the role of money and monetary policy in the macroeconomic process. P: 330 or 332.

435.* Public Sector Economics (3) I II 5 The influence of governmental revenue and expenditure decisions on resource allocation, income distribution, and aggregate economic performance. P: 300 or 361. May be convened with 535.

436.* Economics of Fiscal Federalism (3) II Study of the economics of intergovernmental fiscal relationships in a federal system inclusive of allocational, distributional, and aggregate economic effects. P: 200 or 201b or 210.


442.* International Economics (3) I Financial aspects of international trade relations and commercial policy. P: 330 or 332. May be convened with 542.

443.* International Trade Theory (3) II General equilibrium analysis of product and input markets of international trade, tariffs, commercial policy, and growth and the welfare aspects of each. P: 300 or 361. May be convened with 543.

444.* International Financial Management (3) II Evaluation of international risk exposure and financial management of the multinational firm. P: 330 or 322, FIN 311. (Identical with FIN 444)

453.* Business and Economic Forecasting (3) I Forecasting techniques used in business and government; assembly, interpretation and use of economic data; analysis of business conditions; examination of related environmental factors; construction of actual sales or revenue forecasts. P: 300 or 361; 418. May be convened with 553.

460.* Industrial Organization (3) I Structure, conduct, and performance of American industry; governmental institutions and policies affecting business. P: 300 or 361; 339 or 376. May be convened with 560.

461.* Economics of Regulated Industries (3) I II Economic analysis of the regulated sector of the American economy, including communications, transportation and energy industries; impact of existing and alternative public policies. P: 300 or 361. May be convened with 561.

476.* Natural Resource Economics (3) II (Identical with AREC 476)

480.* New Venture Market and Industry Analysis (4) I (Identical with MKTG 480)

481.* Economics of Wage Determination (3) I Applications of economic theory and empirical methods to labor supply and demand, investment in human capital, minimum wages, union effects on relative wages, and labor market discrimination. P: 339 or 376; 361.

482.* Labor and the Economy (3) I II Macroeconomic aspects of labor economics: unemployment causes and cures; unemployment and inflation; distribution of income. P: 339 or 376; 361.

483.* Urban Economics (3) I II Problems of metropolitan areas; evaluation of alternative solutions. P: 200 or 210b or 210. (Identical with AAS 483)

487.* Health Economics (3) I A study of pricing, allocation, and distribution in the healthcare industry, with particular emphasis on the economic effects of current governmental policy. P: 200 or 210b or 210.

499.* Public Choice (3) I II The study of voting theory, government expenditures, government structures, behavior of voters and bureaucracy. P: 361 or consent of instructor. (Identical with POL 489) May be convened with 589.

*Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.

500. Managerial Economics (3) II Microeconomic theory and applications. P: MIS 400 or MATH 119 or 123. Advanced degree credit available for nonmajors only. Open only to students admitted to a BPA graduate program.


504. Production Economics (3) I (Identical with AREC 504)

505. Comparative Economic Systems (3) II For a description of course topics, see 405. Graduate-level requirements include a research project and different tests. Advanced degree credit available for nonmajors only. P: 361 or 500. May be convened with 405.

506. Experimental Economics (3) I Introduction to laboratory experimental economics; review of current research, exploration of methodological issues, development of techniques of experimentation. P: 501a.

507. Studies in Microeconomics (3) II For a description of course topics, see 407. Graduate-level requirements include a research paper or additional problem sets, depending on exact content. Advanced degree credit available for nonmajors only. P: 361, MATH 125b. May be convened with 407.

508. Applied Economic Analysis (3) II Uses economic history to show how research methods in economics are used to analyze data collected through empirical observation. P: 501a, 520.

509. Economic Anthropology (3) II (Identical with ANTH 509) May be convened with 409.


511. Microeconomic Theory and Behavior (3) I II For a description of course topics, see 411. Graduate-level requirements include a research paper or additional problem sets, depending on exact content. P: 521. May be convened with 411.

512. Economic Policy in Developing Countries (3) II (Identical with AREC 512)

513. Consumption Economics and Price Analysis (3) II (Identical with AREC 513)

514. Cost-Benefit Analysis (3) II (Identical with AREC 514)

515. Operations Research in Applied Economics (3) I (Identical with AREC 515)

516. Agricultural Development (3) [Rpt./1] I (Identical with AREC 516)

518. Introduction to Econometrics (3) I II For a description of course topics, see 418. Graduate-level requirements include a research project that involves applications of econometric methods to the estimating and testing of behavioral models or simulation studies of the statistical properties of an econometric estimation technique. Advanced degree credit available for nonmajors only. P: 339 or 376 or MKTG 552. May be convened with 418.

519. Mathematical Economics (3) I Introduction to the theory and methods of mathematical economics and its applications. Designed primarily for entering graduate students majoring in economics. P: CR, 520; consult with department before enrolling.

520. Theory of Quantitative Methods in Economics (3) I Introduction to the basic concepts of statistics and their application to the analysis of economic data. Designed primarily for entering graduate students majoring in economics. P: CR, 519; consult with department before enrolling.
521.* Introduction to Mathematical Economics (3) I For a description of course topics, see 421. Graduate-level requirements include a research paper or additional problem sets, depending on exact course content. May be convened with 421.


524. Topics in European, Chinese, or Japanese Economic History (3) I II For a description of course topics, see 424. Graduate-level requirements include a research paper or additional problem sets, depending on exact course content. Advanced credit available for nonmajors only. May be convened with 424.

525. Topics in the Economic History of the United States (3) I II For a description of course topics, see 425. Graduate-level requirements include a research paper or additional problem sets, depending on exact course content. Advanced credit available for nonmajors only. May be convened with 425.

530. Macroeconomic Aspects of Finance (3) II The effects of changing economic conditions upon a firm's operation, including capital decisions as well as production decisions. P, 500.

535. Public Sector Economics (3) I II S For a description of course topics, see 435. Graduate-level requirements include a research project on a major current public sector issue. Advanced credit available for nonmajors only. P, 500. May be convened with 435.

536. Innovation and Economic Growth (3) I (Identical with MKTG 536)

537. International Public Finance (3) I II For a description of course topics, see 437. Graduate-level requirements include a research project and different tests. Advanced credit available for nonmajors only. May be convened with 437.

542. International Economics (3) I II S For a description of course topics, see 442. Graduate-level requirements include a research project and different tests. Advanced credit available for nonmajors only. P, 330, 332, or 518. May be convened with 442.

543. International Trade Theory (3) II For a description of course topics, see 443. Graduate-level requirements include a research project and different tests. Advanced credit available for nonmajors only. P, 361 or 500. May be convened with 443.


553. Business and Economic Forecasting (3) I For a description of course topics, see 453. Graduate-level requirements include a research project and different tests. Advanced credit available for nonmajors only. P, 361 or 500; MKTG 552. May be convened with 453.

556. Industrial Organization (3) I For a description of course topics, see 460. Graduate-level requirements include an applied research project that examines the impact of public policy on productivity performance. Advanced degree credit available for nonmajors only. P, 300 or 361 or 500, 339 or 376 or MKTG 552. May be convened with 461.

561. Economics of Regulated Industries (3) II For a description of course topics, see 461. Graduate-level requirements include a case of regulation/deregulation or other approved research project in regulatory theory or policy. Advanced degree credit available for nonmajors only. P, 300 or 361 or 500. May be convened with 461.


566. Economic Development for Educators (2) S Consult instructor before enrolling.


568. Environmental Scanning and Business Strategy (3) I (Identical with MKTG 568).

569. Public Choice (3) III For a description of course topics, see 489 (Identical with POL 569). May be convened with 489.


571. Economics of Natural Resource Policy (3) I (Identical with AREC 571).

572. Advanced Natural Resource Economics (3) I (Identical with AREC 576).

576. Advanced Topics in the Economics of Environmental Regulation (3) II (Identical with AREC 577).

578. Public Choice (3) III For a description of course topics, see 489 (Identical with POL 589). May be convened with 489.


581. Econometric Modeling (3) II P, 696b, 696c, 696d.

d. Economic Analysis of Organizations (3) II P, 696b, 696c.

582. Econometric Theory and Institutions in Industrial Organization (3) I II For a description of course topics, see 461. Graduate-level requirements include a case of regulation/deregulation or other approved research project in regulatory theory or policy. Advanced degree credit available for nonmajors only. P, 300 or 361 or 500. May be convened with 461.


584. Economic Analysis of Organizations (3) II P, 696b, 696c.

585. Public Sector Economics (3) I II S For a description of course topics, see 435. Graduate-level requirements include a research project on a major current public sector issue. Advanced credit available for nonmajors only. P, 500. May be convened with 435.

586. Economic Development for Educators (2) S Consult instructor before enrolling.

587. International Public Finance (3) I II For a description of course topics, see 437. Graduate-level requirements include a research project and different tests. Advanced credit available for nonmajors only. May be convened with 437.

588. International Economics (3) I II S For a description of course topics, see 442. Graduate-level requirements include a research project and different tests. Advanced credit available for nonmajors only. P, 330, 332, or 518. May be convened with 442.

589. Public Choice (3) III For a description of course topics, see 489 (Identical with POL 589). May be convened with 489.


591. Experimental Economics II (3) I P, 696a, 696b, 696c.

592. Experimental Economics II (3) I P, 696a, 696b, 696c.

593. Experimental Economics II (3) I P, 696a, 696b, 696c.

594. Experimental Economics II (3) I P, 696a, 696b, 696c.

595. Experimental Economics II (3) I P, 696a, 696b, 696c.


b. Experimental Economics II (3) I II P, 696b, 696c.

c. Econometric Modeling (3) I II P, 696b, 696c.


e. Public Policy Analysis I (3) III P, 696a, 696b.


g. Advanced Macroeconomic Theory I (3) II P, 696a, 696b.

h. Industrial Organization and Regulation I (3) III P, 696a, 696b.

i. Advanced Macroeconomic Theory I (3) II P, 696a, 696b.

j. Economic History I (3) II P, 696a, 696b.

Education (EDUC)

Education Building, Room 201 (602) 621-1461

The College of Education offers certain courses that are not directly affiliated with any of the academic departments in the college. In many cases, these courses are college-wide requirements for degree programs.

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. Writing-emphasis course for all TTE students. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

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.
600. Quantitative/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 participation in 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 various designs and techniques; preparation of research proposals. P, 600, 601.

604. Leadership for Educational Change (3) I II S Investigations of the characteristics of leadership as they apply to changing basic educational organizational structures and processes.

605. Evaluation of Educational Programs and Personnel (3) I II S Models, purposes served, contextual influences and procedures employed in evaluating educational programs and personnel. P, 500.

606. Policy Analysis in Education (3) I II S Understanding of and necessary skills to provide leadership in the area of educational policy development and analysis.

611. Comparative Education (3) I II S 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 these direct educational policy; critical examination of contending 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 origins to the present.

614. History of Education in the United States (3) I II S The development of American educational thought from its colonial origin to the present.

615. Educational Sociology (3) I II S The school as a social institution; social functions of the school; social processes, socialization, and stratification in education; informal and formal systems and the bureaucratic structure of the school.

See:
Educational Administration and Higher Education
Educational Psychology
Language, Reading and Culture
Special Education and Rehabilitation
Teaching and Teacher Education

Educational Administration and Higher Education (EDA/HED)

Education Building, Room 635 (602) 621-3327

Professors Larry L. Leslie, Head, Waldo K. Anderson (Emeritus), Henry E. Butler, Jr. (Emeritus), Robert T. Grant (Emeritus), Fred Harclerode (Emeritus), Lawrence O. Nelson, F. Robert Paulsen (Emeritus), Macario Saldate, IV, T. Frank Saunders, Sheila Slaughter, Marsden B. Stokes (Emeritus), Dudley B. Woodard, Jr.

Associate Professors Sharon C. Conley, Marcello Medina, Jr., Stanley Pogrow, Gary Rhoades

Assistant Professor Paul E. Heckman

The department offers programs leading to the Master of Arts degree with a major in higher education. The Educational Specialist degree is offered with a major in educational administration. The Doctor of Philosophy degree is offered with a major in higher education. (The Master of Arts and Doctor of Philosophy degrees in Foundations of Education are currently under review.)

Concentrations are available within graduate majors offered in the department. The major in higher education is offered through the Center for the Study of Higher Education, with concentrations in academic administration, student personnel services administration, finance and business affairs administration, community college administration, curriculum and instruction, higher education policy making, and institutional research and planning.

The department also offers certification in educational administration. Students seeking institutional recommendation for Arizona administrative certification should major in educational administration. In the Center for the Study of Higher Education, master's degree programs may be designed to meet the requirements for the Arizona Community College Teaching Certificate (Type A1a) or for entry-level administrative service in institutions of higher education.

An undergraduate grade-point average of at least 3.00 is required for admission to full standing in a graduate degree program. However, applicants with undergraduate grade-point averages of 2.50 to 2.99 may be admitted on a provisional basis. Standardized test scores also are required (e.g., GRE, Miller Analogies). Beyond these minimal requirements, applicants must also meet the specific requirements for all majors offered in the department.

Educational Administration (EDA)

497. Workshop
a. Trends in Educational Administration (3) [Rpt./12 units] I II S May be convened with 597a.

597. Workshop
a. Trends in Educational Administration (3) [Rpt./12 units] I II S May be convened with 497a.

b. School Evaluation/Accreditation: Problems and Procedures (3) I II S

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 theories.

661. Administration of Bilingual Education Programs (3) I S Evolution of modern educational law and the effects of law on educational policy formation and administrative practice.

663. Computer Applications in School Administration (3) I S Techniques for using computers to make school administration more efficient; using computers to enhance the management of information. P, 660 or CR.


666. Educational Governance and Collective Bargaining (3) I S Theory and practice of collective bargaining; history of negotiations in the educational sector; impact of statutes and governing authority. P, 660, 662 or CR.

668. Managing Curriculum Change (3) I S Techniques for administrators to use in analyzing the quality of the curriculum in schools as well as the appropriateness of instructional techniques used to support the curriculum. P, 660 or CR.

671. School Finance (3) I S Historical background of the financing of education in the United States; economics and principles; sources and distribution of funds for education; budgeting, accounting, and reports. P, 660, 661 or CR.

672. School Business Management (3) I S The general management of school business; administration and accounting of school funds; administration of equipment and supplies; other business operations. P, 660 or CR.

674. Law and Administrative Practice (3) I S Routine and continuous effects of law in public schools; tort liabilities, collective bargain-
ing, influence of federal and state regulations, teacher dismissal; Arizona statutory and case law emphasized. P, 660, 661, 662.

675. Theory and Behavior in School Organizations (3) I II Perspectives on the nature of the individual in the school organization; nature of schools as organizations; development of individual-organizational relationships. P, 660.

681. The Principalship (3) I II Functions and activities of building-level administrators, with emphasis on instruction, staff development, student services evaluation, and operational services. P, 693a and 15 units of educational administration, CR 693b.

682. The Superintendency (3) I II Functions and responsibilities of the chief school executive and central office staff, with emphasis on external and internal system relationships in policy formation and decision making. P, 693a, 693b or CR.

693. Internship
   a. Educational Administration (2-3) [Rpt./4 units] I II S P, 660, 661, 662 or CR.
   b. Advanced Educational Administration (3-4) [Rpt./8 units] I II P, 693a and 15 units of educational administration, CR, 681 or 682.

695. Colloquium
   a. Issues in Educational Administration (1-3) [Rpt./12 units] I II
   b. Seminar
      a. Topics in Educational Administration (1-3) [Rpt./12 units] I II
      b. Problems in Educational Administration (1-3) [Rpt./12 units] I II

Higher Education (HED)

Education Building, Room 327
(602) 621-7951

561. The Community College (3) I The scope, objectives, and educational functions of the community college, patterns of community college programs.

565. Higher Education in the United States (3) I The scope of higher education in the United States; brief survey of historical developments and philosophic bases, public policy issues at the state and federal level; types of institutions and their purposes; characteristics of faculty, students and curricula.

568. The College Student (3) I History and characteristics of the college student; interactions with campus environmental influences; developmental and normative trends; major research findings.

609. Organization and Administration in Higher Education (3) I Organizational theory, structures, systems, and administrative procedures in varied higher education institutions; patterns of governance and policy development.

612. Student Personnel Services in Higher Education (3) II Student personnel services, philosophy, history, administrative procedures, representative programs, current trends.

622. Teaching in Higher Education (3) II Planning, organizing, presenting and evaluating learning experiences for mature students.

641. Institutional Research and Planning (3) I Development of institutional research programs for short-term and long-term planning; input and output measures.

650. Higher Education Finance (3) I Historical patterns of financing private and public higher education; current sources and types of financial support; alternative methods of financing; social benefits and consumer theories.

651. Higher Education Business Management (3) II Budget planning and execution; systems of resource allocation; personnel management; physical plant planning and construction; information systems and use in management.

661. Higher Education and the Law (3) I Critical court decisions, past and present, affecting higher education; increasing role of the courts in decision making and policy development. Field trips. P, 601, 609, 621 or 650.

693. Internship
   c. Higher Education (1-3) [Rpt./12 units] I II

695. Colloquium
   c. Issues in Higher Education (1-3) [Rpt./12 units] I II
   d. Seminar
      c. Topics in Higher Education (1-3) [Rpt./12 units] I II

Educational Psychology (EDP)

Education Building, Room 602
(602) 621-7825

Assistant Professor M. Virginia Gonzales

The Department of Educational Psychology offers programs leading to the M.A., Ed.S., and Ph.D. degrees. Concentrations on the doctoral level include: school psychology; learning and development—early childhood through adulthood (affiliated with Center for Developmental Sciences); measurement and methodology; and instructional design and technology. The Ed.S. degree is available only in school psychology and instructional design and technologies concentrations. For detailed information on concentrations, graduate admission, and graduate degree requirements, please consult the Graduate Catalog.

300. Development Throughout Life (3) I II Life span development within the context of physical, intellectual, social, emotional, and moral development; emphasis on the dynamics of personal growth.

301. Child Development (3) I II Human growth and development from conception through early adolescence; integration of behavioral principles into the elementary school setting.

310. Learning in the Schools (3) I II Psychological principles applied to learning and instructional design in the educational setting, emphasizing learning and instructional variables and their applications.

340. Statistics and Measurement for Research in Education (3) I II Basic concepts essential to the comprehension of research in education, including measurement principles and descriptive statistics.


402. Early Adolescent Development (3) II S Major cognitive, psychosocial, physical and anthropological developmental theory of early adolescence (ages 10-14 years old). Also, the implications of theory into practice regarding early adolescents and schooling. May be convened with 502.

403. Advanced Adolescent Development (3) II Major developmental issues within the adolescent years, emphasis on the importance and design of adolescent research. (Identical with FS 403) May be convened with 503.

423. Socio-Cultural Context of Human Development (3) I II (Identical with FS 423) May be convened with 523.

500. Life Span Development (3) II Dynamics of development, social integration and roles across the life span. Special emphasis on cognitive, emotional, and personality development with concentration on the antecedent events to adult life experiences. (Identical with FS 500)

501. Advanced Child Development (3) I II Aspects of growth and development which influence behavior of the school-age child; emphasis on current research findings. P, 301.

502. Early Adolescent Development (3) II S For a description of course topics, see 402. Graduate-level requirements include an in-depth research paper or other research project. May be convened with 402.

503. Advanced Adolescent Development (3) II For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper or other research project. (Identical with FS 503) May be convened with 503.

510. Learning Theory in Education (3) I II Major theories of learning and motivation; emphasis on relationships between theory and practice in the schools.

517. Classroom Application of Behavior Modification Techniques (3) I II Application of
behavior principles and techniques to promote learning and social development of school-related behavior. 2R, 3L. P, 510 or CR.

523. Socio-Cultural Context of Human Development (3) II (Identical with FS 523) May be convened with 423.

530. School Psychology (3) I Roles of the school psychologist; implementing programs in the public schools; legal and ethical issues in school psychology. 2R, 3L.

541. Statistical Methods in Education (3-4) I II Descriptive, correlational, and inferential procedures for presenting and analyzing school and research data. For students in all fields. 3R, 1L.

577. Design of Questionnaires and Scales (3) I II Emphasis on theoretical and methodological issues related to the development of survey and rating scales, sampling procedures, and response bias.

588. Educational Tests and Measurements (3) I Theoretical and practical application of psychometric techniques to test construction, analysis, and interpretation of test results. P, 541.

599. Testing of Minorities (3) II Current theoretical, social, and practical issues in the use of norm-referenced tests with individuals from minority cultures.

600. Theories of Human Development (3) I History and analysis of psychological theories of human development and a comprehensive overview of major theoretical systems. P, 500 or 501.

613. Psychological Theory in Educational Practice (3) II Major theories of psychological thought; strategies for utilizing such theories in educationally relevant research. P, 510.

615a-615b. Cognitive Development (3-3) I II Cognitive theory and research as they bear upon developmental and educational processes. P, 500 or 501.


638. Behavioral Consultation in Educational Settings (3) I II Principles and techniques of conducting behavioral consultation in educational settings to promote learning and development of children and youth. 2R, 3L. P, 517.

640. Advanced Statistical Methods in Education (3) I II Inferential procedures for analyzing educational data; includes nonparametric methods and introduction to multivariate and causal procedures. P, 541.

646. Multidimensional Methods in Educational Research (3) II Provides an understanding of and facility with research application of multivariate correlational techniques, such as multiple regression, discriminant function, canonical correlation, and factor analysis. P, 640.

647. Factor Analytic Techniques in Education (3) II Principles and techniques of factor analytic procedures for analyzing data in educational research. P, EDUC 600.

658. Theory of Measurement (3) II Advanced topics in theoretical and practical issues in psychometrics. P, 556, 640 or CR.

673. Theories of Intellectual Assessment (3) I II Various theories and models of human ability and their implications for intellectual assessment. P, 558 or CR.

674a-674b. Field Experience in Intellectual Assessment in Education (3-3) Supervised field experience in the administration, scoring and interpretation of various intellectual assessment devices. 674a: Wechsler Adult Intelligence Scale. 674b: Intellectual assessment techniques. 1R, 3L. Open to majors and minors only. Credit allowed for 674a or 674b, but not for both. P, 673 or CR.

677. Individual Assessment Techniques in the Schools (3) II Techniques for assessing personality and social behavior; practice in implementing programs derived from assessment techniques. 2R, 3L. Open to majors and minors only. P, 674b.

679. Psychosocial Assessment in the Schools (3) I Psychosocial assessment techniques; practice in presenting remedial programs. 2R, 3L. Open to majors and minors only. P, 673, 674b.

682. Educational Program Evaluation Principles and Techniques (1-3) [Rpt./12 units] I II Development and current viewpoints, political context, illustrative cases, technical skills for determining merit or making decisions about educational and social programs. P, 541, 558.

685. Child Behavior Disorders and Adjustment (3) I II The diagnostic and assessment techniques, theories, and research related to child behavior disorders. P, 530.


693. Internship a. Research/Evaluation (1-3) [Rpt./12 units] II
b. School Psychology (1-3) [Rpt./12 units] II

694. Practicum a. School Psychology (1-3) [Rpt./12 units] I II

695. Colloquium a. Issues in Educational Psychology (1-3) [Rpt./12 units] I II

696. Seminar a. Issues in Educational Psychology (1-3) [Rpt./12 units] I II

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**Electrical and Computer Engineering (ECE)**

ECE Building, Room 230
(602) 621-2434


The Department of Electrical and Computer Engineering in the College of Engineering and Mines offers the degrees of Bachelor of Science in Electrical Engineering, in Computer Engineering, and in Optical Engineering, and Master of Science and Doctor of Philosophy with a major in electrical engineering.

All three of the undergraduate curricula have the goal of educating immediately productive engineers who are also qualified to pursue further education as necessary to keep pace with these rapidly changing areas. The electrical engineering program prepares students for careers in such areas as electronics, microelectronics, communications, controls, electromagnetics, and signal processing. The computer engineering program prepares students for computer-related careers including microcomputer-based design, computer-aided VLSI design, computer networks, and artificial intelligence applications. The optical engineering program, of-
fiered in cooperation with the Optical Sciences Center; supports careers in areas involving optical design, optical fabrication and testing, lasers, optical detectors, optical instrumentation, optical fibers, etc. (See the College of Engineering and Mines section of this catalog for specific undergraduate program requirements.)

The department participates in the honors program.

For graduate admission and degree requirements, consult the Graduate Catalog.

207. Elements of Electrical Engineering (3) I II S CDT Introductory survey of electrical engineering, with emphasis on electric power. 3ES. P, MATH 125A, PHYS 116.

208. Elements of Electronics (3) I II S CDT Introductory survey of electronic principles and instrumentation. 3ES. P, 207.

210. Electromagnetic Optics (3) I (Identical with OPTI 210)

210L. Geometrical Optics Laboratory (3) I (Identical with OPTI 210L)

220a-220b. Basic Circuits (4-4) I II S CDT 220a: Analysis of elementary linear circuits, with laboratory. 3R, 1D, 3L. 4ES. P, CR, PHYS 116, MATH 223. 220b: Transient and sinusoidal analysis of linear circuits with laboratory. 2R, 1D, 3L. P, CR, MATH 254. Both 220a and 220b are offered each semester. Credit will be allowed for only one of the following sequences: 220a-220b or 207-208.

221L. Basic Electronics Laboratory I (1) I Basic laboratory techniques, experiments illustrating circuits and electronics topics from 220a. 1ES. P, CR, 220a.

222L. Basic Electronics Laboratory II (1) I Basic laboratory techniques, experiments illustrating circuits and electronics topics from 220b. 1ES. P, CR, 220b.

226. Physical Optics (3) II (Identical with OPTI 226)

226L. Physical Optics Laboratory II (1) II (Identical with OPTI 226L)

274. Digital Logic (3) I II S CDT Number systems and coding, logic design, sequential systems, register transfer language. 2ES, 1ED. P, CR, PHYS 116.

275. Computer Programming for Engineering Applications (3) I II Fundamentals of C; complexity and efficiency analysis, numerical precision and representations, intro to data structures, structured program design, application to solving engineering problems.

301. Electrical Engineering Laboratory (3) I II S CDT Emphasis on measurement techniques, lab procedures, and operating principles of instruments. Experiments deal primarily with basic circuit and electronic concepts and basic design techniques. 3ES. P, CR, 320, 351a-351b.

302. Electrical Engineering Design Laboratory (3) I II S CDT Design-oriented lab. Exercises in circuits, electronics and fields. 3ED. P, 301.

320. Circuit Theory (3) I II S CDT Electric circuits in the frequency domain, using sinusoidal steady-state, Laplace and Fourier methods, and including single-phase and three-phase power; time domain methods and convolution; transformed networks; natural frequencies; poles and zeros; two-port network parameters; and Fourier series analysis. 2ES, 1ED. P, 220b.

340. Engineering Systems Analysis (3) I II S CDT Basic concepts in the modeling and analysis of engineering systems and fundamental topics in communication controls, and signal processing. Includes classification of systems; signal characterization in frequency domain; Fourier and Laplace transforms; representation of continuous-time systems by I/O models; system diagrams; state variable models; stability analysis and Bode plots; feedback system characteristics; discrete-time systems; and digital signal processing. 2ES, 1ED. P, 320.

350. Radiometry, Sources, and Detectors (3) I (Identical with OPTI 350)

351a-351b. Electronic Circuits (3-3) I II S CDT 351a: Operational amplifiers, diode circuits, PSPICE, circuit characteristics of bipolar and MOS transistors; differential amplifiers; MOS and bipolar digital circuits. 1.5ES, 1.5ED. P, 220b. 351b: Amplifiers, frequency response and feedback; output stages, analog integrated circuits; filters, signal generators. 1.5ES, 1.5ED.

352. Device Electronics (3) I II S CDT Electronic properties of semiconductors; carrier transport phenomena; P-N junctions; bipolar, unipolar, microwave and photonic devices. 1.5ES, 1.5ED. P, 351a.


370. Lasers and Electro-Optical Devices (3) II (Identical with OPTI 370)


372. Computer System Hardware (3) I II Computer components and circuits, random, and sequential memory devices, peripherals and interface design, case studies of computer systems. 2R, 3L. 1.5ES, 1.5ED. P, 276.

381. Introductory Electromagnetics (3) I II Electrostatic and magnetostatic fields; Maxwell's equations; introduction to plane waves, transmission lines, and sources. 2ES, 1ED. P, MATH 322.

412. Optical Instrumentation (3) I (Identical with OPTI 412)

415. Instrumentation and Measurement (3) I II Basic concepts of instrumentation and measurement; principles of transducers, operational amplifiers and instrument systems, with emphasis on biomedical applications; lab, experiments with transducers, amplifiers, computers, and medical equipment. 2R, 3L. 1ES, 2ED. P, senior standing in engineering. May be convened with 515.

416. Optical Design, Fabrication and Testing (4) II (Identical with OPTI 416)

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

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

422. Active and Passive Filter Design (3) I Approximation; methods for realizing Butterworth, Chebychev, Thomson and Elliptic filters; verification and testing of realizations. 0.5ES, 2.5ED. P, 320. May be convened with 522.

425. Image Science and Engineering (3) II Properties of optical images and image forming systems; acquisition and manipulation of digital images; two-dimensional Fourier representation; image quality criteria; introduction to image processing. 2ES, 1ED. P, 340. May be convened with 525.

426. Modern Filtering and Signal-Processing Techniques (3) II Operational amplifier circuits, noise and circuit limitations, active RC filter design, nonlinear wave shaping, switching; A/D and D/A components; interfacing. 1ES, 2ED. P, 320. May be convened with 526.

429. Digital Signal Processing (3) I II Discrete-time signals and systems, z-transforms, discrete Fourier transform, fast Fourier transform, digital filter design. 1.5ES, 1.5ED. P, 340. MATHEMATICAL SCIENCE 322. May be convened with 529.

430. Optical Communication Systems (3) II Physics of optical communication components and applications to communication systems. Topics include fiber attenuation and dispersion, laser modulation, photodetectors, linear and nonlinear system properties, and noise, receiver design, bit error rate calculations, and coherent communications. 1ES, 2ED. P, SIE 230, ECE 340, 352, 381; CR, 431. May be convened with 530.

431. Principles of Communication Systems (3) I II Signal analysis techniques associated with modulation and demodulation in systems such as AM, FM, and PCM, with special emphasis on digital communication. 1.5ES, 1.5ED. P, 340, 351a.

434. Electrical and Optical Properties of Semiconducting Materials (3) I 1993-94 (Identical with MIE 434)


436. Introduction to Coding Techniques (3) I Error-correcting codes used in modern digital communications systems, with emphasis on hardware implementations and performance on real channels. 2ES, 1ED. P, SIE 274 and SIE 230. May be convened with 536.

441. Automatic Control (3) I II Linear control system representation in time and frequency domains, feedback control system characteristics, performance analysis and stability, design of control. 1.5ES, 1.5ED. P, 340.

442. Digital Control Systems (3) II Modeling, analysis, and design of digital control systems; A/D and D/A conversions, Z-transforms, time and frequency domain representations, stability, microprocessor-based de-
signs. 1.5ES, 1.5ED. P, 441. May be convened with 542.

446. Photovoltaic Systems Engineering (3) I (Identical with NEE 446) May be convened with 546.

447. Direct Energy Conversion (3) II (Identical with NEE 447) May be convened with 547.


543. Active Linear Circuit Design (3) I Design of discrete and integrated analog solid-state circuits, DC, wide-band, power transconductance, and operational amplifiers; computer simulations; applications. 1.5ES, 1.5ED. P, 351a-351b, 352.

545. Elementary Digital Circuit Design (3) II Emphasis on first-order analysis and design; integrated bipolar and MOS digital circuits. 0.5ES, 2.5ED. P, 351a-351b.

546. Optoelectronics (3) I Properties and applications of optoelectronic devices and systems. Topics include radiation sources, detectors and detector circuits, fiber optics, and electro-optical components. 1.5ES, 1.5ED. P, 352, 381. May be convened with 556.

547. Integrated Circuit Laboratory (3) II Experiments in diffusion, oxidation, processing, etc. Fabrication of an integrated circuit. P, 458 or equivalent. (Identical with MSE 457) May be convened with 557.

548. Solid-State Circuits (3) I Introduction to unit step processes in semiconductor manufacturing. Introduction to various semiconductor processes, with emphasis on process and device integration issues for major integrated circuit processes. Basic circuit and design techniques including subsystem design and device scaling. Fundamentals of chip layout and integrated circuit design methodology for solid state circuits. 1ES, 2ED. P, 352.

459. Laser Principles and Devices (3) I Introduction to the characteristics of laser radiation including Gaussian beam propagation, ABCD Law, beam guiding, and resonators. Material requirements for stimulated emission, light amplification and threshold. Also covered: basic types of laser systems with an emphasis on semiconductor lasers. 1.5ES, 1.5ED. P, 352, 381; CR, 482. May be convened with 559.

460. Aerosol Science and Engineering (3) I 1993-94 (Identical with CH E 460) May be convened with 560.

461. Energy Conversion (3) I Principles and operating characteristics of rotating machinery and electromagnetic transducers, single-phase and polyphase transformer operation, laboratory demonstrations and tests of transformers and rotating machinery. 2ES, 1ED. P, 320, 381.

464. Operating System Concepts (3) I Fundamental issues in the design, implementation and evaluation of operating systems. Topics include process models, concurrency control algorithms, resource management and an introduction to distributed system concepts. 1.5ES, 1.5ED. P, 276, 372. May be convened with 564.


470a-470b. Optics Laboratory (3-3) (Identical with OPTI 470a-470b)


473. Software Engineering Concepts (3) I II In-depth consideration of each of the phases of the software project life cycle. Object-oriented design and programming. Includes a large-scale software development project involving groups of students. 2R, 3L. 1ES, 2ED. P, 276. May be convened with 573.

474a-474b. Computer-Aided Logic Design (3-3) 474a: Tabular minimization of single and multiple output Boolean functions, NMOS and CMOS realizations, synthesis of sequential circuits. RTL description, laboratory exercises. 1.5ES, 1.5ED. P, 271a. 474b: Standard cell layout, gate and switch level simulation, level mode sequential circuits. VLSI testing, CAD tools, laboratory projects. 1ES, 2ED. (Identical with C SC 474a-474b) May be convened with 574a-574b.

475. Microcomputer-Based Design (3) I Design of microprocessor-based real-time test and control systems, use of development systems and emulators. 2R, 3L. 0.5ES, 2.5ED. P, 372.


479. Principles of Artificial Intelligence (3) I Provides an introduction to problems and techniques of Artificial Intelligence (AI). Problem solving; basic problem solving methods and techniques; search and game strategies, knowledge representation using predicate logic; structured representations of knowledge; semantic nets, system entity structures, frames and scripts; planning; learning, expert systems; implementing AI systems. 1.5ES, 1.5ED. P, 276, 473. May be convened with 579.

481. Microwave Measurements (3) I II Measurement techniques and the application of hardware and test equipment in the modern microwave laboratory. 2R, 3L, 1.5ES, 1.5ED. CR, 482 or consult department before enrolling.

482. Electromagnetics (3) I II Electromagnetic waves in complex media, waveguides, cavity resonators, and antennas. 1.5ES, 1.5ED. P, 361 or PHYS 415a.

484. Antenna Theory and Design (3) II 1993-94 Review of infinitesimal dipole, line current radiator, directivity and gain. Antenna impedance, radiation efficiency, polarization and other properties. Design of arrays, wire, antennas, and aperture antennas. 1.5ES, 1.5ED. P, 482.

485. Radio Waves (3) II 1994-95 Geometrical ray tracing, diffraction and scattering, ground waves propagation, magneto-ionic theory, random media effects, topographic influence on electromagnetic communications, and fiber optic transmission. 1.5ES, 1.5ED. P, 482. May be convened with 585.

486. Microwave Engineering (3) I II Waveguides; cavities; S-parameter representation of microwave components and networks; transistor and MESFET amplifiers; IMPATT diode and Gunn oscillators; microwave integrated circuits. 1.5ES, 1.5ED. P, 482.

487. Fiber Optics Laboratory (3) II (Identical with OPTI 487) May be convened with 587.


492. Practicum a. Senior Practicum in Design (3) I II 0.5ES, 2.5ED. P, 302. Writing-Emphasis Course.*

b. Engineering Practice (4) I II 2.5ED. P, 302 or consult department before enrolling. Writing-Emphasis Course.*

Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see “Writing-Emphasis Courses” in the Academic Policies and Graduation Requirements section of this catalog).

501. Linear Systems Theory (3) I Mathematical descriptions of linear systems, statevariable models, analysis methods-stability, controllability and observability, state feedback techniques, design of feedback controllers and observers.

502. Analytical Methods in Electrical Engineering (3) I Linear vector spaces, analytic function theory; Green’s functions, eigenfunction expansions.


515. Instrumentation and Measurement (3) I II For a description of course topics, see 415. Graduate-level requirements include additional homework and a term project. May be convened with 415.

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) II Modern techniques for realizing active RC filters using passive elements and operational amplifier gain blocks; determination of sensitivity; effects of gain-bandwidth.

525. Image Science and Engineering (3) II For a description of course topics, see 425. Graduate-level requirements include additional homework and a term project. P. 340. May be convened with 425.

526. Modern Filtering and Signal-Processing Techniques (3) II For a description of course topics, see 426. Graduate-level requirements include additional homework and a term project. May be convened with 426.

527. Holography (3) II 1994-95 (Identical with OPTI 527)


529. Digital Signal Processing (3) I II For a description of course topics, see 429. Graduate-level requirements include additional homework and a term project. May be convened with 429.

530. Optical Communication Systems (3) II For a description of course topics, see 430. Graduate-level requirements include additional homework and a term paper. P, STAT 361, ECE 340, 352, 381; CR, 431. May be convened with 430.

531. Image Processing Laboratory for Remote Sensing (3) I Techniques and applications of digital image processing in remote sensing, multispectral image enhancement and analysis, classification, feature extraction for cartography, rule-based systems for mapping from imagery. 3R, 1L. (Identical with OPTI 531)

532. Computer Vision (3) II Computer pattern recognition and scene analysis. Theory, algorithms, and applications of computer vision and artificial intelligence. Biological vision models. P. 340. (Identical with OPTI 532)

533. Digital Image Processing (3) I Image statistics, models, transforms; enhancement and restoration; coding, topography. P. 429/529, 503. (Identical with OPTI 533)


535. Noise in Communications Systems (3) II For a description of course topics, see 435. Graduate-level requirements include additional homework and a term project. Credit is allowed for this course or for 538 but not for both. P, 431, SIE 230 May be convened with 435.

536. Introduction to Coding Techniques (3) I For a description of course topics, see 436. Graduate-level requirements include additional homework and a term project. P, 274 and SIE 230. May be convened with 436.

537. Digital Transmission and Telephony (3) I Spectrum control, synchronization, and multiplexing in digital transmission systems. Topics include line coding, scrambling, spread spectrum, time-division multiplexing, frequency division multiplexing, timing recovery, frame synchronization, jitter, and echo cancellation. P, SIE 230 and ECE 431.

538. Digital Communications Systems (3) II Digital modulation techniques for the Gaussian white noise channel, emphasizing optimal demodulation methods, analysis of error rates, and signaling techniques over finite bandwidth channels. Credit is allowed for this course or for 535 but not for both. P, 503.

539. Algebraic Coding Theory (3) I II 1993-94 (Identical with MATH 539)


542. Digital Control Systems (3) II For a description of course topics, see 442. Graduate-level requirements include additional homework and a term project. May be convened with 442.


545. Decentralized Control and Large-Scale Systems (3) II 1993-94 Introduction to large-scale systems, definitions and special problems, modeling/model reduction, structural properties, decentralization of control and information, hierarchical and multi-level controllers. P, 501.

546. Photovoltaic Systems Engineering (3) I (Identical with NEE 546) May be convened with 446.

547. Direct Energy Conversion (3) I I II 1993-94 (Identical with NEE 547) May be convened with 447.


552. Solid-State Devices (3) II Basic semiconductor physics and materials, PN junctions, metal semiconductor junctions/contacts. BJTs and MOSFETs, device operation, terminal behavior and frequency response, device models. P, 352, 451.

554. Electronic Packaging Principles (3) I I Introduction to problems encountered at all levels of packaging: thermal, electrical, reliability, materials and system integration. Future trends in packaging. (Identical with MSE 554)

555. VLSI Chip Engineering (3) I Layout methods and tools for MOSFET and bipolar ICS, statistical circuit design techniques, circuit models for SPICE simulation, ESD and latch-up protection, exercises and term project in design of a chip, including SPICE simulation on mainframe computer and chip layout using modern CAD system on work station. P, 458.

556. Optoelectronics (3) I For a description of course topics, see 456. Graduate-level requirements include additional homework and a term project. May be convened with 456.

557. Integrated Circuit Laboratory (3) I II For a description of course topics, see 457. Graduate-level requirements include additional homework and a term project. P, 458 or 540, or equivalent. (Identical with MSE 557) May be convened with 457.

558. Vacuum System Engineering (3) I II 1993-94 Rarefied gas dynamics, pumping, gauging and systems as they apply to microelectronic device and thin-film fabrication. Materials and techniques for ultraclean and ultrahigh vacuum processing. P, 557 or consult department before enrolling.

559. Laser Principles and Devices (3) I For a description of course topics, see 459. Graduate-level requirements include additional homework and a term project. May be convened with 459.

560. Aerosol Science and Engineering (3) I 1993-94 (Identical with CHE 560) May be convened with 460.


562. Plasma Processing (3) II Practical methodology of plasma etching, sputtering, and plasma enhanced CVD. Plasma physics and plasma chemistry. RF and DC discharges. P, 557 or consult department before enrolling.

563. Engineering Applications of Graph Theory (3) I Topics will emphasize engineering applications of graph theory. Terminology, algorithms and complexity analysis will be included. Application areas will include, but are not limited to, communication networks, VLSI routing and layout, analog circuits, and mapping of sequential and parallel algorithms onto computer architectures.
564. Operating System Concepts (3) I For a description of course topics, see 464. Graduate-level requirements include additional homework and a term project. P. 276, 372. May be convened with 464.

565. Microelectronics Packaging Materials (3) II (Identical with MSE 565) May be convened with 465.

566. Computer Network Design (3) II Fundamental issues in the design, implementation and evaluation of distributed computer programs. Focus on understanding, using, and designing upper-level network protocols and interfaces. Topics include OSI, TCP/IP and SNA protocols, and the TLJ and socket interfaces. P. 564, 578.

567. Modern Computer Architecture (3) I Overview of uniprocessor architectures, introduction to parallel processing, pipelining, vector processing, multi-processing, multi-computing, memory design for parallel computers, cache design, communication networks for parallel processing, algorithms for parallel processing. P. 369.


571a-571b. Digital Systems Design (3-3) 571a: Computer organization and architecture; control unit design, microprogramming, input/output. 571b: Advanced I/O, bus arbitration, interface design, fault tolerance, associative cache, and virtual memory, RISC architectures. (Identical with C SC 571a-571b)

572a-572b. Continuous-System Simulation (3-3) For a description of course topics, see 472a-472b. Graduate-level requirements include more difficult homework and separate grade normalization. (Identical with C SC 572a-572b) May be convened with 472a-472b.

573. Software Engineering Concepts (3) II For a description of course topics, see 473. Graduate-level requirements include additional homework and a term project. May be convened with 473.

574a-574b. Computer-Aided Logic Design (3-3) I II For a description of course topics, see 474a-474b. Graduate-level requirements include additional homework and term projects. (Identical with C SC 574a-574b) May be convened with 474a-474b.

575. Object-Oriented Simulation/Discrete Event Models (3) II Introduction to object-oriented simulation methodology and its implementation on multi-processors. Modular hierarchical discrete event model design and mapping onto distributed simulator architectures. Prior course in simulation recommended.

576. Knowledge-Based System Design (3) II Provides a framework for systematic design of systems and for constructing computer-aided environments to support engineering design activities. Characterization of design methodologies; introduction to knowledge-based design; system design and simulation modeling, knowledge-based model of design, representing designs and design knowledge, design model synthesis, concepts for evaluation, learning and creativity in design systems. A large-scale term project is central to the course. P. 479, 473.


578. Fundamentals of Computer Networks (3) I For a description of course topics, see 478. Graduate-level requirements include additional homework and a term project. May be convened with 478.

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.

581a-581b. Electromagnetic Field Theory (3-3) 581a: II Time-harmonic fields; fundamental theorems and concepts; rectangular and circular waveguides and resonators; apertures in ground planes, cylinders, and wedges; scattering by cylinders and wedges. P. 502 or MATH 422b; 482 or PHYS 415b; 515b: I Spherical geometries: interface problems; perturbational techniques; integral equations; asymptotic techniques; introduction to transient fields.

583. Remote Sensing Instrumentation and Techniques (3) II Development of instrumentation, measurement and signal processing techniques required for electromagnetic remote sensing applications with emphasis on atmospheric remote sensing. P. 482. (Identical with ATMO 583)

584. Advanced Antenna Theory and Design (3) II 1994-95 Electromagnetic radiation and diffraction; dipoles, slots, open wave guides, and horns; apertures, reflectors, and arrays; mechanical and electronic scanning; applications to practical radar and communications problems. P. 581a.

585. Radio Waves (3) II 1994-95 For a description of course topics, see 485. Graduate-level requirements include a research report on a topic selected by the instructor from the course material. P. 482. May be convened with 485.

587. Fiber Optics Laboratory (3) II (Identical with OPTI 587) May be convened with 487.

589. Atmospheric Electricity (3) II 1993-94 (Identical with ATMO 589)

631. Neural Networks (3) I Theory and application of a parallel distributed computational configuration to elementary processing elements; PE models and neural architectures; datalogical classification, supervised/unsupervised; neural network models; associative memories; training algorithms.

636. Information Theory (3) II 1994-95 Definition of a measure of information and study of its properties. Introduction to channel capacity and error-free communications over noisy channels; rate distortion theory; error detecting and correcting codes. P. 503. (Identical with MATH 636)


650. Advanced Analog Circuits (3) II Advanced topics in bipolar and CMOS analog integrated circuits including both switching and nonswitching applications. Voltage references, DAC and ADC systems, instrumentation amplifiers, sample-hold circuits, switched-mode power supply regulators. P. 550.

651. Advanced Topics in Semiconductor Devices (3) II Preparation of approximately three research reports and presentations on semiconductor topics of current interest. P. consult department before enrolling.

652. Advanced Solid-State Devices (3) I Analysis and design of devices including BJTs, MOSFETs, MESFETs, MODFETs, microwave devices, and photonic devices. P. 552.


659. Advanced Topics in Microelectronics and Solid-State Devices (3) [Rpt. 9 units] Specialized topics, as announced, such as submicron MOSFETs, radiation effects on devices, yield analysis, advanced semiconductor processing technologies, and contamination control. P. consult department before enrolling.


672. Computer-Aided Design Algorithms and Techniques for VLSI (3) I Introduction to VLSI design, combinational and sequential logic synthesis, layout generation and optimization, logic and timing simulation, design styles. P. 474, 574.

673. Real-Time Distributed Processing Systems (3) II Methodology and design approaches for real-time systems, using distributed architectures. Multiple processors and interconnection networks, sizing techniques, and parallel algorithm implementations. P. 475, 564. (Identical with C SC 673)
Engineering and Mines (ENGR)

Geology Building, Room 134
(602) 621-6032

Listed below are courses which are common to all degrees offered by the College of Engineering and Mines, and others that are available to all university students.

100a-100b. Fundamentals of Engineering (3-3) I III S Introduction to the design process, basic engineering principles, professionalism, problem solving techniques, software tools and a structured programming language. Techniques learned will be applied to the solution of engineering design problems. 100a: 1ES, 1ED, CR, MATH 124, 125a. 100b: 1ES, 1ED. P. 100a.


102. Problem Solving and Engineering Design (3) I III S Introduction to the engineering design process, basic engineering principles, problem-solving techniques, and software tools. Culminates in an engineering design project. IES, 1ED. P. 101.

109. Technology and Society: An Historical Perspective (3) I (Identical with NEE 109)

120. Mineral Resources, Geotechnology and the Environment (3) I (Identical with MN E 120)

195. Colloquium a. Materials in Engineering (1) Field trips b. Materials Science and Engineering (1) (Identical with MSE 195b, which is home)


220. Microcomputing Applications (3) I II (Identical with ABE 220)

251. Social Constraints on Engineering (3) (Rpt./11) I (Identical with MSE 251)

255. Materials Science in Modern Society (3) I (Identical with MSE 255)

256. Laboratory for Materials Science (1) I (Identical with MSE 256)

257. Materials Science of Art and Archaeological Objects (3) I II (Identical with MSE 257)

258. Materials Science of Art and Archaeological Objects Laboratory (1) I I II (Identical with MSE 258)

265. Engineering Economic Analysis (3) I II S (Identical with SIE 265)

435. Corrosion and Degradation (3) II (Identical with MSE 435)

454. Law for Engineers/Scientists (3) II I II II (Identical with CH E 454) May be convened with 554.

479. Culture and Materials Technology (3) I (Identical with ANTH 479)

485. Technological Forecasting (3) I (Identical with MSE 485)

486. Technology and Society (3) I (Identical with MSE 486)

488. Scanning Electron Microscopy (3) I (Identical with MSE 488)

501. Planning for Discovery: Problem Solving and Proposal Preparation (3) I (Identical with MSE 501)

502. Research Proposal Preparation (3) I I (Identical with MSE 502)

554. Law for Engineers/Scientists (3) I II II (Identical with CH E 554) May be convened with 454.

English (ENGL)

Modern Languages Building, Room 445
(602) 621-1836


Lecturers Christopher Carroll, Tom J. Collins (Emeritus), Ruth M.B. Gardner (Emerita)

The Department of Engineering offers instruction in language and literature, leading to the following degrees: Bachelor of Arts with majors in English and creative writing, Bachelor of Arts in Education with teaching majors in English and extended English, Master of Arts with majors in English and English as a Second Language, Master of Education with a teaching major in English, Master of Fine Arts with a major in creative writing, and Doctor of Philosophy with majors in English and rhetoric, composition, and the teaching of English. For further information regarding the graduate programs, please see the Graduate Catalog.

Courses are offered in a number of topics which will allow the undergraduate to experience a wide variety of approaches to and kinds of literature, develop writing skills, and appreciate the nature of the language. As well as courses in the traditional fields of English and American literature, Mexican-American literature, African-American literature, English language/linguistics, composition, and creative writing, the department offers courses in such areas as film and literature, women's studies, folklore, American Indian studies, fan-
tasy, and the oral tradition. Students may participate in the study-abroad program in London. Undergraduate majors in English can expect to attain writing, organizational, and analytical skills which will allow them to pursue careers in professional graduate studies in literature, or in business, law, medicine, and a number of fields of endeavor which demand these skills.

The major in English for the B.A.: 36 units of upper-division English and American literature divided into two groups of 18 units. The 18-unit "core" requires ENGL 370a, 370b, 426, 431a or 431b, 444, and one seminar (496). The other 18 units must be chosen from one of three concentrations: British literature, American literature, or literature and composition. British concentrators must take one course in American literature and one in literature before 1800. Literature and composition concentrators must take 306, 419a or 419b, one English language course (405, 406, or 421), one applied rhetoric course (301, 401, 402, 414, or 419a or 419b), a course in writing about literature (380 or another 496), and a literature elective at the 300 or 400 level. Majors are also required to take either HUM 250a or ENGL 251a (which may also be used in partial fulfillment of the general education requirement in Western Civilization) as a prerequisite. All majors are required to fill out a plan of study with the department's Director of Undergraduate Studies or an Associate Advisor in English.

The supporting minor for majors in English. Recommended subjects are classics, drama, philosophy, modern languages, history and theory of art or of music, journalism, communication, anthropology, government, economics, history, linguistics, psychology, sociology; other subjects as may be individually justified.

The major in creative writing: 36 units, including 209, 210, 370a-370b; 3 units from 261, 265, 267a-267b, 380; 6 units from 301, 304, 309; 3 units from 401, 404, 409, 413, T AR 460a-460b; 3 units from 415a-415b; 9 units of upper-division (300 level or above) literature courses in the English Department, to include 3 units of course work in modern or contemporary literature.

The minor in creative writing: 21 units, including 209, 210; 3 units from 301, 304, 309; 3 units from 401, 404, 409, 413, T AR 460a-460b; 3 units from 261, 265, 267a-267b, 370a-370b, 380; 3 units from 415a-415b; 3 units at the 400 level in modern or contemporary literature.

The teaching major in English (for students who are candidates for a B.A. in Education with secondary teaching cer-

**The Honors Program in English** welcomes students of any major who have shown outstanding capacities for the study of literature. Students normally begin as juniors and must take two 495H seminars and six units of Independent Study (including the writing of a thesis) to complete the 12-unit program. Students are 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 the program to the Director of English Honors.

Courses taken to fulfill the university requirement in first-year composition may not be used as part of any English major or minor. Satisfaction of the first-year 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; 101 and 102; 103H and 104H; for ESL students: 106, 107, and 108; 107 and 108. Students are placed in First-Year Composition by scores on the American College Test (ACT) or the Scholastic Aptitude Test (SAT) and a written placement essay.

The Center for English as a Second Language. The center offers an intensive, noncredit program for students who are not native speakers of English. Brochures describing the program are available from the Center for English as a Second Language.

The department participates in the University Honors Program.

100. First-Year Composition (3) I II Elements of expository prose.

101. First-Year Composition (3) I II Exposition, emphasis on essays.


103H. First-Year Composition (3) I II Exposition for advanced students.

104H. First-Year Composition (3) I II Critical papers for advanced students. P, 103H.

106. English Composition for ESL Students (3) I II Exposition, syntax and usage for ESL students.*

107. English Composition for ESL Students (3) I II Exposition, emphasis on essays, for ESL students.*

108. English Composition for ESL Students (3) I II Exposition, critical papers, for ESL students.* P, 107.

*NOTE: All entering foreign students must take a placement examination given at the beginning of each semester and summer session. See "Admission of Foreign Students" in the Admission and Registration section.

109H. Advanced First-Year Composition (3) I II Critical papers. P, AP English score of 4 or 5. (Note: A combination of AP composition credit and English 109H with a grade of C or better satisfies the University first-year composition requirement. See Advanced Placement under the Admission and Registration section of this catalog.)

195. Colloquium a. Critical Reading and Writing (3) S Open to Bio-Prep program students only.

197. Workshop a. Thinking and Writing (3) S

207. Sophomore Composition (3) I II Exposition and critical papers.

209. Introduction to Poetry Writing (3) I II Beginning techniques of poetry writing. P, 102.


222. The Structures and Sources of American English Words (3) I S (Identical with LING 222)


260. Major British Writers (3) I II Intensive study of selected works by major British writers.

261. Modern Literature (3) I II Readings in modern fiction, drama, and poetry.

265. Major American Writers (3) I II Intensive study of selected works by major American writers.
267a-267b. World Literature (3-3) 267a: Dramatic literature; great plays of the western literary tradition with emphasis on genre, theme and structure. 267b: Narrative literature; great narrative works of the western literary tradition with emphasis on form, theme and culture context.

270a-270b/270c-270d. Approaches to Literature. (3-3-3-3) II S 270a: Major Authors. An Assessment of the works of one, two, or three major authors, emphasizing the common themes they treat and their different modes of treatment. 270b: Major Works. A study of one or more demonstrably major works in the western tradition which have had a pervasive influence on western thought. 270c: Literary Mode or Genre. A study of how individual literary forms work and how they arise out of specific cultural circumstances. 270d: Major Themes. An introduction to important themes in literature which incorporate, use, and transform ideas in the literary tradition. Courses need not be taken in sequence. P, Freshman Composition.

277. Eroticism and Love in the Middle Ages (3) I I S (Identical with GER 277)

285. Introduction to Humanities Computing (3) S (Identical with GER 285)

290. Politics and the Novel (3) I I (Identical with POL 290)

295. Colloquium
a. British Life and Culture (3) I I q. 10Q4 Creativity: A Class in Self Expression (3) I I S GRD (Identical with HUM 295Q)

300. Literature and Film (3) I II [Rpt] 1993-94 The art of translating literature into film as aesthetic expression and artistic medium of the narrative film.

301. Creative Nonfiction Writing (3) I II P, 207 or 210 or 306, and consult department before enrolling.


308. Technical Writing (3) I II Analysis and presentation of scientific and technical information. P, 102.


331. Shakespeare's Major Plays (3) I II A close reading of six to eight plays, including a comedy, a history, a tragedy, and a tragicomedy.


370a-370b. English Literature (3-3) A survey, with emphasis on major writers in their literary and historical contexts. 370a: From Old English to Renaissance literature. 370b: From Restoration to modern literature. 370a is not prerequisite to 370b. Both 370a and 370b are offered each semester.

371a-371b. American Literature (3-3) A survey with emphasis on writers in their literary and historical contexts. 371a: From the Revolutionary Period to 1900. 371b: From 1900 to the present.


380. Literary Analysis (3) I II Introduction to the various modes, techniques, and terminology of practical criticism.

397. Workshop
a. Writing Workshop (1) [Rpt./3 units] I I S P, for students whose performance on the upper-division writing-proficiency examination is unsatisfactory.


400. Themes in Literature and Film (3) I I Special topics or themes in literature and film. P, 300.

401. Advanced Creative Nonfiction Writing (3) I II P, 301 or 306, and consult department before enrolling. Writing-Emphasis Course for creative writing majors.*


403. Mexican-American Literature (3) I I (Identical with SPAN 403)


405. History of the English Language (3) I I The evolution of English sounds, inflections, and vocabulary from earliest times to the present, with attention to historical conditions. (Identical with GER 405) May be convened with 505.

406. Modern English Grammar (3) I I S Introduction to the nature of grammar and approaches to the description of English grammar, emphasizing Chomsky's transformational-generative model. Focus is on grammatical structure, but scope includes phonology and social/historical factors which influence the form and use of English in various contexts. Includes practice in phonemic transcription and sentence diagramming. P, 405. May be convened with 506.


408. English as a Second Language in Bilingual Education (3) I I Methodology for the teaching of English as a component of bilingual education; grammar, phonology, and syntax as they apply to the teaching of language skills. (Identical with TTE 408) May be convened with 508.

409. Advanced Poetry Writing (3) I II P, 309. Writing-Emphasis Course for creative writing majors.*


411. Teaching of Literature (3) I II Theory and practice of teaching literature, with intensive study of genres and works commonly taught in secondary schools. P, nine units of literature. (Identical with TTE 411) May be convened with 511.


413. Poetry in Forms (3) I II Explores prosody through discussing and writing of forms and types, research paper. P, 309. May be convened with 513.

414. Advanced Scientific Writing (3) I II Preparation of professional literature for publication. May be convened with 514.


416. The Nature of Literature (3) I What literature is and does, as exposed in theories of writing and in self-conscious literary works.

417. Women Authors (3) I Analysis of selected writings by women in the context of the authors' lives and social milieu. (Identical with W S 417)

418. Women in Literature (3) I II Analysis of the representations of women in selected literary texts. (Identical with W S 418)

419a-419b. Non-fiction Prose (3-3) 419a: The essay in English. 419b: Other prose forms. P, First-year Composition; upper-division standing.

421. American English (3) I II History of the development of American English from the colonial period to the present. Topics include regional and social varieties, language contact and slang, geographic atlas, social survey, and lexicographic research methods are utilized. P, 405 or introduction to linguistics. May be convened with 521.

423. Studies in Southwest Literature (3) I II (Identical with AINS 424) May be convened with 524.

427. Chaucer (3) II The Canterbury Tales and other poems, read in Middle English.

429. Chinese-American Literature 1960 - Present (3) II (Identical with CHN 429) May be convened with 529.

431a-431b. Shakespeare (3-3) 431a: Twelve comedies, histories and tragedies from the period 1590-1600 (including Hamlet). 431b: Ten comedies, tragedies and tragi-comedies from the period 1601-1613. 431a is not prerequisite to 431b.

432. Renaissance Drama (3) II Critical and historical study of Marlowe, Kyd, Jonson, Greene, Dekker, Webster, Heywood, and other contemporaries of Shakespeare.

434a-434b. Renaissance Literature (3-3) 434a: Critical and historical survey of major authors, including More, Skelton, Wyatt, Sidney, and Spenser. 434b: Bacon and Hobbes; Ben Jonson and his Tribe; Donne and the Metaphysicals; Milton.

436. Japanese Sociolinguistics (3) [Rpt./1] I (Identical with JPN 436) May be convened with 536.

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 theory, 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).

449a-449b. Folke (3-3) 449a: Forms of verbal folklore; 449b: non-verbal folklore and material culture (Identical with ANIS 449a-449b and ANTH 449a-449b) May be convened with 549a-549b.

450a-450b. Literature of Restoration and Eighteenth Century (3-3) 450a: Survey of Restoration and early 18th-century literature (1660-1745). 450b: Poetry, fiction, drama, and essays from 1745 to 1800.

454. Irish Revolutionary Literature (3) I (Identical with HUM 454)

458a-458b. The English Novel (3-3) 458a: Defoe, Richardson, Fielding, Sterne, Smollett, and Austen. 458b: Scott, the Brontes, Dickens, Thackeray, Eliot, Trollope, and Hardy.

460a-460b. Romantic Literature (3-3) 460a: Focus on the "older" Romantics: William Blake and those born in the 1770s; Wordsworth, Coleridge, Lamb, and others. 460b: Focus on the "younger" Romantics, those born in the 1780s and 90s, particularly Shelley, Keats, Byron, and others. 460a is not prerequisite to 460b.

461. Linguistics and the Study of Literature (3) II 1994-95 (Identical with LING 461)

465. Victorian Literature (3) I Major poetry and nonfictional prose.

466. Themes in Victorian Literature (3) II The impact of science, the sexual revolution, art and ecology, and the Romantic heritage.

470. Literature and Major Philosophers (3) I II Selected works of literature in connection with particular philosophical statements or problems. An honors section is available. P. First-year Composition; upper-division standing.

472. Modern Fiction (3) I American, British, and Continental fiction, with particular attention to the development of characteristically modern techniques.

473a-473b. Modern British Literature (3-3) 473a: Development of British fiction from the late 19th century to the present. 473b: Development of British poetry from the turn of the century to the present.

475. Modern 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.

477. American Indian Literature (3) I II (Identical with AINS 477) May be convened with 577.

478. African American Literature (3) I The study of novels, drama and poetry by leading Black writers. P. upper-division standing. (Identical with AAS 478).

481. Literature of the Early Republic (3) I Satire, drama, essays, novels, and poetry of the Revolutionary and post-Revolutionary periods; Franklin, Frenaye, Crevecoeur, the Connecticut Wits. C.B. Brown, Irving, Cooper. P. upper-division standing.

482. American Romanticism (3) II Prose and poetry by Hawthorne, Poe, Emerson, Whitman, Thoreau, and Melville.

483. American Realism (3) I The development of realism and naturalism in American literature; Twain, James, Crane, Dreiser, and other writers.

484a-484b. The American Novel (3-3) 484a: The nineteenth century—Hawthorne, Melville, Twain, and others. 484b: The twentieth century—James, Fitzgerald, Faulkner, and others.

485. Modern British and American Drama (3) I The development of drama in English from 1900 to the present; Shaw, O'Casey, Beckett, Osborne, Pinter, O'Neill, Wilder, Miller, Williams, Albee, and other playwrights.

486. Themes in American Literature (3) I II Analysis of such literature Themes as the frontier, the American Adam, American humor, self and society.

487. Major American Author (3) I II A consideration of the major works of one author, including such authors as Hawthorne, Melville, James, and Faulkner.


495. Colloquium

496. Seminar

501. Writing Project in Creative Nonfiction Writing (4-4) May be convened with 411.

505. History of the English Language (3) I II For a description of course topics, see 405. Graduate-level requirements include an in-depth research paper. (Identical with GER 505) May be convened with 405.

506. Modern English Grammar (3) I II For a description of course topics, see 406. Graduate-level requirements include an in-depth outside paper. May be convened with 406.

508. English as a Second Language in Bilingual Education (3) I II For a description of course topics, see 408. Graduate-level requirements include a special in-depth paper. May be convened with 408.

510. Teaching of Composition (3) I II For a description of course topics, see 410. Graduate-level requirements include a special topics paper. P. 306. May be convened with 410.

511. Teaching of Literature (3) I II For a description of course topics, see 411. Graduate-level requirements include a special topics assignment. P. nine units of literature. May be convened with 411.

512. Teaching of the English Language (3) I II For a description of course topics, see 412. Graduate-level requirements include a special topics report. P. 405/500, 406/506. May be convened with 412.

513. Poetry in Forms (3) [Rpt.] II For a description of course topics, see 413. Graduate-level requirements include a research paper. P. 309. May be convened with 413.

514. Advanced Scientific Writing (3) I II For a description of course topics, see 414. Graduate-level requirements include more detailed and lengthier papers. May be convened with 414.

515a-515b. History of Criticism and Theory (3-3) 515a: Plato through the 19th century. 515b: Modern criticism and theory.
516. Theories of Linguistic Structure (3) I II
In-depth examination of at least two recent theoretical models of linguistic structure, including Chomsky’s, with attention to English and cross-linguistic differences. P, 506 or an introductory linguistics course.

520. History of the German Language (3) II
1993-94 (Identical with GER 520)

521. American English (3) II For a description of course topics, see 421. Graduate-level requirements include additional readings and a special topics paper. P, upper-division standing. May be convened with 421.

524. Studies in Southwest Literature (3) I II
Graduate-level requirements include an additional term paper. (Identical with AINS 524) May be convened with 424.

525. Beowulf (3) II (Identical with GER 525)

526. Advanced Studies in Chaucer (3) II

527a-527b. Studies in Medieval Language and Literature (3-3) 527a: Old English. (Identical with GER 527a). 527b: Middle English.

529. Chinese-American Literature 1960 - Present (3) I II (Identical with CHN 529) May be convened with 429.

531. Advanced Studies in Shakespeare (3) I

533. Studies in the Renaissance (3) [Rpt./1] I II

534. Advanced Studies in Milton (3) I

536. Japanese Sociolinguistics (3) [Rpt./1] I II (Identical with JPN 536) May be convened with 436.

541. Studies in the Restoration and Eighteenth Century (3) [Rpt./1] II

545. Introduction to TESL: An Overview (2) I II
For a description of course topics, see 445. Graduate-level requirements include an in-depth paper. May be convened with 445.

548. Theory and Practice of Writing (3) II 1993-94 (Identical with FREN 548)

549a-549b. Folklore (3-3) For a description of course topics, see 449a-449b. Graduate-level requirements include an in-depth paper. (Identical with AINS 549a-549b, ANTH 549a-549b, and CCLS 549a-549b) May be convened with 449a-449b.

554. Contemporary Feminist Theories (3) I II (Identical with W 554)


561. History of Children’s Literature (3) I II (Identical with LS 561)


577. American Indian Literature (3) I II For description of course topics, see 477. Graduate-level requirements include a special in-depth paper. (Identical with AINS 577)

585. Linguistics and Computer-Assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 585)

587. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)

595. Colloquium
a. Professional Studies (1-3) I II [Rpt./4] Designed for teaching assistants in English. May also be used, at discretion of graduate program directors in English, for other professional training.

596. Seminar
a. Medieval Literature (3) [Rpt./4] I II
b. Renaissance Literature (3) [Rpt./4] I II
c. Restoration and Eighteenth-Century Literature (3) [Rpt./4] I II
d. Nineteenth-Century British Literature (3) [Rpt./4] I II
e. Twentieth-Century British Literature (3) [Rpt./4] I II
f. American Literature (3) [Rpt./4] I II
g. Comparative Literature (3) [Rpt./4] I II
h. Modern Language (3) [Rpt./24 units] I II
i. Open to creative writing majors only.

601. German Linguistics (3) [Rpt./4] I II P, 506

602. Second Language Acquisition Research (3) [Rpt./4] II P, 506
k. Methods and Materials of Literary Research (3) [Rpt./4] I II
l. Theories of Criticism (3) [Rpt./4] I II
m. Studies in the Oral Tradition (3) [Rpt./9 units] I II (Identical with ANTH 596m)

603. Discourse Analysis (3) [Rpt./3] I

604. Contrastive Rhetoric (3) [Rpt./2] I, II (Identical with W 596w)

609. Writing Project in Fiction (1-6) [Rpt./24 units] I II For M.F.A. candidates working toward book-length writing project in fiction.

610. Writing Project in Poetry (1-6) [Rpt./24 units] I II For M.F.A. candidates working toward book-length writing project in poetry.

612. Grammatical Analysis (3) I English grammatical analysis in relation to the acquisition of English as a second language. (Identical with LRC 612)

613. Second Language Acquisition in Formal Context (3) I Foundations, theory, and methodology in English as a second language. (Identical with LRC 613)


693. Internship
a. Applied ESL (3) [Rpt./1] II P, 612, 613.

696. Seminar
b. Linguistics (2 to 4) I II (Identical with GER 696b, which is home)
c. History of Rhetoric (3) [Rpt./6] I II

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**Entomology (ENTO)**

Forbes Building, Room 410
(602) 621-1151

Professors Elizabeth A. Bernays, Head, William S. Bowers, Reginald F. Chapman, Eddie W. Cripp (Veterinary Science), René Feyereisen, Henry H. Hagedorn, John G. Hildebrand, Roger T. Huber, Leon Moore (Emeritus), José M.C. Ribeiro, Donald M. Tuttle (Emeritus), George W. Ware (Emeritus), Theo F. Watson

Associate Professors Nancy A. Moran (Ecology and Evolutionary Biology), Robert L. Smith

Assistant Professors David R. Maddison, Martin F. Taylor, Diana E. Wheeler

Adjunct Professors Richard C. Collins, Eric H. Erickson

Adjunct Associate Professor Stephen L. Buchmann, Allen C. Cohen, Dave T. Langston, Hayward G. Spangler

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.

The department administers an undergraduate minor in entomology and advanced degrees, the Master of Science and Doctor of Philosophy with a major in entomology. For graduate admission and degree requirements, consult the Graduate Catalog.

The undergraduate minor: The department offers students the opportunity to complete an undergraduate minor in entomology. The minor requires at least 20 units of credit to be selected from course offerings in entomology. Specific course requirements include 201; three courses chosen from 404, 407, 411, 416, 444; and six or more credits selected from the upper-division courses offered by the department. For further details, consult
with a faculty advisor in the department. Students will be expected to have completed prerequisites and/or supporting courses that may be required by the courses in the minor.

151. Insects and Society (3) I Introduction to the biology, ecology, and management of insects affecting man and his interests. Intended for non-majors. Olson

195. Colloquium
a. Exploring Biology (1)
b. Agriculture as a Science (1) II (Identical with PL S 155b, which is home)

201R. Fundamentals of Entomology (3) I 1993-94 Insects and other land arthropods, their functional anatomy, perception of the environment, relationship to plants and other animals, and importance to man. Classification to orders and most important families. P, MCB 181, ECOL 182. Chapman

201L. Fundamentals of Entomology Laboratory (1) 1993-94 I Classification of insects and other land arthropods to the level of families, with emphasis on recognition; collection. Field trips.

202. Applied Entomology (3) [Rpt./1] I Survey of insect pests of crops and domestic animals, in the forest and urban environments, and as vectors of plant and animal diseases. Control of insects using pesticides and biological methods and the public debate over insect control will be discussed. 2R, 3L Field trips.

402. Agriculture and the Environment (3) I (Identical with A ED 402) May be convened with 502. Huber

403R. Biology of Animal Parasites (3) I (Identical with V SC 403R) May be convened with 503R.

403L. Parasitology Laboratory (1) I (Identical with V SC 403L) May be convened with 503L.

404. Insect Morphology (4) I 1994-95 Internal and external structure of insects as related to function, physiology, and evolution. 3R, 5L P, 201R or invertebrate zoology. May be convened with 504. Wheeler

405. Aquatic Entomology (3) II 1994-95 Morphological, physiological and behavioral adaptations of insects to life in water; taxonomy and ecology of aquatic insects. 2R, 3L Field trips. P, ECOL 182. (Identical with WFSC 405 and ECOL 405) May be convened with 505. Smith

407R. Insect Physiology (3) II 1994-95 Introduction to the diverse and unique ways insects solve physiological problems. A whole animal approach will be used centered around various aspects of an insect's life (i.e., growing, flying, reproducing). P, 201; CR, 407L; biochemistry recommended. May be convened with 507R. Hagedorn/Chapman

407L. Insect Physiology Laboratory (1) II 1994-95 Modern methods of physiological experimentation. P, 201; CR, 407R; biochemistry recommended. May be convened with 507L. Hagedorn/Chapman

408. Insect Toxicology (3) II 1993-94 Introduction to the interactions of insects with natural and synthetic toxicants; metabolism, mode of action and resistance of insects to insecticides. P, 3 units of organic chemistry or biochemistry. (Identical with TOX 408) May be convened with 508. Feyerisen

411. Insect Behavior (3) III 1993-94 The evolution of arthropod behavior in ecological context. Ultimate causation with some consideration of physiological and morphological constructs. 2R, 3L Field trips. (Identical with ECOL 411) May be convened with 511. Smith/Papaj


426. Bio-Analytical Techniques (2) I 1993-94 Direct hands-on experience with modern instrumentation focused on the isolation, identification, and biological assay of natural products. Interdisciplinary instruction for both chemists and biologists. P, 3 units of organic or biochemistry, 2 courses in biological science. (Identical with V SC 426) May be convened with 526. Bowers

427. Insect Chemical Ecology (2) I 1993-94 The chemistry of relationships regulating insect growth, development, reproduction, diapause, and communication. Derivation of biorational methods of insect control. P, 201, 507 or equivalent, and 3 units of organic or biochemistry. (Identical with V SC 427) May be convened with 527. Bowers

443. Insect Neurobiology (3) II 1993-94 The structure, function and development of the insect nervous system. Basic concepts in neurobiology and presentation of insects as model systems of neurophysiology, development and behavior. P, MCB 181, ECOL 182. (Identical with MCB 443) May be convened with 543.

444. Insect Ecology (3) I 1994-95 The study of how variation in the environment, interactions with other species and the special features of an insect's life have determined the evolution of diverse insect life histories, the dynamics of insect population and the roles of insects in communities. 2R, 3L Field trips and project. P, 201R. (Identical with ECOL 444) May be convened with 544. Taylor

452. Medical-Veterinary Entomology (4) I 1994-95 Survey of arthropods of public health and veterinary importance, with emphasis on transmission dynamics of pathogens, biometrics of vector populations, and current control concepts. 3R, 3L P, 201; parasitology recommended. (Identical with V SC 452) May be convened with 552. Cupp/Ribeiro

468. Insect Pest Management (3) II 1994-95 Principles underlying the management of arthropods in agricultural systems. P, 201R. May be convened with 568. Watson

470. Biological Control (3) II 1993-94 Principles of the biological control of arthropods and weeds, emphasizing their application to agricultural and rangeland entomology. P, 444 and 468. May be convened with 570. Watson

494. Practicum
a. Professional Skills (2) I (Identical with ECOL 494a) May be convened with 594a.

495. Colloquium
a. Senior Report (1) I II Writing-Emphasis Course.

*Writing-Emphasis Course. P. Satisfaction of the upper-division writing proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

496. Seminar
a. Entomology (1) [Rpt./4] I II May be convened with 596a.
b. Medical-Veterinary Entomology (1-3) I P, 452. May be convened with 596b.
c. Insect Ecology and Evolution (1) [Rpt./5] I II May be convened with 596c.
d. Plant-Insect Interactions (1) [Rpt./5] I II. (Identical with PL S 469d. May be convened with 596d.
e. Insect Physiology, Biochemistry, Toxicology (1) [Rpt./5] I II May be convened with 596e.

f. Topics in Pest Management (1) [Rpt./5] I II May be convened with 596f.

497. Seminar
a. Biological Control (3) II 1993-94 Principles of the biological control of arthropods and weeds, emphasizing their application to agricultural and rangeland entomology. P, 444 and 468. May be convened with 570. Watson

502. Agriculture and the Environment (3) I (Identical with A ED 502) May be convened with 402. Huber

503R. Biology of Animal Parasites (3) I (Identical with V SC 503R) May be convened with 503R.

503L. Parasitology Laboratory (1) I (Identical with V SC 503L) May be convened with 503L.

504. Insect Morphology (4) I 1994-95 For a description of course topics, see 404. Graduate-level requirements include a written literary review and oral presentation of a selected topic. P, 201R or invertebrate zoology. May be convened with 404. Wheeler

505. Aquatic Entomology (3) II 1994-95 For a description of course topics, see 405. Graduate-level requirements include an original piece of research on some aspect of aquatic entomology agreed upon by the student and the professor. Field trips. P, ECOL 182. (Identical with WFSC 505 and ECOL 505) May be convened with 405. Smith

507R. Insect Physiology (3) II 1994-95 For a description of course topics, see 407R. Graduate-level requirements include written literature reviews. P, 201; biochemistry recommended. 507L is not required for 507R. May be convened with 407R. Hagedorn/Chapman

507L. Insect Physiology Laboratory (1) II 1994-95 For a description of course topics, see 407L. Graduate-level requirements include helping to develop a laboratory. P, 201; biochemistry recommended. 507L is not required
508. Insecticide Toxicology (3) II 1993-94 For a description of course topics, see 408. Graduate-level requirements include additional in-depth material. P, 3. P. of organic chemistry or biochemistry. (Identical with TOX 508) May be convened with 408. Feiereisen

511. Insect Behavior (3) II 1993-94 For a description of course topics, see 411. Graduate-level requirements include a written literature review and oral presentation of a selected topic. 2R, 3L. Field trips. (Identical with ECOL 511) May be convened with 411. Smith/Papaj

514. Bee Biology and Pollination (2) II 1994-95 For a description of course topics, see 414. Graduate-level requirements include a research paper on some topic of bee biology or pollination, terminating with an oral presentation. Field trips. P, one course in biology. May be convened with 414. Erickson/Buchmann

516. Insect Systematics (4) I 1993-94 For a description of course topics, see 416. Graduate-level requirements include a written literature review and oral presentation of a selected topic. 3R, 3L. Field trips. May be convened with 416. Hagedorn/Chapman

526. Bio-Analytical Techniques (2) I 1993-94 For description of course topics, see 426. Graduate-level requirements include written project report. (Identical with V SC 526) May be convened with 426. Bowers

527. Insect Chemical Ecology (2) I 1993-94 For description of course topics, see 427. Graduate requirement includes written project report. (Identical with V SC 527) May be convened with 427. Bowers

543. Insect Neurobiology (3) II 1993-94 For a description of course topics, see 443. Graduate-level requirements include taking the lead in class discussion and completion of a term paper. P, MCB 181, ECOL 182. (Identical with MCB 543) May be convened with 443.

544. Insect Ecology (3) I 1994-95 For a description of course topics, see 444. Graduate-level requirements include an independent research project and a literature review paper. Field trips and project. P, 201R. (Identical with ECOL 544) May be convened with 444. Taylor

552. Medical-Veterinary Entomology (4) II 1994-95 For a description of course topics, see 452. Graduate-level requirements include a written review of contemporary journal articles. P, 201; parasitology recommended. (Identical with V SC 552) May be convened with 452. Cupp/Ribeiro

568. Insect Pest Management (3) II 1994-95 For a description of course topics, see 468. Graduate-level requirements include an additional report. P, 201R. May be convened with 468. Watson

570. Biological Control (3) II 1993-94 For a description of course topics, see 470. Graduate-level requirements include a research paper on some major area of biological control, terminating with an oral presentation. P, 444 and 468. May be convened with 470. Watson

576. Environmental Toxicology (3) I (Identical with TOX 576)

594. Practicum
a. Professional Skills (2) I (Identical with ECOL 594a) May be convened with 494a.

596. Seminar
a. Entomology (1) [Rpt./6] I II May be convened with 496a.
b. Medical-Veterinary Entomology (1-3) I P, 452. May be convened with 496b.
c. Insect Ecology and Evolution (1) [Rpt./5] I II May be convened with 496c.
d. Plant-Insect Interactions (1) [Rpt./5] I II. (Identical with PL 596c) May be convened with 496c.
e. Insect Physiology, Biochemistry, Toxicology (1) [Rpt./5] I II May be convened with 496c.
f. Topics in Pest Management (1) [Rpt./5] I II May be convened with 496d.
g. Ecology, Epidemiology and Control of Vector-borne Diseases (1-3) I II [Rpt./5] I II May be convened with 496f.

612. Biological Electron Microscopy (4) I (Identical with MCB 612)

696. Seminar
a. Entomology (1) [Rpt./6] I II

Environment and Behavior (ENV)

Psychology Building, Room 517
(602) 621-7430

Graduate Interdisciplinary Program in Environment and Behavior

Committee:
Professors Robert Bechtel, Chair (Psychology), Charles Albanese (Architecture), Terry Daniel (Psychology), Donald Davis (Hydrology), William Havens (Renewable Natural Resources), Robert Hershberger (Architecture), William Ittelson (Psychology), David King (Renewable Natural Resources), William Rathje (Anthropology), Thomas F. Saarinen (Geography), Ervin H. Zube (Renewable Natural Resources)

Associate Professors Curtis W. Bryant (Civil Engineering), Dennis Doxtater (Architecture), William Shaw (Renewable Natural Resources)

Assistant Professors Chet Ross (Architecture)

The Graduate Interdisciplinary Program in Environment and Behavior functions to coordinate and further develop study of the relationship between physical settings and human activities. This multidisciplinary group of teachers and researchers will assist students interested in combining an environment and behavior emphasis into majors such as psychology, architecture, landscape architecture, interior design, geography, renewable natural resources, political science, and water resources administration. Students should consult their department advisors and appropriate members of the Program in Environment and Behavior.

Environmental Science

Shantz Building, Room 429
(602) 621-1646

The major is interdisciplinary and leads to the Bachelor of Science in Environmental Science degree. It is administered through the Department of Soil and Water Science, with an advisory committee formed from the departments of: Civil Engineering and Engineering Mechanics, Chemistry, Ecology and Evolutionary Biology, Economics, Geology, Hydrology and Water Resources, Soil and Water Science, and Toxicology.

There are four program areas: land and water emphasis, biology emphasis, environmental health emphasis, and environmental engineering sciences emphasis. The major is a science oriented curriculum, and provides a strong background in the chemical, biological, and physical sciences. The environmental science major provides students with an understanding of the scientific processes and practical applications that affect pollution of land, water, and air.

General education requirements are set by each college. The major will allow a student to use the general education requirements for any college, as long as two conditions are satisfied: the full requirements for a particular college will be met, and the additional requirements for environmental science will be met. See the Department of Soil and Water Science for a listing of course requirements for the B.S. degree in Environmental Science.
Epidemiology (EPI)

2501 East Lee Street
(602) 626-4010

Graduate Interdisciplinary Program in Epidemiology

Committee:

Professors T.E. Moon, Chair (Family and Community Medicine), B. Burrows (Internal Medicine), L.C. Clark (Family and Community Medicine), J.E. Dalen (Internal Medicine), M.D. Lebowitz (Internal Medicine)

Assistant Professors A.E. Camilli (Internal Medicine), A.L. Estrada (Family and Community Medicine), D.J. Roe (Family and Community Medicine)

Research Associate Professor Julia Emerson (Cancer Center), D. Sherrill (Internal Medicine)

Research Assistant Professor F. Martinez (Pediatrics), A. Wright (Pediatrics)

Research Instructor B. Cartmel (Family and Community Medicine)

The graduate interdisciplinary program in epidemiology offers the opportunity for study in the scientific discipline concerned with the causes and prevention of disease in human populations. Advances in clinical medicine, laboratory science, environmental health, nutrition, statistics, computer data processing and the basic understanding of the pathogenesis of disease enable epidemiology researchers to better examine causes of disease and to evaluate more effective strategies for disease prevention and control. Multidisciplinary collaborations between program faculty and members of university departments and state and national health institutions provide classroom and community training opportunities. To accomplish this goal, faculty program members with overlapping expertise from several health science departments have been selected to direct courses and research.

Degrees

The Graduate Program in Epidemiology offers a major in epidemiology for the Master of Science and Doctor of Philosophy degrees.

Admission Requirements: For further information, see Graduate Catalog

515. Subspecialty

h. Cancer Epidemiology and Prevention (3) P, none; statistics helpful. (Identical with RONC 515h)
i. Cancer Prevention and Control (3-15) II (Identical with RONC 515i)

610. Biostatistics for Research (3) II Descriptive statistics and statistical inference relevant to biomedical research, including data analysis, regression, and correlation analysis, analysis of variance, survival analysis, biological assay, statistical methods for epidemiology and statistical evaluation of clinical literature. P, STAT 509.

650. Quantitative Epidemiology (3) I Study of computer intensive multivariate epidemiologic methods including evaluation of potential etiologic environmental exposures in human populations to the risk of disease. 2R, 1L. P, 596r, 596b.

660. Infectious Disease Epidemiology (3) I [Rpt+] Introduction to epidemiologic methods used in infectious disease investigations. An emphasis will be placed on understanding the relationships between the host, the parasite and the environment as they relate to disease causation. P, 596r, 596b.

670. Chronic Disease Epidemiology (4) II Nutritional and occupational epidemiology and environmental epidemiology. P, 596r, 596b.

696. Seminar

i. Epidemiology (3) I II [Rpt/8 units]

896. Seminar

b. * Epilepticologic Methods (3) I II [Rpt/1]

* Psychosocial Epidemiology (2) Available as both 596 and 896.

Exercise and Sport Sciences

(See Health-Related Professions)

Family and Consumer Resources (FCR/MCS/FS/HEE/ID/COUN)

FCR Building, Room 205
(602) 621-1075

Professors Victor A. Christopherson (Emeritus), Interim Director, Oscar C. Christensen, Roger J. Daldrup (Emeritus), Kathryn L. Hatch, James R. Hine (Adjunct), Jean Ruley Kearns (Emeritus), Amy Jean Knorr (Emeritus), Doris E. Manning (Emerita), Shirley O'Brien (Adjunct), Naomi A. Reich (Emerita), Associate Director, Robert R. Rice, Carl A. Ridley, David W. Rowe and Associate Professors Ellen Goldsberry, Associate Director FCR Extension Programs, Donna R. Iams, Maureen A. Kelly, Roger M. Kramer, Philip J. Lauver (Emeritus), Jessica Lazarus (Adjunct), Mary H. Marion (Emerita), Betty J. Newton, Soyeon Shim, Angela Taylor, Mari S. Wilhelm

Assistant Professors Donna H. Christiansen, James E. Deal, Mary Ann Eastlick, Daniel J. Flannery, Wendy Gamble, Lynn Lyon, Susan B. Silverberg

Extension Specialists Sherry L. Betts, Lawrence M. Sullivan, Shirley Jo Taylor, Frank R. Williams

Lecturers Oscar Blasquez, Chet J. Ross

Adjunct Professors James R. Hine, Shirley O’Brien

Adjunct Associate Professor Jessica Lazarus

Adjunct Instructor Ruth Ann Fowler

The School of Family and Consumer Resources provides instructional, research, extension and outreach programs that enable families, individual family members and consumers to achieve an optimum quality of life throughout the lifespan. Instructional programs prepare professionals for careers serving families and consumers in a culturally diverse and rapidly changing society.

The undergraduate program has as its major objectives: (1) specialization in various aspects of Family and Consumer Resources, in preparation for professional positions, and (2) courses to enrich the professional preparation of students in other colleges.

The school is organized into two divisions, Family Studies and Merchandising and Consumer Studies, and two program areas, Counseling and Guidance and Interior Design.

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

Interior design is being phased out. No new majors are being accepted. Faculty and some element of the interior design program have been transferred to Architecture. Students interested in the area should contact the College of Architecture.

Graduate degree programs offered by the School of Family and Consumer Resources include the Master of Arts with a major in counseling and guidance; the Master of Science with a major in family and consumer resources; home economics education; the Master of Education with a major in family and consumer resources; and the Master of Home Economics Education with a major in home economics education. For the Master of Science degree with a major in family and consumer resources, concentrations are available in family studies; consumer studies; merchandising; and home economics education. The school also offers the Doctor of Philosophy with a major in family and consumer resources. Emphases are available.
in consumer studies; human development, interpersonal relationships and family resource management. For further information, consult the Graduate Catalog.

Students enrolled in majors in Family and Consumer Resources may select a minor subject area with the approval of the student's advisor.

**Family and Consumer Resources (FCR)**

The major in Family and Consumer Resources combines three disciplines into a coherent and intellectually challenging major. Designing the major requires that the student (a) prepare a written proposal, (b) meet with an advisor, (c) have a final proposal accepted, and (d) receive an advisor's signature. Each student will select two subject areas (21 units each) from within FCR. The student will select a third subject area within FCR or outside of FCR. All applications must be submitted to an FCR committee for approval.

**297. Workshop**
- a. Self and the World of Work (1) I II
- b. Student Executive Training in Higher Education (2) I II
- c. Student Assistant in College Residence Halls (1) I

**465. Women in International Development** (3) II (Identical with ANTH 465) May be convened with 565.

**565. Women in International Development** (3) II (Identical with ANTH 565) May be convened with 465.

**696. Seminar**
- Family and Consumer Resources (1-3) [Rpt.] I II

**Division of Merchandising and Consumer Studies**

S. Shim, Chair

The Merchandising and Consumer Studies Division offers a program of professional education preparing students for careers in the fast changing merchandising institutions that serve families and individual consumers in a global society. The purpose of the undergraduate curriculum in the MCS major is to provide a broad education to prepare the students not only for their professional careers but also for their responsible citizenship and leadership roles in society.

The MCS major coursework, concentrated in the upper-division portion of the degree program, focuses on the effective and efficient delivery of products and services to consumers through four core components of the program: products and services environment, business environment, visual and aesthetic environment, and consumer and global environment.

Prior to the upper-division standing, students are encouraged to complete a basic foundation of general education, including course work in communications, mathematics, physical and environmental science, arts, literature, and language, the social and behavioral sciences, and world civilizations.

It is important for students to note that they are required to meet the advanced upper-division standing requirement (a cumulative grade-point average of 2.6 or above) in merchandising and consumer studies to establish eligibility for the upper-division level courses in the major. Also important is to note the advanced standing requirement (a cumulative grade-point average of 2.75 or above) required by the College of Business and Public Administration to establish eligibility for the upper-division level business courses.

Any course work that might be applicable to the upper-division professional core major requirements taken while enrolled in other colleges or at other universities is subject to acceptance by the School of Family and Consumer Resources for degree certification purposes.

The major in merchandising and consumer studies: Majors must complete five general education study areas, as described in the College of Agriculture section of this catalog (see school advising sheets for specific requirements for study areas); as well as completing ENGL 101 or 103H, 102 or 104H; COMM 112; HE E 428; ENGL 307; MATH 117 or ENGL 111 or approved course. Major requirements include: MCS 114, 115, 284, 304, 315, 310 or 346, 349, 404, 434, 454; 6 units from MCS 434, 376 or 454, AREC 446; ENGL 337, 351 or 468, 469, 352 or 346, 376 or 454, 6 units from MKTG 361, 458, or 452 or 456 (first two MKTG courses are required; students can choose from second group); and 9 units from ACCT, FIN, MAF, 305, 320, 330.

114. Introduction to Merchandising (3) I II
The processes involved in moving apparel and related consumer products from development through the wholesale and retail system.

115. Fundamentals of Design (3) I Theory and exploration of design elements and principles; historical aspects and contemporary trends. Open to FCR and L AR majors only or consult department before enrolling.

114. Introduction to Consumer Affairs (3) I II
Overview of the problems and issues facing consumers and roles of consumer affairs professionals. P 114 or CR.

284. Textile Science (4) I Scientific theory concerning fibers, yarn, fabric construction and finishes; use of scientific data related to selection, use and care. P, CHEM 101a, 102a, or PHYS 102a, 180a.

284. Textile Science (4) I Scientific theory concerning fibers, yarn, fabric construction and finishes; use of scientific data related to selection, use and care. P, CHEM 101a, 102a, or PHYS 102a, 180a.

304. Merchandising Analysis (3) I II Development of merchandising policies and procedures used in retailing with emphasis on retail mathematics. P, 284, ACCT 200.

310. Consumer Economics (3) I (Identical with AREC 310)

315. Merchandising Promotion (3) I II Activities used to influence sales of merchandise and services to promote trends and ideas; promotional plans including advertising, visual display, special events and publicity. P, 114.

335. Hard Goods Product Evaluation (3) I (Identical with I D 335)

346. Textiles and Apparel in the International Economy (3) II Domestic and international economics of the textile and apparel industries with emphasis on production, distribution, and global setting. Current and future international and domestic issues and problems are included. P, ECON 201a or 201b.

354. Soft Goods Product Evaluation (3) II Understanding of the product characteristics (as price, quality, design, and other attributes) and their relationship to the retail establishment and the target customer. P, 114, 284.

376. Consumer Problems (3) I II The buyer-seller relationship, with emphasis on consumer problems, the consumer movement, and business and consumer rights and responsibilities.


388. Design for Living (3) S Elements and principles of interior design, planning for space, personal lifestyle, and budget; lighting, color, materials, and furnishings; designed for nonmajors.

411. Consumer Issues in Nutrition (3) S (Identical with N FS 411)

434. Strategic Merchandise Management (3) II Application of retail planning and control procedures with emphasis on development and evaluation of retail strategies. P, 315, MKTG 361, MKTG 458 or CR. May be convened with 534.


455. Visual Merchandising and Display (3) I S All aspects of displaying merchandise, including window display, interior display, color and lighting techniques, line and composition, three-dimensional presentation, fixtures and systems, planning and layout, scheduling and promotion. P, 115 or ART 101. May be convened with 555.

456. Store Planning and Design (3) I II Studies the retail environment, taking into account all the physical and psychological effects that initi-
tiate and motivate customer activity. 3L. P, 455. May be convened with 556.

507. Research Methods in Merchandising and Consumer Studies (3) II Research literature, methods, techniques, and procedures for conducting research, and analysis and interpretation of data. P, 3 units of graduate statistics.

534. Strategic Merchandising Management (3) II For a description of course topics, see 434. Graduate-level requirements include testing on additional references on appropriate topics and completion of three projects. P, 304, MKTG 361. May be convened with 434.

540. Consumer Concepts and Theory (3) I For a description of course topics, see 440. Graduate-level requirements include reading and developing weekly briefs of research articles in the literature on consumer behavior for presentations in class, tests on supplemental readings, and a term paper 10 pages longer and including 20 additional academic references than those required of undergraduates. May be convened with 440.

554. New Developments in the Textile Field (3) I For a description of course topics, see 454. Graduate-level requirements include a research report suitable for publication and an oral presentation. P, 284. May be convened with 454.

555. Visual Merchandising and Display (3) I S For a description of course topics, see 455. Graduate-level requirements include an indepth research paper on a design-related aspect or issue. P, 115 or ART 101. May be convened with 455.

556. Store Planning and Design (3) II For description of course topics, see 456. Graduate requirements include indepth research paper. May be convened with 456.

600. International Consumer and Retailing (3) I 1994-95 Understanding of international market environment and retailing structure, system, issues and trends in the contemporary global market; analysis of cultural, social, legal, political influence on international consumption pattern and retailing process. Developing retailing strategies on a global basis.

607. Topics in Merchandising and Retailing (3) [Rpt./6 units] II 1993-94 Analysis of current major topics or issues facing merchandising and retailing industries. P, 540, 606.

634. Retail Merchandising Analysis (3) I 1993-94 Analysis of current literature and case studies of major issues facing retail management. P, 3 units statistics, 3 units research methods.


Division of Family Studies
D. Rowe, Division Chair
The division of family studies offers two majors; family studies and home economics education. The major in family studies focuses on generation and dissemination of basic 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 human development, interpersonal relations, or family life education. The major in home economics education 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 degree in Family and Consumer Resources. Home economics education majors will not be allowed to register for 300- or 400-level home economics or College of Education courses until successful completion of the writing proficiency exam.

The major in family studies: Majors must complete five general education study areas as described in the College of Agriculture section of this catalog (see school advising sheets for specific requirements for study areas); as well as completing ENGL 101 or 103H, 102 or 104H; ENGL 308; ALC, 3 units; MATH 117/R/S; MIS 114, 115, 284, 388; I D 136; SER elective, and N FS 101.

Family Studies (FS)

117. Human Development and Relations (3) I II Behavioral science approach to human development through the life span.

137. Life Span Family Relations (3) I II Behavioral science approach to family development through the life span.

223. Child Development (3) I II Growth, development, and socialization of the child within the family setting, from conception to the middle school years; observations of infants and preschoolers. P, PSYC 101.

316. Social and Financial Stressors in Families (3) I 1993-94 Study of the impact of normative and non-normative family life transitions on individuals and families, with emphasis on related social and financial stressors. Course content will include theoretical perspectives on current literature relevant to the study of family life stressors. P, 137.

337. Dynamics of Family Relations (3) I II The modern family and its relationships with emphasis on marriage and interpersonal relationships. P, 137.

347. Child Development in Group Settings (3) I Laboratory experience with young children. Supervised experience with 3-5 year-old children in a group setting; interactions, observations, discussions. 2R 3L. P, 223.


403. Advanced Adolescent Development (3) II (Identical with ED P 403) May be convened with 503.

407. Problems in Child Development (3) II Special child-rearing contexts in contemporary society; poverty, minority group membership, social change, and special developmental considerations. P, 223.
413. Issues in Aging (3) II Introduction to gerontology, with emphasis upon contemporary issues. (Identical with GERO 413).

423. Socio-Cultural Context of Human Development (3) II Examination of the social and cultural contexts of individual development, including family, community, peers, school, and ethnic groups as well as the influence of social class and economic conditions. Special attention will be given to socialization and development of ethnic-American children and adolescents. P: 117. (Identical with ED P 423). May be convened with 523. Writing-Emphasis Course.

427. Problems in Marriage and the Family (3) I Identification and analysis of major problem areas in marriage and the family, including economic, sexual, role conflict, emotional disorders, and child rearing. P: 137.

447. Advanced Child Development (3) I In-depth examination of various dimensions of human growth and development. P: 223; 6 units of PSYC. May be convened with 547. Writing-Emphasis Course.*

457. Bio-Social Determinants of Socialization (3) II Bio-social factors, including genetic influences, related to development, socialization, and cross-cultural patterns of behavior. P: 223; 6 units of child dev. or SOC or PSYC (Identical with SOC 457) Writing-Emphasis Course.*

466. Family Economics (3) I Analysis of the family as an economic decision-making unit within the larger economic system. P: ECON 201b. May be convened with 566.

477. Genetic Basis of Normal and Deviant Traits (3) II Explores methods of studying genetic influences on human traits and summarizes research findings on normal traits, such as sociability and IQ, and on deviant traits such as criminality. Implications for the fields of family studies, sociology, and psychology are considered. May be convened with 577.

487. Advanced Family Relations (3) II Critical analysis of selected studies and current research in family relations. P: 337, or SOC 321. May be convened with 587. Writing-Emphasis Course*.

537. Analysis of Family Studies (3) I An analysis of major research topics; critical resources relevant to graduate training; and ethical/professional issues related to the conduct of research.

547. Advanced Child Development (3) I For a description of course topics, see 447. Graduate-level requirements include additional assignments. P: 223; 6 units of PSYC May be convened with 447.

557. Methods in Marital Therapy (3) I Theories and principles of counseling for marital, marital, and group counseling situations. (Identical with COUN 557)

566. Family Economics (3) I For a description of course topics, see 466. Graduate-level requirements include extra required readings and an in-depth term paper. P: ECON 201b. May be convened with 466.

567. Theories of Human Development (3) II Analysis of major paradigms and world views influencing the study of human development. Overview of key issues and controversies arising in the field as well as evaluations of specific theories and specific theorists.

573. Theories of the Family (3) II Major theories of the family to include theory construction, historical roots of family theories, and classic and contemporary family theories. P: 9 units of family studies, psychology or sociology.

577. Genetic Basis of Normal and Deviant Traits (3) II For a description of course topics, see 477. Graduate-level requirements include a research proposal or paper. May be convened with 477.

587. Advanced Family Relations (3) II For a description of course topics, see 487. Graduate-level requirements include extra required readings and an in-depth term paper. P: 337, or SOC 321. May be convened with 487.


500. Life Span Development (3) (Identical with ED P 500).

503. Advanced Adolescent Development (3) II (Identical with ED P 503) May be convened with 403.

507a-507b. Research Methods in Family Studies (3-3) 507a: I Design issues of general relevance to behavioral research. 507b: I Design issues of particular relevance to family and developmental research. Both 507a and 507b are offered in the fall semester only.

523. Socio-Cultural Context of Human Development (3) II For description of course topics, see 423. Graduate-level requirements include a review of research literature. (Identical with ED P 523). May be convened with 423.

533g. Teaching Home Economics (4) I (Identical with TTE 338g) Writing-Emphasis Course*.

*Writing-Emphasis Courses. P, Satisfaction of the upper-division writing-proficiency requirement (see “Writing-Emphasis Courses” in the Academic Policies and Graduation Requirements section of this catalog).


411. Consumer Issues in Nutrition (3) S (Identical with NFS 411)

428. Professional Presentations and Techniques (3) I Theory and practice of educational techniques in non-formal settings in positions in business, government and human services. 3L. May be convened with 528.

439. Non-Formal Education (3) II (Identical with A ED 439) May be convened with 539.

489. Supervised Teaching in Home Economics (1-12) II Teaching vocational home economics under supervision in approved programs in secondary schools in Arizona. Preregistration first semester of the junior year. P: TTE 338g; CR, HE E 408.

493. Internship

e. Supervised Work Experience in Home Economics (1 to 6) [Rpt./2] II Open to home economics education majors only.

509. Occupational Home Economics Programs (3) I 1993-94. For a description of course topics, see 409. Graduate-level requirements include developing two evaluation instruments (one affective and one psychomotor) and developing two sets of teaching materials, e.g., job training manual. P, CR, TTE 338g. May be convened with 409.

528. Professional Presentations and Techniques (3) I For a description of course topics, see 428. Graduate-level requirements include a paper and a 30 to 45-minute presentation on a topic from the outline. In addition, graduate students must design an educational program tailor-made to their interest. May be convened with 428.

539. Non-Formal Education (3) II (Identical with A ED 539) May be convened with 439.

597. Workshop
d. Administration, Management, and Supervision of Non-formal Education (1) [Rpt./3] I II (Identical with A ED 597d, which is home).

g. Computer Application in Agricultural and Non-formal Education (1) [Rpt./3] I II (Identical with A ED 597g, which is home).

h. Family Development through Home Economics Programs (1-2)
ney. Environmental Education in Agriculture (1) [Rpt./3] II I (Identical with A ED 597n, which is home)
6. Developments in Non-Formal Education (1) [Rpt./3] II I (Identical with A ED 597, which is home)

607. Topics in Home Economics Education (1-3) [Rpt./12 units] II S Philosophy, content, and resources for understanding, teaching, and working in home economics education.

609. Supervision in Vocational Education and Extension (3) II 1994-95 Theory, principles and techniques of supervision in vocational and extension education.

610. Investigation and Studies in Home Economics (3) I Study and analysis of research literature, methods, techniques, and procedures for conducting investigations, selecting and developing plans for research problems.

628. Curriculum Theory in Home Economics (3) II 1994-95 Theoretical bases and processes of curriculum building in home economics; current issues in home economics education.

**Interior Design (I D)**

This program is being phased out. No new majors are being accepted. Faculty and some element of the interior design program have been transferred to Architecture. Students interested in the area should contact the College of Architecture.

The major in interior design: 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 103; 102 or 104H; COMM 112, ENGL 307, MATH 117/118, MIS 111, and two of the following courses: MCS 284 or ARCH 101; 3 units selected from I D 345, I D 365, 385, 405; MKTG 361; PSYC 371, 427; EXSS 2 (units); FCR upper-division course from outside the major.


345. Interior Perspective (3) S Application of various one-point perspectives in interior design. Use of techniques such as pencil, ink, color pencils and markers applied to interior perspective for presentation as well as use of sketches and furniture perspectives. P, drafting course.

355. History of Design (3) I Period styles in interiors and furniture, ancient to the 20th century. P, 6 units of art history, HIST 101, 102 or 8 units of HUM 250a-b. Writing-Emphasis Course

365. Housing (3) II Human needs in housing; housing structure; and construction practices. Field trips. P, junior standing.


385. Computer Aided Drafting (3) II Introduction to the basic concepts of computer graphics and the basic set-up and operation of a computer graphics system. Assignments, design problems, and final interior design project included. 4S. For majors only. P, MIS 111.

405. Barrier Free Design (3) II Current research in architecture, interior design, product design, physical therapy, behavioral science and rehabilitation reviewed and applied in design problem-solving. P, 9 units of individuals, Societies and Institutions courses. May be convened with 505.

435. Advanced Computer Aided Design (3) I An advanced course using the computer to create sophisticated presentation drawings. Projects exploring potential applications in computer aided design/drafting with emphasis on 3D modeling and isometric drawing. SF, 275, Open to majors only.

475. Public Space Design (4) I Studio projects with specific focus on interior environments designated for public usage. Includes programing, design development, project documentation and organization, working drawings and presentation techniques. P, 375, 385. May be convened with 575.

485. Ethics and Practice for Interior Design (3) II Readings in the interior fields, with emphasis on ethics, business organization, communication and professional development. Includes study of billing and fee structures; writing proposals, contracts, specifications; and highlights various career tracks associated with the design profession. P, 475. May be convened with 585.

488. Advanced Public Space Design (4) III Studio projects with special focus on large-scale multifunction public space environments; design development by teams. P, 475. May be convened with 588.

489. Ethics and Practice for Interior Design (3) II Readings in the interior fields, with emphasis on ethics, business organization, communication and professional development. Includes study of billing and fee structures; writing proposals, contracts, specifications; and highlights various career tracks associated with the design profession. P, 475. May be convened with 585.

495. Barrier Free Design (3) II For a description of course topics, see 405. Graduate-level requirements include an additional research paper dealing with a theoretical aspect of barrier-free design.

503. Principles of Adlerian Psychology (3) S An analysis of issues in addictions counseling ranging from various theoretical positions, information regarding diagnosis of addictive personality, treatment programs, and research. P, 6 units of counseling or related area.

505. Addictions Counseling (3) S An analysis of issues in addictions counseling ranging from various theoretical positions, information regarding diagnosis of addictive personality, treatment programs, and research. P, 6 units of counseling or related area.

550. Counseling and Human Sexuality (3) S Sexual function, dysfunction, and disorders in context of individual and couple; interview techniques and intervention strategies. P, 6 units of counseling or related area.

557. Methods in Marital Therapy (3) I Identical with FS 557

570. Counseling the Adult (3) S Adult crisis, life changes and developmental patterns; counseling techniques and intervention strategies. P, 6 units of counseling or related area.

571. Counseling Women (3) S Examination of the counseling needs of contemporary women and current types of intervention designed to meet these needs. P, 6 units of counseling or related area. (Identical with WS 571)

579. Workshop d. Counseling Children and Adolescents (3) S 

f. Professional Relationships: Building Communication and Mediating Conflict (3) I S 

j. Anger, Depression and Guilt (3) S P, 6 units of counseling or related area.

k. Psychodrama (3) S P, 6 units of counseling or related area.

m. Counseling Mexican Americans (3) S Foundations of Counseling (3) I 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 Methods of appraising and reporting individual behavior, with emphasis on non-psyrometric data. Open to majors only.
623. Testing in Counseling (3) I Evaluation and selection of psychological tests for guidance; use of psychometric data in counseling. Open to majors only.
631. Career Counseling (3) I Theories of vocational development; types, sources, and use of occupational and educational information in career counseling and decision making. P, 601 or CR.
644. The Counseling Process (3) II Introduction to theories of counseling: collation and interpretation of counseling data; the counseling process; study of cases. P, 601, 622.
645. Theories of Counseling (3) II Rationale, development, and research underlying major counseling theories. P, 631, 644.
647. Premarriage and Marriage Counseling (3) I Contemporary issues, concepts, and procedures in premarriage and marriage counseling. P, 622.
648. Procedures in Family Counseling (1 to 3) II Theory and process in family counseling; problem solving techniques applied to parent-child conflict; lab. experience. P, 403.
672. Cross-Cultural Counseling (3) II Issues, research and procedures involved in counseling with culturally different persons. Open to majors only. P, 601, 622.
683. Group Counseling (3) I Theory and process in group counseling; applications in community and mental health settings; lab. experience. P, 644.
(Identical with MAP 481)
481. Finance and New Venture Development (4) I Financial integration of marketing, production, and management functions. Prerequisite: ECON 330, MKTG 361. (Identical with MAP 481)
484. Development of New Ventures Plans (4) II (Identical with MAP 484)
*Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.
511. Managerial Finance (3) I Integration of the basic principles and underlying theory of finance, with emphasis on analytical financial management of business firms and other organizations. Open only to students admitted to a BPA graduate program. P, ACCT 550.
512. Advanced Corporation Finance (3) II Financial theory applied to capital structure; investment decisions; corporate valuation; and corporate financial policies. P, 412 or 511.
528. Topics in Public and Nonprofit Financial Management (3) II (Identical with PA 328)
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 en-
The Department of French and Italian offers language 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 of Italy and in business French. Study abroad options include programs in Florence and in Paris.

Undergraduate majors in French or Italian attain a command of the language and a knowledge of the culture that can prepare them to teach at the secondary level or to undertake postgraduate studies in French or Italian, or to pursue careers in international business or in the foreign service. Departmental majors selecting the latter option may combine language study with a thematic business minor in the College of Business and Public Administration, concentrating in general business, management, or marketing. This option provides a solid foundation of marketable skills for careers in international business and finance, communications and technology, government and administration.

Degree Programs: Bachelor of Arts with a major in French (concentrations in French literature and culture, or in business French or in teaching); Bachelor of Arts with a major in Italian; Master of Arts with a major in French; and Doctor of Philosophy with a major in French. An option at the M.A. level is the program in Francophone studies, focusing on the cultural originality and vitality of French-speaking areas outside of France (Quebec, Belgium, the Maghreb, Black Africa, the Caribbean). Doctoral minors are offered in Italian, French and Francophone literatures, and interdisciplinary programs are available in conjunction with women's studies, the graduate interdisciplinary programs in comparative cultural and literary studies, and the program in second language acquisition and teaching.

Writing-Emphasis Courses: Because writing in all upper-division courses is in the language of instruction (French or Italian), the requirement will be satisfied through completion of at least one 3-unit course designated as a Writing-Emphasis Course within the department (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog). Consult an undergraduate advisor.

The department participates in the honors program and offers honors sections of selected courses. Inquire with the departmental honors advisor.

French (FREN)

Unless otherwise indicated, all courses are taught in French. For purposes of appropriate placement, enrollment in all language courses is subject to the consent of the instructor. Under certain circumstances, FREN 355 can be substituted for FREN 375a if a 375a-level supplement is taken at the final exam and if a grade of B or better is obtained.

Literature major: 36 units past the 201 level, including 350, 375a-375b, the three 400-level survey courses, 401, 402, and 403, and two additional electives from the 400 level, one of which must be a course in literature or creative writing. No fewer than 24 units must be upper-division course work. The minor subject will be chosen in consultation with the major advisor.

Teaching major: 36 units past the 201 level, including 350, 372, 375a-375b, 401, 414, 430b, 470. Consult with undergraduate advisor.

Business Emphasis Option: 36 units past the 201 level, including 370a-370b, 375a-375b, 401, 416, 430b. No fewer than 24 units must be from upper-division course work. Among recommended courses for the remaining units are 372, 430a, 470. The minor subject will be chosen in consultation with the major advisor.

French Minor: Various options are available for a French minor. Consult an undergraduate advisor in French for details.

Unless otherwise specified, in a course sequence a-b, a is a prerequisite to b.

101. Elementary French I (4) I II S CDT Listening, speaking, reading, and writing; an introduction to the basic structures and vocabulary of French. (Does not count toward the French major or minor.) Also see 113, 213.

102. Elementary French II (4) I II S CDT Listening, speaking, reading, and writing; an introduction to the basic structures and vocabulary of French, continuation. P, 101 or placement. (Does not count toward the French major or minor.) Also see 113, 213.

112. Accelerated French I (6) S 112 is the equivalent of 101 and 102. Credit is allowed for this course or 101 and 102, but not for both.

113. Intensive French I (4) I II S 113 is the equivalent of 101 and 102. Credit is allowed for this course or 101 and 102, but not for both. P, 305b. Credit is allowed for this course or 101 and 102, but not for both. (Note: 113 "Intensive" covers the same materials as 112 "Accelerated," which is offered summer only.)

201. Intermediate French I (4) I II S CDT Continued skill development; reinforcement
of basic language skills. P, 102 or placement. (Does not count toward the French major or minor.)

202. Intermediate French II (4) I II S CDT Continued skill development; reinforcement of basic language skills. P, 201 or placement.

212. Accelerated French II (6) S 212 is the equivalent of 201 and 202. Credit is allowed for this course or 201 and 202, but not for both.

213. Intensive French II (4) II 213 is equivalent to 201 and 202. Credit is allowed for this course or 201 and 202, but not for both. P, knowledge of another foreign language at the 305b level, or consult department before enrolling. (Note: 113 "Intensive" covers the same material as 112 "Accelerated," which is offered summer only.)

282. The French Novel and Society (3) I French literature in translation. Does not count toward fulfillment of language requirement, or the major or minor in French. Taught in English.

283. Existentialism and the Absurd: The French Foundations (3) II French literature in translation. Does not count toward fulfillment of language requirement, or the major or minor in French. Taught in English.

285. Introduction to Humanities Computing (3) S (Identical with GER 285)

305a-305b. Composition and Conversation (3-3) Designed for students who wish to write and speak fluently in everyday idiom, material based on practical current topics. P, 202. Both 305a and 305b are offered each semester.


355. Intensive Composition and Conversation (3) S For students at advanced and high intermediate levels. Materials for discussion and writing exercises are derived from current activities in Paris (films, plays, and other cultural events). Offered in Paris program only. P, 202 or two years of college French. Under certain conditions, FREN 355 can be substituted for FREN 375a if a 375a level supplemental is taken at the final exam and if a grade of B or better is obtained.


375a-375b. Advanced Composition and Conversation (3-3) Practice in formal writing and formal oral communication. P, 305b. Both 375a and 375b are offered each semester.

396H. Honors Proseminar (3)

401. French Literature of the 19th and 20th Centuries (3) Survey of French literature of the period with selected readings of major authors, textual analysis and discussion of historical, social and cultural background. P, 350.

402. French Literature of the 17th and 18th Centuries (3) Survey of French literature of the period with selected readings of major authors, textual analysis and discussion of historical, social and cultural background. P, 350.


414. Teaching of Modern Languages (3) II (Identical with TTE 414)


416. Translation (3) II Theory and practice of translation (French/English; English/French). Literary and technical. P, 375b or 370b.

422. Introduction to Romance Philology (3) I 1994-95 (Identical with SPAN 422)

425. Paris: Capsule/Capital of French Cultural History (3) S The cultural history of France surveyed through selected works of literature, art, and architecture. Readings and discussions, in conjunction with faculty-guided visits to historical sites in Paris. Offered in Paris program only. P, 202 or two years of college French.

430a-430b. French Civilization (3-3) Historical, social, economic, literary, and artistic elements in the development of the French nation. 430a is not prerequisite to 430b. P, 305b.

440. French Poetry (3) I The evolution of poetic form and content from the Middle Ages to the present. P, 350.


452. French Literature of Quebec (3) I 1994-95 Comprehensive study of the most significant literary expression in Quebec. P, 350. May be convened with 552.


457. Advanced Grammar and Usage (3) II Structural analysis of spoken and written French, with emphasis on structural patterns and attention to contrasts with English. P, 305b.

458. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 485) May be convened with 558.


510. Introduction to Graduate Study in French Language and Literature (3) I 1993-94 Problems and methods of advanced research in French language and literature. Use of specialized library resources and computerized data bases. Issues in the history, sociology, and politics of the professional practice of language and literature study in American universities.

511. Contemporary French Literary Theory (3) II 1993-94 Methods of criticism and techniques of literary analysis.

515a-515b. Literature of the 20th Century (3-3) 1994-95 515a: Novel. 515b: Poetry and drama. 515a is not prerequisite to 515b.

516a-516b. Literature of the 19th Century (3-3) 1994-95 516a: Poetry and theatre. 516b: Novel and short story; intellectual current. 516a is not prerequisite to 516b.

517a-517b. Literature of the 18th Century (3-3) 1993-94 Study of ideas in the French Enlightenment. 517a: Rationalist currents. 517b: Sensibility. 517a is not prerequisite to 517b.

518a-518b. Literature of the 17th Century (3-3) 1993-94 518a: Literature and culture in the first half of the 17th century. 518b: The Classical ideal. 518a is not prerequisite to 518b.

519a-519b. Literature of the 16th Century (3-3) 1993-94 519a: Early Renaissance. Reformations. Rabelais, the Pleiad. 519b: The Humanists, Montaigne, D'Aubignye, the drama. 519a is not prerequisite to 519b.


548. Theory and Practice of Writing (3) II 1993-94 An experiment in writing, concerning the means, the raw material at our disposal and the different literary devices that allow us to achieve it. (Identical with ENGL 548)

550a-550b. French Literature of Black Africa and the Caribbean (3-3) I II 1994-95 450a: For a description of course topics, see 450a-450b. Graduate-level requirements include more demanding readings and other assignments. May be convened with 450a-450b.

552. French Literature of Quebec (3) I 1994-95 For a description of course topics, see 452. Graduate-level requirements include more demanding readings and assignments. P, 350. May be convened with 452.

553. Culture and Civilization of North Africa (3) I II 1994-95 For a description of course topics, see 453. Graduate-level requirements include more demanding readings and assignments. Taught in English. May be convened with 453.

554. Francophone Literature of the Maghreb and Lebanon (3) I II 1994-95 For a description of course topics, see 454. Graduate-level requirements include more demanding readings and assignments. Taught in English. May be convened with 454.

579. Problems in Teaching College French (1 to 3) I II Methodology course in lower-division college pedagogy. Discussion of broader issues of language, pedagogy, academy, the history of foreign language education, college teaching as a career.
585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 585) May be convened with 485.

587. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)

696. Seminar a. French Linguistics (3) [Rpt.]: I II
   b. Foreign Language Pedagogy (3) [Rpt.]: I II
   c. French Literature: General Topics (3) [Rpt.]: I II
   d. Old French Literature (3) [Rpt.]: I II
   e. Sixteenth Century (3) [Rpt.]: I III
   f. Seventeenth Century (3) [Rpt.]: I III
   g. Eighteenth Century (3) [Rpt.]: I III
   h. Nineteenth Century (3) [Rpt.]: I III
   i. Twentieth Century (3) [Rpt.]: I II I I.
   P, 579.
   k. Francophone Literature and Culture (3) [Rpt.]

   *Note: May be repeated for credit when content varies. Consult department for current topics.

Italian (ITAL)
The major: 32 units (in addition to 101 and 102), including 305a-305b and 400a-400b, and 12 additional units of literature courses in the 400 series. No fewer than 24 units must be upper-division course work.

The minor: 20 units (in addition to 101 and 102), including 305a-305b and 400a-400b.

Students with teaching minors are required to complete a course in the methodology of foreign-language teaching used in high school and/or community college.

101. Elementary Italian I (4) I II CDT Listening, speaking, reading, and writing; and introduction to the basic structures and vocabulary of Italian. Does not count toward the Italian major or minor. Also see 102.

102. Elementary Italian II (4) I II CDT Listening, speaking, reading, and writing; an introduction to the basic structures and vocabulary of Italian, continuation. P, 101 or placement. Does not count toward the Italian major or minor. Offered each semester. Also see 102.

102a. Intensive Elementary Italian (4) I P, language major or demonstrated language proficiency. Corresponds to 101 and 102.

201. Intermediate Italian I (4) I II CDT Continued skill development; reinforcement of basic language skills. P, 102 or placement. Also see 202.

202. Intermediate Italian II (4) I II CDT Continued skill development; reinforcement of basic language skills. P, 201 or placement. Also see 202.


282. The Middle Ages: Italian Literature in Translation (3) I II Detailed study of representative masterpieces of Italian literature of the Middle Ages. Does not count toward fulfillment of language requirements nor for the major or the minor in Italian. Counts toward the general education requirement in literature. Taught in English.

283. The Renaissance: Italian Literature in Translation (3) I II Detailed study of representative masterpieces of Italian literature of the Renaissance. Does not count toward fulfillment of the language requirement nor for the major or the minor in Italian. Counts toward the general education requirement in literature. Taught in English.

284. Italian Theater in Translation (3) I II 1993-94 Detailed study of Italian theater from its origins in the Middle Ages to the contemporary stage. Does not count toward fulfillment of the major or the minor in Italian. Counts toward the general education requirement in literature. Taught in English.

305a-305b. Composition and Conversation (3-3) GRD Emphasis on improving listening, comprehension, speaking, and writing. P, 202 or consult department before enrolling.

400a-400b. Main Currents of Italian Literature (3-3) 400a: The Middle Ages and Renaissance. 400b: The 17th through 20th centuries. P, 202 or consult department before enrolling.


404a-404b. The Renaissance (3-3) 1993-94 404a: Study of representative masterpieces of Humanism and the Early Renaissance in Italy. 404b: High and Late Renaissance in Italy. P, 202 or consult department before enrolling. Alternates between 404a-404b. May be convened with 504a-504b.

504a-504b. The Renaissance (3-3) 1993-94 For a description of course topics, see 404a-404b. Graduate-level requirements include more demanding readings and other assignments. P, 202. May be convened with 404a-404b.

505a-505b-505c-505d-505e-505f. Literary and Cultural Studies (3-3-3-3-3) 1993-94 For a description of course topics, see 405a-405b-405c-405d-405e-405f. Graduate-level requirements include more demanding readings and other assignments. P, 202. May be convened with 405a-405b-405c-405d-405e-405f.

506a-506b. The Novel (3-3) 1994-95 For a description of course topics, see 406a-406b. Graduate-level requirements include more demanding readings and other assignments. May be convened with 406a-406b.

696. Seminar a. Italian Literature (3) [Rpt.]: I II

Genetics (GENE)
Biosciences West Building, Room 310
(602) 621-7511
Graduate Interdisciplinary Program in Genetics
Committee:
Professors Harris Bernstein (Microbiology and Immunology), Robert P. Erickson (Pediatrics), William B. Heed (Emeritus), Conrad Istock (Ecology and Evolutionary Biology), Margaret G. Kidwell (Ecology and Evolutionary Biology), Brian A. Larksins (Plant Sciences), John W. Little (Biochemistry), Robert G. McDaniel (Plant Sciences), Neil H. Mendelson (Molecular and Cellular Biology), Richard E. Michod (Ecology and Evolutionary Biology), David W. Mount (Molecular and Cellular Biology), David C. Rowe (Family and Consumer Resources), Nobuyoshi Shimizu (Molecular and Cellular Biology), Hans VanEtten (Plant Pathology), Samuel Ward (Molecular and Cellular Biology)

Associate Professors Dennis T. Ray, Chair (Plant Sciences), Danny L. Brower (Molecular and Cellular Biology), Suzanne B. Cassidy (Pediatrics), Sue K. Denise (Animal Sciences), Carol L. Dieckmann (Biochemistry), Jennifer D. Hall (Molecular and Cellular Biology), Tim Helentjaris (Plant Sciences), Eugene Homye (Pediatrics), Dennis T. Ray (Plant Sciences),

450. Renaissance Studies (3) S Taught in English. On-site study of the birth and development of the Italian Renaissance with emphasis on Florence. Offered only in Florence, Italy.

502a-502b. II Trecento (3-3) 1994-95 For a description of course topics, see 402a-402b. Graduate-level requirements include more demanding readings and other assignments. P, 202. May be convened with 402a-402b.

504a-504b. The Renaissance (3-3) 1993-94 For a description of course topics, see 404a-404b. Graduate-level requirements include more demanding readings and other assignments. P, 202. May be convened with 404a-404b.

505a-505b-505c-505d-505e-505f. Literary and Cultural Studies (3-3-3-3-3) 1993-94 For a description of course topics, see 405a-405b-405c-405d-405e-405f. Graduate-level requirements include more demanding readings and other assignments. P, 202. May be convened with 405a-405b-405c-405d-405e-405f.

506a-506b. The Novel (3-3) 1994-95 For a description of course topics, see 406a-406b. Graduate-level requirements include more demanding readings and other assignments. May be convened with 406a-406b.

696. Seminar a. Italian Literature (3) [Rpt.]: I II
Genetics from various departments comprise the interdepartmental program in 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.

415. Somatic Cell and Molecular Genetics (2) II (Identical with MCB 415) May be convened with 515.

416. Computer Analysis of Sequences (3) II (Identical with MCB 416) May be convened with 516.

423. Cytogenetics (3) II (Identical with ECOL 423) May be convened with 523.

432. 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 432) May be convened with 533. Ward.

435. Evolution (3) I (Identical with ECOL 435) May be convened with 535.

473. Recombinant DNA Methods and Applications (4) II (Identical with MCB 473).

509. Statistics for Research (4) I II (Identical with STAT 509).

513. Quantitative Genetics (3) I 1994-95 (Identical with AN S 513).

515. Somatic Cell and Molecular Genetics (2) II (Identical with MCB 515) May be convened with 415.

516. Computer Analysis of Sequences (3) II (Identical with MCB 516) May be convened with 416.

520. History of Genetics (1) I 1994-95 Experiments and discoveries which have led to the present state of knowledge in the various areas of genetics. P, ECOL 320 or 321.

523. Cytogenetics (3) II (Identical with ECOL 523) May be convened with 423.

524. Theoretical Population Genetics (3) I (Identical with ECOL 524).

525. Speciation (2) II (Identical with ECOL 525).

533. Human Genetics (3) I For a description of course topics, see 433. Graduate-level requirements include an in-depth research paper on a current problem in human genetics.

P, ECOL 320 or 321. (Identical with ECOL 533) May be convened with 433. Ward.

535. Evolution (3) I (Identical with ECOL 535) May be convened with 435.

545. Concepts in Genetic Analysis (3) I (Identical with MCB 545).


568. Nucleic Acids (4) I (Identical with MCB 568).

570. Molecular Genetics & Evolution (3) I 1994-95 (Identical with MCB 570).

574. Advances in Mammalian Genetics (2) [Rpt./1] I 1994-95 (Identical with MCB 574).

589. Cancer Genetics and Cytogenetics (3) I 1994-95 (Identical with CBIO 589, which is home).

595. Colloquium a. Genetics (1) I [Rpt.] I II

601. Molecular and Cellular Biology (4) I Acquire a basic understanding of modern genetics, molecular biology and cell biology, and learn how to apply that understanding to human disease. Open to students in the Masters degree program in Genetic Counseling only. (Identical with MCB 601, which is home).

627. Advanced Genetics (3) II 1994-95 (Identical with PL S 627).

635. Advanced Cytogenetics (4) I 1994-95 (Identical with PL S 635).

665. Survey Physical Anthropology (3) (Identical with ANTH 665).

666. Human Microevolution (3) II 1994-95 (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)

Harvill Building, Room 409 (602) 621-1652


Associate Professors D. Robert Altschul, Charles F. Hutchinson (Arid Lands Resource Sciences), Katherine K. Hirschboeck (Climatology, Tree Ring Laboratory), Stuart E. Marsh (Arid Lands Resource Sciences), Sallie A. Marston, Marvin Waterstone, Assistant Professors Andrew C. Comrie, Lisa J. Graumlich (Dendrochronology and Renewable Natural Resources), Beth A. Mitchell.

Curricula in geography and regional development are designed to contribute to general education; to provide a solid substantive and methodological grounding in geography for those who plan to teach or pursue graduate work in the field; and to provide preparation for those persons desiring professional training and/or careers in such fields as urban and regional planning, land development, resource management, environmental policy-making, foreign service, and cartography and remote sensing.

The degrees of Bachelor of Arts with a major in geography and Bachelor of Science with a major in geography are available through the College of Arts and Sciences and the Bachelor of Arts in Education, with a teaching major in geography, is available through the College of Education. In addition, the Master of Arts, Master of Education, and Doctor of Philosophy degrees are offered with a major in geography. The Master of Science with a major in planning (regional planning concentration) is offered through the Graduate College for students wishing professional preparation for careers in planning for urban and rural regions. For graduate admission and degree requirements, consult the Graduate Catalog.

The major in geography: 35 units, including 101a-102b, 103a-103b, 104a-104b, 105a, 105b, 106a, 106b, 107, at least 3 units from 330, 381, 417, 418, 457, 481, 483; and at least 3 units from 151, 375, 407, 408, 411, 412, 413, 464, 469. To complete the remainder of the 35 minimum required units, students may design their own concentrations or may select one of four structured concentrations: geographical applications and methods, people-environment interaction, urban geography and planning, world regions and cultures. At least 18 units must be at the upper-division level.

The major in regional development: 35 units, including 102b, 110 or 301, 303, 371, 379, 412, 418, 457, 481, 483, and at least three units from 453, 456, 471. At least 21 units must be at the upper-division level. A supporting minor in economics, finance, real estate, marketing, or general business is recommended.

A minimum of three units of internship (393) may be counted toward either the major in geography or the major in regional development.

Interdisciplinary studies majors may elect a geography or regional development concentration; students may also...
101a-101b. Physical Geography (3-3) Treats the atmosphere, biosphere, hydrosphere, and lithosphere as interrelated and geographically variable components of the earth's physical landscapes and the natural environment of humans. Both 101a and 101b are offered each semester. 101a is not prerequisite to 101b. Both 101a and 101b are offered each semester. An honors section of 101a is available. Pederson/Kirby/Marston/Gibson

104a-104b. Physical Geography Laboratory (1-1) Field observation and laboratory analysis of data and map interpretation. 104a: P, CR, 103a. 104b: P, CR, 103b. Both 104a and 104b are offered each semester. 104a is not prerequisite to 104b. Reeves/Comrie/Altschul

110. Regional Land Use (3) Problems of regional environments in relation to the use and development of activities on the land. Emphasis on field study of actual land uses and introduction to the analysis and mapping of these using microcomputers. The relation of land use to taxation, zoning, and real estate transfer and development. (Identical with PLNG 110) Mann

151. World Regional Geography (3) I II Geographic concepts and information organized by conventional region and nation. Appropriate for elementary and secondary teaching.

171. Introduction to Meteorology and Climatology (3) I II (Identical with ATMO 171)

171L. Introduction to Meteorology and Climatology Laboratory (1) I II (Identical with ATMO 171L)

301. Introduction to Regional Planning (3) II Introduction to the principles and techniques used for planning in metropolitan and rural regions. Field trips. (Identical with PLNG 301) Mann

305. Economic Geography (3) I II Analysis and modeling of the spatial structure of primary, secondary, and tertiary economic activities; location theory and regionalization in economic systems. Mulligan/Mitchneck Writing-Emphasis Course*

330. Introduction to Remote Sensing (3) I Introduction to remote sensing principles, techniques, and applications, designed primarily for those with no background in the field. (Identical with G EN 330, GEOS 330, S W 330, and WS M 330) Marsh

337. Geographical Research Methods (3) I II Formulation and solution of geographic problems; models, research design, and methods of gathering, analyzing, and portraying geographic data. 2R, 3L. P. 3 units of geography. Marston Writing-Emphasis Course

360. Environmental Perception (3) II Consideration of patterns in human perception in relation to modification of environment and environmental planning. Saarinen Writing-Emphasis Course*

371. Principles and Practices of Regional Development (3) I Introduction to basic concepts, objectives, practices and techniques of regional and industrial development as a professional activity, with emphasis on development problems and solutions. Field trips. Gibson Writing-Emphasis Course*

373. Political Geography (3) II Explores links between global economic and political processes, national affairs and local politics. Designed to foster participation; assessment is via essays and assignments. (Identical with POL 373) Kirby Writing-Emphasis Course*

375. Metropolitan Tucson (3) I Physical and cultural bases of Tucson's geographic patterns, with emphasis on the city's site, situation, settlement patterns and problems of growth and change. Field trips. Saarinen

379. Urban Growth and Development (3) I S Location patterns in urban areas and processes of growth; historical development of U.S. cities, rent theory, housing markets, commercial and industrial location, the role of transportation and planning. Student development teams create a model city using the ACRES real estate simulation game. (Identical with PLNG 379) Plane

381. Cartography (3) I Tools and techniques, properties and construction of projections, design and preparation of maps for publication. 2R, 3L. Altschul

387. The American Landscape (3) II Origin and character of the visual aspects of places viewed individually and regionally; changes in habitat, vernacular structures and landscapes, townscales, countriesides and special features. Field trips. (Identical with L AR 407) May be convened with 507. Zube Writing-Emphasis Course*

407. Arizona and the Southwest (3) I The changing character of the land and man's occupation of it, with emphasis on Arizona; historically and problem oriented. Field trip. May be convened with 508. Writing-Emphasis Course*

409. Russia and the Former Soviet Union (3) II Political, population and economic elements of contemporary Russia and the former Soviet Union. Emphasis on human settlement, economy, and resource development. (Identical with RSS 409) May be convened with 509. Mitchell Writing-Emphasis Course*

411. Middle America (3) II Land, people, and culture in the major natural and cultural regions of Mexico, Central America, and West Indies. (Identical with LA S 411) May be convened with 511. Pederson Writing-Emphasis Course*

412. South America (3) I Physical and cultural bases of South America's geographic patterns, with emphasis on human settlement and problems of resource development. (Identical with LA S 412) May be convened with 512. Pederson Writing-Emphasis Course*

413. Africa (3) II Physical and human bases of regional contrasts, with emphasis on tropical environmental systems and changing patterns of resource utilization and development. May be convened with 513. Altschul Writing-Emphasis Course*

415. Introduction to Water Resources Policy (3) II (Identical with HWR 415) May be convened with 515.

416. Rural Area Development (3) I (Identical with AREC 416) May be convened with 516.

417. Introduction to Geographic Information Systems (3) II (Identical with RNR 417) May be convened with 517.

418. Advanced Geographic Information Systems (3) III (Identical with RNR 418) May be convened with 518.

431. Global and Regional Climatology (3) III 1944-95 Description and analysis of the atmospheric circulation process that produces differences in climates throughout the world. Emphasis on the earth's problem climates and climatically sensitive zones most susceptible to floods, droughts, and other environmental stresses due to global change. P. ATMO 171/GEOG 171 or GEOG 103a. May be convened with 531.

453. Locational Analysis (3) I Industrial location theory and location factors, consumer travel behavior and market areas, geography of economic impacts, location of public facilities. (Identical with PLNG 453) May be convened with 553. Mulligan Writing-Emphasis Course*

456. The American City (3) I An integrated approach to the built environment with special emphasis on the historical, social, and political aspects of American urban development. (Identical with PLNG 456) Marston Writing-Emphasis Course*

457. Statistical Techniques in Geography, Regional Development and Planning (3) I Methods of gathering and analyzing data for the solution of geographical, urban, and regional planning problems, with emphasis on quantitative and statistical techniques used in spatial analysis and cartography, on the one hand, and program planning, on the other. P. MATH 117R or 117S or equivalent preparation. (Identical with PLNG 457) May be convened with 557.

459. Land Use and Growth Controls (3) II Current planning and legal techniques to regulate the rate of growth, the sequence of growth, and the eventual total size of towns, regions, and states: concentration on case
461. Population and Resources (3) I (Rpt. /1) I Estimates of present and potential world population; distribution and methods of conserving important resources. (Identical with HWR 461, LA S 461 and PLNG 461) Waterstone Writing-Emphasis Course*

464. The Arid and Semiarid Lands (3) II Past, present and future of settlement and resource utilization in the world’s arid lands; spatial interrelationships of environmental, demographic, socioeconomic and political systems. May be convened with 564. Bonine Writing-Emphasis Course*

465. Physical Aspects of Arid Lands (3) I The climate, landforms, hydrology, soils and vegetation of deserts, with special emphasis on processes and distribution at micro-to-macro scales. May be convened with 565. Altschul Writing-Emphasis Course*

469. Geography of the Middle East (3) I Physical environments and cultural areas of Southwest Asia, with emphasis on people-environment interrelationships, settlement systems, and impact of Islam. (Identical with NES 469) Bonine Writing-Emphasis Course*

471. Problems in Regional Development (3) II Analysis of population growth trends, market areas, the role of transportation in development, regional specialization and economic structure, interregional migration, and regional policy issues. (Identical with AREC 471 and PLNG 471) May be convened with 571. Mitchell Writing-Emphasis Course*

476. The Land Development Process (3) [Rpt. /1] II A case-oriented approach to site selection, rezoning, financing, architectural design, economic feasibility, and other facets of the land development process. Field trip. Consult with department before repeating course. (Identical with PLNG 476) May be convened with 576. Mann

478. Global Change (3) II (Identical with GEOS 478) May be convened with 578.

481. Computer Cartography (3) II Introduction to the use of computers for map production, with emphasis on cartographic principles and practical experience with several user-oriented mapping programs. (Identical with PLNG 481) May be convened with 581.

483. Geographic Applications of Remote Sensing (3) II Use of aircraft and satellite imagery for monitoring landforms, soils, vegetation and land use, with the focus on problems of land-use planning, resource management and related topics. 2R, 3L. Field trip. P, two units of remote sensing or equivalent experience. (Identical with PLNG 483) May be convened with 583. Marsh

488. Governing Science and Technology (3) II Historical, cross-cultural, and geographical assessment of strategies societies have deployed to govern science and technology; effects of particular strategies in terms of impacts (both positive and negative) of science and technology on people, their lives, and the environment. (Identical with ANTH 488 and POL 488) Waterstone Writing-Emphasis Course*

490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.

496. Seminar (3) II Open to majors and honors students. Honors section available. P, junior or senior standing in Geography plus 357, or honors standing. Writing-emphasis course.*

497. Workshop (3) II Geography for Teachers (3) S May be convened with 597a.

499. Physical Aspects of Arid Lands (3) I The climate, landforms, hydrology, soils and vegetation of deserts, with special emphasis on processes and distribution at micro-to-macro scales. May be convened with 599. Altschul Writing-Emphasis Course*

500. Current Geographical Research (3) I Major trends and issues in human and physical geography. Kirby/Waterstone

504. Public and Policy Economics (3) II (Identical with PA 504)

507. The American Landscape (3) II For a description of course topics, see 407. Graduate-level requirements include the completion of an essay and annotated bibliography on the work of a specific scholar, place, or region. Field trips. (Identical with L AR 507) May be convened with 407. Zube

508. Arizona and the Southwest (3) I For a description of course topics, see 408. Graduate-level requirements include the completion of an original research paper on an approved topic. Field trip. May be convened with 408.

509. Russia and the Former Soviet Union (3) II For a description of course topics, see 409. Graduate-level requirements include two research projects. May be convened with 409. Mitchell

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 PLNG 510) Mann

511. Middle America (3) II For a description of course topics, see 411. Graduate-level requirements include three tutorial sessions and a research-review paper. (Identical with LA S 511) May be convened with 411. Pederson

512. South America (3) I For a description of course topics, see 412. Graduate-level requirements include three tutorial sessions and a research-review paper. (Identical with LA S 512) May be convened with 412. Pederson

513. Africa (3) II For a description of course topics, see 513. Graduate-level requirements include the completion of and oral presentation of an original research paper on an approved topic. May be convened with 413. Altschul

515. Introduction to Water Resources Policy (3) II (Identical with HWR 515) May be convened with 415.

516. Rural Area Development (3) I (Identical with AREC 516) May be convened with 416.

517. Introduction to Geographic Information Systems (3) II (Identical with RNR 517) May be convened with 417

518. Advanced Geographic Information Systems (3) II (Identical with RNR 518) May be convened with 418.

550. Metropolitan and Regional Planning (3) II 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 PLNG 550) Mann

553. Locational Analysis (3) I For a description of course topics, see 453. Graduate-level requirements include the completion of several data-intensive research projects. (Identical with PLNG 553) May be convened with 453. Mulligan

556. Urban Systems Analysis (3) II Theoretical and applied analysis of urban growth models, gradients of urban influence, residential and facility decisions, and urban transportation. (Identical with PLNG 556)

557. Statistical Techniques in Geography, Regional Development and Planning (3) I For a description of course topics, see 457. Graduate-level requirements include the completion of several data-intensive research projects. (Identical with PLNG 557) May be convened with 457.

559. Land Use and Growth Controls (3) II For a description of course topics, see 459. Graduate-level requirements include the completion of a series of research projects. (Identical with PLNG 559) May be convened with 459. Mann

561. Resource Management (3) I Examination and critical appraisal of social and behavioral science aspects of resource management, with special emphasis on factors affecting decision making. (Identical with PLNG 561) Saarinen

563. Perception of Environment (3) I Examination of interdisciplinary research on environmental perception; consideration of social and behavioral variables at all scales of environmental perception and planning. (Identical with PLNG 563) Saarinen

564. The Arid and Semiarid Lands (3) II For a description of course topics, see 464. Graduate-level requirements include the completion of an original research paper on an approved topic. (Identical with AR L 564) 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. (Identical with AR L 565) May be convened with 465. Reeves

567. Geographical Analysis of Population (3) II Population distribution and change; practical methods of demographic analysis, migration, business and planning applications. (Identical with PLNG 567) Plane
Geological Engineering
(See Mining and Geological Engineering)

Geosciences (GEOS)
Gould-Simpson Building, Room 208
(602) 621-6024


Associate Professors Mark D. Barton, Andrew W. Cohen, Owen K. Davis, Randall M. Richardson, Joaquim Ruiz, Robert Singer (Planetary Sciences)
Assistant Professors Lawrence M. Anovitz, Suzanne Baldwin, L. Susan Beck, George E. Gehrels, Roy A. Johnson, Jay Quade
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 (Emeritus), William J. Robinson (Emeritus), Charles W. Stockton, Marvin A. Stokes (Emeritus)
Associate Professor Katie Hirschboeck, Steven W. Leavitt
Assistant Professors Lisa J. Graumlich, Thomas W. Swetnam

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 sources, water, industrial and commercial minerals, and questions concerning earth processes involved in modern geologic studies.

The department offers the following degree programs: Bachelor of Science in Geosciences with concentrations in geology or geophysics; and a Master of Science and Doctor of Philosophy with a major in geosciences. For graduate admissions and degree requirements, consult the Graduate Catalog. The degree of Bachelor of Science in Education with a teaching major in earth sciences is available through the College of Education.

The B.S. in Geosciences (geology concentration): In addition to the requirements of the College of Arts and Sciences, the following courses are required: GEOS 101, 102, 103, 104, 209, 225, 302, 315, 321, 322, any four 400-level GEOS courses, and a field program (GEOS 412 and 413, or equivalent), MATH 124 or 125a, 125b, and one additional course from MATH 215, 223, STAT 263 (or STAT 160); CHEM 103a-103b, 104a-104b; PHYS 110, 116, 121; C SC 115 (or other approved computer course); plus approved electives from geosciences and supporting fields to total 131 units.

The B.S. in Geosciences (geophysics concentration): In addition to the requirements of the College of Arts and Sciences, the following courses are required: GEOS 101, 102, 103, 104, 209, 302, 321, 322, 412, 416, 420, and 419 or 424 or 432 or 434 or 469; MATH 124 or 125a, 125b, 225, 254, and 422a; CHEM 103a-103b, 104a-104b; PHYS 110, 116, 121; C SC 115 (or other approved computer course); plus approved electives from geosciences and supporting fields to total 131 units.

Students in the B.S. in Education (earth science teaching major) enroll in the College of Arts and Sciences as a prerequisite major for the freshman and sophomore years. Although students meet with a pre-educa major in the Department of Geosciences. Students must apply for admission, and subsequent transfer, to the College of Education for their junior and senior years. The required courses include: ASTR 110a; ATM0 171; GEOS 101, 102, 103, 104, and 401, MATH 124, 125a. A minimum of 12 additional elective units require two courses selected from GEOS 225, 321, 322, 431, 450, 453 or 478; one course on societal issues in earth science
from GEOS 415, GEOS 473, ATMO 336 or ECOL 206; and one course from ASTR 301, ATMO 300a or 300b, PTYS 403 or ECOL 302. If either ASTR 301 or ATMO 300a or 300b is chosen, ASTR 110a or ATMO 171, respectively, will be waived from the core requirement. The teaching minor may be a single minor or a split minor from chemistry, physics, or biology; a single minor in mathematics is also acceptable. Students must also satisfy the College of Arts and Sciences general education requirements and professional preparation courses in the College of Education.

A variety of geosciences minor options are available to students in other departments: earth resources, environmental geoscience, geochronology, geophysics, mineralogy, and palaeontology. A split minor is also an option. An advisor in the student's field of interest will assist in selecting courses. The geosciences major requires 20 units of approved earth science courses, including GEOS 101, 102, 103, 104; ASTR 110a-110b, and ATMO 171.

The department participates in the honors program.

101. Introduction to Physical Geology (3) Earth's materials; surface and internal geologic processes; development of plate tectonics model. CR, 103.


106. Survey of the Solar System (4) I II (Identical with PTYS 106)

107a. Introduction to Global Change (4) I Examination of the ways humanity alters the global environment; analysis of linkages between components of the earth system (i.e., atmosphere, biosphere, and geosphere). 107a not prerequisite to 107b. For non-majors only. (Identical with HWR 107a)

107b. Introduction to Global Change (4) I (Identical with HWR 107b)

110. Environmental Geology (3) I II Introduction to geologic studies and their application to current environmental problems, their causes and possible solutions. Focuses on surface geologic processes and geohazards, natural resources, and global systems. Field trips. Primarily for nonmajors. Kresan/ Schreiber

209 Introduction to Crystallography and Mineralogy (4) II GRD Geometric crys-
tallography. Internal structure of crystals. Crystal chemistry. Chemical and physical properties of major rock-forming minerals. Mineral paragenesis. Laboratory consists of identification of major minerals in hand specimen and optics. 3R, 3L, P. 101, 103, CHM 103a-103b, 104a-104b. Snow

225. Introduction to Paleontology (4) I GRD Basic principles and concepts; morphology and classification of fossils; their occurrence, distribution, geologic and evolutionary significance. 3R, 2L. Field trips. P, 102, 104. Flessa

280. History of Life (II) II Scenarios and explanations for major events in the history of life from the origin of the Earth to the evolution of humans. Lindsay


315. Introduction to Petrology (4) I GRD II Classification, distribution, and genesis of igneous and metamorphic rocks; chemical diagenesis. Hand specimen and thin section analysis 3R, 3L. P, 209. Anovitz

319. 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, 3L. P. 101, 102. G. Gehrels

322. Introduction to Geophysics (3) I I GRD Physical principles applied to problems in earth science including seismology, gravity, magnetic, heat flow, plate tectonics, PHYS 116 and 130b. Butler

330. Introduction to Remote Sensing (3) I (Identical with GEOG 330)

346H. Natural Resources and Society (3) I History of the impact of minerals and metals on development of society and civilization, uniqueness of resources, current situation and problems. P, junior standing. Tilley

396H. Honors Proseminar


400. Introduction to Geochemistry (3) I Nuclear systemsatics and thermodynamics with applications to geologic processes. P, 101, 103, CHM 103b, 104b. May be convened with 500. Ruiz

403. Introduction to the Solar System (3) I 1993-94 (Identical with PTYS 403) May be convened with 503.

404. Petrographic Techniques (3) I Introduction to application of modern petrographic techniques. Use of optical theory, optical petrography, electron microprobe and image processing to examine and describe minerals and other materials. 2R, 3L. May be convened with 504. Anovitz


407. Photogeology (3) I II (Identical with G EN 407) May be convened with 507.

408. Mammalian Phylogeny and Evolution (3) I 1994-95 A study of the mammalian fossil record, with emphasis on taxonomy and morphologic evolution of selected mammal orders. 2R, 3L. Field trips. May be convened with 508. Lindsay


411. Introduction to Planetary Geology (4) I 1994-95 (Identical with PTYS 411)


413. Geology Field Camp II (3) S Field studies in geology, with emphasis on geologic mapping. Fee. P, 412.


416. Field Studies in Geophysics (3) I II S (Identical with G EN 416) May be convened with 516.

417. Sedimentary Basin Analysis (3) II Stratigraphic sedimentological, paleogeographic, and paleotectonic evolution of sedimentary basins with attention to facies relations, depositional systems, and structural and plate tectonic framework. P. 302. May be convened with 517. Parrish

418. Advanced Mineralogy (3) I 1994-95 Structure and crystal chemistry of minerals, microstructural development, kinetics and mechanisms of mineral reactions and transformations, with application to determining geologic history of rocks. P, 209 or consult department before enrolling. May be convened with 518. Snow

419. Global Tectonic Processes (3) II Plate tectonics; thermal properties and processes in the Earth; mechanical behavior of lithosphere and mantle; global gravity and geoid. P, MATH 254, PHYS 121. (Identical with PTYS 419) May be convened with 519. Richardson/Chase

421. Tectonometamorphism (3) II 1993-94 Introduction to the use of thermodynamics and kinetics in constraining the P·T· Variables controlling subsolidus processes. Application of these results to interpretations of regional tectonics and the thermal evolution of planetary bodies. P, consult with department before enrolling. May be convened with 521. Anovitz
423. Regional Structural Geology (3) [Rpt.] I Geologic mapping in a variety of rock types and structural regimes, with emphasis on the recognition and solution of regionally significant structural problems. Field trips. P, 413. May be convened with 523. G. Gehrels

424. Paleomagnetism: Principles and Applications (3) II Physical basis for remanent magnetism in rocks, techniques of sample collection, measurements, and statistical treatment; review of polarity time scale, apparent polar wander, plane tectonics. P, PHYS or 116. May be convened with 524. Butler

425. Regional Tectonics (3) I Discussion of the geology, geophysics, petrology, and geochemistry of different types of orogenic systems and their tectonic evolution. Methods of tectonic regionalization and integration based on lithotectonic assemblages and terranes, and regional structural geology. Plane tectonic regimens and kinematics. May be convened with 525. Conen

426. Cordilleran Tectonics (3) II Geologic and tectonic evolution of the North American Cordillera based on analysis of geologic, paleomagnetic, and paleobiogeographic constraints and tectonic models. May be convened with 526. Gehrels

429. Scanning Electron Microscopy (2) I Introduction to the principles and methods of Scanning Electron Microscopy/Energy Dispersive Spectroscopy and Image Analysis for geological/paleontological samples. Students will have the opportunity to conduct original research in SEM/EDS/IA as a portion of the laboratory. 2R, 3L. May be convened with 529.

431. Hydrogeology (3) I (Identical with HWR 431) May be convened with 531.

432. Introduction to Seismology (3) I Fundamentals of earthquake seismology; wave propagation, interpreting seismograms, and quantifying earthquake sources. P, MATH 254. May be convened with 532. Wallace


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 enrolling. May be convened with 540. Chase


447. Industrial Minerals and Rocks (3) I 1994-95 Geology, origin, mode of occurrence, and methods of evaluation of nonmetallic mineral deposits. 2R, 3L. P, 446. May be convened with 547. Guilletti

448. Geophysical Exploration and Engineering (3) I (Identical with G EN 448) May be convened with 548.


451. Sedimentary Petrology (4) I Hand specimen, detrital grain, and thin section study of terrigenous clastic rocks, including mudrocks, carbonaceous rocks and associated evaporites; cherts, iron-rich rocks, and phosphorites. 2R, 6L. Field trips. P, 302, 315. May be convened with 551. Schreiber

452. Petroleum Geology (3) I Origin, migration, chemistry, and accumulation of petroleum; reservoir mechanics, types of traps; recovery of petroleum; oil shales and tar sands. 2R, 3L. May be convened with 552. Nagy

453. Glacial and Quaternary Geology (3) II Glacial processes, landforms, and deposits. Physical aspects of Quaternary paleoenvironmental change and effects on fluvial, eolian, lacustrine, weathering, and mass movement processes. P, 102, 104. May be convened with 553. Baker

457. Low Temperature Geochemistry (3) II Equilibrium and kinetic chemical processes producing soils, natural waters, and chemical sediments. P, 101, 103, 400/500 or CHEM 480a; CHEM 103b, 104b. (Identical with HWR 457) May be convened with 557. Long

458. Geochronology (3) I Introduction to geochronologic methods used in the geological sciences including K-Ar/39Ar, Rb-Sr, Sm-Nd, U-Th-Pb, and fission track techniques. Application of isotopic dating techniques to the study of crustal dynamics. P, PHYS 110, 116, MATH 124 or 125A, CHEM 103a, 103b, 104a, 104b or consult department before enrolling. Open to majors only. May be convened with 558.

459. Thermochronology (3) II Closure temperature and methods used to determine temperature-time histories of igneous and metamorphic rocks. Applications of thermochronology and P-T-t paths of crustal terranes. P, 458/558, MATH 254 or permission of instructor. May be convened with 559.


464. Introduction to Dendrochronology (4) Survey of dendrochronological theory and methods. Applications to archaeological, geological, and biological dating problems and paleoenvironmental reconstruction. Emphasis on dating methods, developing tree-ring chronologies, and evaluating tree-ring dates from various contexts. 2R, 4L. Field trips. (Identical with ANTH 464 and WS M 464) May be convened with 564. Swetnam

469. Seismic Data Processing (3) I Fundamental theory and practical applications of time-series analysis and digital filtering. A problem-solving approach to seismic reflection data processing. P or CR, 434, MATH 422A. May be convened with 569. Johnson

470. Introduction to Paleozoology (3) II Palaeontologic approaches to the reconstruction of ancient environments, populations, and communities. Evolution of communities through geologic time. 2R, 3L. Field trips. P, 225, 302. May be convened with 570. Flessa

473. Geology and the Urban Environment (3) II Geologic processes that result in loss of life and property damage; emphasis on case studies of urban areas in the Southwest. Implications for public policy. 2R, 3L. All-day field trips. (Identical with PLNG 473) May be convened with 573. McCullough

475. Cenozoic Mammalian Faunas (3) II 1993-94 Study of mammal faunas and deposits yielding those faunas, with emphasis on sequential ordering of the faunas using biostratigraphic and paleomagnetic methods. 2R, 3L. Field trips. May be convened with 575. Lindsay

478. Global Change (3) II Analysis of the entire Earth system through an examination of how its component parts and their interactions have changed in the past and may be expected to change in the future. P, upper-division standing; introductory course work in biological and physical sciences. (Identical with ECOL 478, GEOG 478, HWR 478 and RNR 478) May be convened with 578. Graumlich

482. Paleoclimatology (3) I 1994-95 Topics in paleoclimatology including prediction of palaeoclimatic patterns, proxy paleoclimatic indicators, and paleoclimatic cycles. May be convened with 582. Parish

490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.

497. Workshop (c) Dendrochronology (2L). (Identical with ANTH 497c and WS M 497c). May be convened with 597c.

500. Introduction to Geochemistry (3) I For a description of course topics, see 400. Graduate-level requirements include an independent research report. P, 101, 103: CHEM 103b, 104b. May be convened with 400. Ruiz

503. Introduction to the Solar System (3) I 1993-94 (Identical with PTYS 503) May be convened with 403.

504. Petrographic Techniques (3) I For a description of course topics, see 404. Graduate-level requirements include a paper and class presentation. May be convened with 404. Ahonitz

505. Applied Multispectral Imagery (3) II (Identical with G EN 505)

506. Conservation Biology (3) II 1994-95 (Identical with ECOL 506) May be convened with 406.

507. Photogeology (3) II (Identical with G EN 507) May be convened with 407.
508. Mammalian Phylogeny and Evolution (3) II 1994-95 For a description of course topics, see 408. Graduate-level requirements include an in-depth research paper on a topic selected by the student and instructor. P, PHYS 103b or 116. May be convened with 424. Butler.

525. Regional Tectonics (3) I For a description of course topics, see 425. Graduate-level requirements include a research paper on regional or tectonic topics. May be convened with 425. Coney.

526. Cordilleran Tectonics (3) II For a description of course topics, see 426. Graduate-level requirements include final report concerning some aspect of the tectonic evolution of western North America. May be convened with 426. Gehrels.

527. Orogenic Systems (3) II An analysis of the geology, geophysics, and geochemistry, and the tectonic evolution of selected world mountain systems ranging from currently active belts in both oceanic and continental settings back through Phanerozoic, Proterozoic, and into Archean time. Coney.


529. Scanning Electron Microscopy (2) For a description of course topics, see 429. Graduate-level requirements include a sophisticated research project. 2R, 3L. May be convened with 429.

530. Hydrogeology (3) II 1994-95 For a description of course topics, see 430. Graduate-level requirements include panel leaderships on environmental discussion sessions, and additional lab exercise questions. 3R, 3L. May be convened with 430. Johnson.

531. Exploration Geophysics: Seismic methods (3) II For a description of course topics, see 431. Graduate-level requirements include a special research project. P, MATH 254. May be convened with 431. Wallis.

532. Introduction to Seismology (3) I For a description of course topics, see 432. Graduate-level requirements include a term paper. P, MATH 254. May be convened with 432. Wallis.

533. Regional Structural Geology (3) I 1993-94 For a description of course topics, see 433. Graduate-level requirements include an independent research project or a term paper regarding some aspect of a major course topic. 2R, 3L. May be convened with 432. Wallis.


509a-509b.

510. Principles of Cosmochemistry (3) I 1994-95 (Identical with PTYS 510)

511. Late Quaternary Geology (3) I Paleo- environment and geochronology of Late Quaternary alluvium as read from the stratigraphic records and geomorphology at key localities in North America. May be convened with 411. Davis.

512. Meteorites (3) II 1994-95 (Identical with PTYS 512)

513. Applied Geochemistry (3) II Applications to geophysical problems. P, 20 units of geology, including 321, 3 units geophysics, MATH 254; consult with department before enrolling. May be convened with 440. Chase.

514. Economic Mineral Deposits (3) II GRD For a description of course topics, see 444. Graduate-level requirements include a term paper. P, 446. May be convened with 447. Guiltbert.

515. Industrial Minerals and Rocks (3) I 1994-95 For a description of course topics, see 445. Graduate-level requirements include a term paper. P, 446. May be convened with 447. Guiltbert.

516. Field Studies in Geophysics (3) I II S (Identical with G EN 516) May be convened with 416.

517. Advanced Aquatic Geology (3) I 1994-95 For a description of course topics, see 417. Graduate-level requirements include an additional research project. P, 302. May be convened with 417. Hays.

518. Advanced Mineralogy (3) I 1994-95 For a description of course topics, see 418. Graduate-level requirements include an original research proposal. P, 209 or consult department before enrolling. May be convened with 418. Snow.

519. Global Tectonic Processes (3) II For a description of course topics, see 419. Graduate-level requirements include a term paper in publication format on some aspect of a major course topic. P, MATH 254; PHYS 121. (Identical with PTYS 530) May be convened with 419. Richardson/Chase.

520. Sedimentary Basin Analysis (3) II For a description of course topics, see 420. Graduate-level requirements include an additional research project. P, 209 or consult department before enrolling. May be convened with 420. Davis.

521. Geochemical Processes in Magma Hydrothermal Systems (3) I Dynamics and chronology of natural systems are reconstructed using mathematical systems and computer models to represent the redistribution of thermal and mechanical energy around magma chambers. Norton.

522. Analytical Methods in Geophysics (3) II For a description of course topics, see 422. Graduate-level requirements include asymptotic series, special functions, probability applications to geophysical problems. P, MATH 22b. Wallis.

523. Hydrogeology (3) I II (Identical with PTYS 530) May be convened with 431. A. Davis.

524. Paleomagnetism: Principles and Applications (3) II For a description of course topics, see 424. Graduate-level requirements include an in-depth research paper on a topic selected by the student and instructor, P, PHYS 103b or 116. May be convened with 424. Butler.

525. Regional Tectonics (3) I For a description of course topics, see 425. Graduate-level requirements include a research paper on top-
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>457</td>
<td>Low Temperature Geochemistry (3)</td>
<td>II For a description of course topics, see 457. Graduate-level requirements include an independent research project or term paper in publication format. P, 101, 103, 400/500 or CHEM 480a; CHEM 103b, 104b. (Identical with HWR 557) May be convened with 457. Long.</td>
</tr>
<tr>
<td>458</td>
<td>Geochronology (3)</td>
<td>I For a description of course topics, see 458. Graduate students will be required to present projects at the end of the semester. May be convened with 458.</td>
</tr>
<tr>
<td>459</td>
<td>Thermochronology (3)</td>
<td>II For description of course topics, see 459. Graduate students will be required to present projects at the end of the semester. May be convened with 459.</td>
</tr>
<tr>
<td>460</td>
<td>Electrical Exploration Methods (3)</td>
<td>I (Identical with G EN 560)</td>
</tr>
<tr>
<td>461</td>
<td>Paleolimnological Origins (3)</td>
<td>I (Identical with ANTH 561)</td>
</tr>
<tr>
<td>462</td>
<td>Introduction to Quaternary Ecology (3)</td>
<td>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.</td>
</tr>
<tr>
<td>464</td>
<td>Introduction to Dendrochronology (4)</td>
<td>For a description of course topics, see 464. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology. 2R, 4L. Field trips. (Identical with ANTH 564 and WS M 564) May be convened with 464. Suwann.</td>
</tr>
<tr>
<td>465</td>
<td>Seismic Data Processing (3)</td>
<td>I For a description of course topics, see 466. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology. 2R, 4L. Field trips. (Identical with ANTH 564 and WS M 564) May be convened with 464. Johnson.</td>
</tr>
<tr>
<td>466</td>
<td>Advanced Seismology (3)</td>
<td>II 1993-94 Computational techniques in seismology. The application of synthetic seismograms to model source processes and complex structure. P, 432,433; MATH 422b. Wallace.</td>
</tr>
<tr>
<td>467</td>
<td>Seismic Data Processing (3)</td>
<td>I For a description of course topics, see 466. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology. 2R, 4L. Field trips. (Identical with ANTH 564 and WS M 564) May be convened with 464. Johnson.</td>
</tr>
<tr>
<td>468</td>
<td>Introduction to Paleontology (3)</td>
<td>II For a description of course topics, see 470. Graduate-level requirements include a research project and an abstract to be submitted for publication. 2R, 3L. Field trips. P, 225, 302. May be convened with 470. Fiesella.</td>
</tr>
<tr>
<td>469</td>
<td>Terrestrial Planets (3)</td>
<td>I 1993-94 (Identical with PTYS 571)</td>
</tr>
<tr>
<td>470</td>
<td>Geology and the Urban Environment (3)</td>
<td>II For a description of course topics, see 473. Graduate-level requirements include a research paper on a topic related to geologic hazards but not covered in lectures. 2R, 3L. All-day field trips (Identical with PLNG 573) May be convened with 473. McCullough.</td>
</tr>
<tr>
<td>471</td>
<td>Cenozoic Mammalian Faunas (3)</td>
<td>II 1993-94 For a description of course topics, see 475. Graduate-level requirements include an in-depth research paper on a topic selected by the student and the instructor. 2R, 3L. Field trips. May be convened with 475. Lindsay.</td>
</tr>
<tr>
<td>472</td>
<td>Global Change (3)</td>
<td>II For a description of course topics, see 478. Graduate-level requirements include an in-depth research paper on a topic selected by the student and instructor. 2R, 3L. Graduate students will be required to present projects at the end of the semester. May be convened with 458. McCullough.</td>
</tr>
<tr>
<td>473</td>
<td>Introduction to Quaternary Macropalynology (4)</td>
<td>I 1994-95 Literature and techniques of identification of plant remains still includes leaves, seeds, and wood of gymnosperms and angiosperms. 2R, 6L. Field trips. P, ECOL 472. O. Davis.</td>
</tr>
<tr>
<td>474</td>
<td>Advanced Stratigraphy (3)</td>
<td>I For a description of course topics, see 475. Graduate-level requirements include an in-depth research paper on a topic selected by the student and the instructor. 2R, 3L. Graduate students will be required to present projects at the end of the semester. May be convened with 458. McCullough.</td>
</tr>
<tr>
<td>475</td>
<td>Quaternary Paleontology (3)</td>
<td>I II 1994-95 Theory and application of pollen to geology, biology, archaeology, and paleoecology; definition of information pollen sample record; experience in pollen extraction and identification. 3R, 4L. P, ECOL 472. (Identical with ANTH 581) O. Davis.</td>
</tr>
<tr>
<td>476</td>
<td>Palaeoecology - Paleoenvironments (1-4)</td>
<td>I II For description of course topics, see 475. Graduate-level requirements include an in-depth research paper on a topic selected by the student and the instructor. 2R, 3L. Graduate students will be required to present projects at the end of the semester. May be convened with 458. McCullough.</td>
</tr>
<tr>
<td>477</td>
<td>Thermodynamics in Geosciences (3)</td>
<td>I Principles of classical and elementary statistical thermodynamics. Thermo-chemical and physical properties; equations of states for solids and gases; solutions; phase equilibrium; nonideal multicomponent systems with emphasis on geological and planetary problems. P, MATH 125a-125b, or MATH 119 and/or departmental approval before enrolling. (Identical with PTYS 583) Ganguly.</td>
</tr>
<tr>
<td>479</td>
<td>Seminar</td>
<td>a. Petrography-Petrology (1-4) (Rpt./6 units) II b. Structural Geology (1-4) (Rpt./6 units) II c. Mineral Deposits (1-4) (Rpt./6 units) II d. Petroleum Geology (1-4) (Rpt./6 units) II e. Thermochronology (1-4) (Rpt./6 units) II f. Geology and Geophysics (1-4) (Rpt./6 units) II g. Geomorphology (1-4) (Rpt./6 units) II h. Geophysics (1-4) (Rpt./6 units) II i. Stratigraphy (1-4) (Rpt./6 units) II j. Regional Tectonics (1-4) (Rpt./6 units) II</td>
</tr>
<tr>
<td>481</td>
<td>Geochemistry of Mineral Deposits and Related Rocks (4-4)</td>
<td>Principles and methods of physical chemistry as applied to ore deposits. 644a: II 1993-94 Principles. Equilibrium thermodynamics and phase equilibria, isotope geochemistry, chemical kinetics, elementary mass and heat transfer. Includes problem solving and applications to igneous, metamorphic, and sedimentary ore deposits. 644b: II 1994-95 Applications. Theoretical and analytical techniques for estimation of intensive, characterization of mass and heat transfer, and elementary genetic modeling, includes lab and class problems focused on a particular class of deposits. 3R, 3L, P, CHEM 480a. Gautier.</td>
</tr>
</tbody>
</table>
proceed to student teaching after dem-
to 10 units of credit. The student may
will include TTE 493b, which carries up
work done in the College of Education
ciency Advanced or the equivalent. The
at the level of ACTFL /ETS Oral Profi-
demonstrate oral proficiency in German
302b, 315a -315b, 400b, 410a -410b, 475a or
selected from the following: 275, 276,
language study beyond 102, and 12 units
German culture: includes 8 units of lan-
major advisor.
with the assistance and approval of the
teaching major in German.
The Department of German provides in-
Department of German faculty is
are prepared to offer courses in the follow-
ences, subject to faculty availability and
and student interest: Special Topics in
German Literature; Linguistic and
Approaches to Literature; Scandinavian
English Translation; German Cinema; German
Graduate Students; and Second
Language Acquisition, Teaching and
The department participates in the
in addition to the courses listed below, the
Department of German is prepared
courses in the following
required level of oral prof-
The teaching minor: includes 302a or
302b, 315a-315b, 475a or 475b, 479 or 480
A minimum of 9 upper-division units
must be taken in the Department of Ger-
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 Cata-
log.
The department participates in the
honors program.
In addition to the courses listed below, the
Department of German is prepared
courses in the following
required level of oral prof-
The teaching minor: includes 302a or
302b, 315a-315b, 475a or 475b, 479 or 480
A minimum of 9 upper-division units
must be taken in the Department of Ger-
Candidates must demonstrate oral
proficiency in German at the ACTFL/ETS Proficiency Intermediate High Level
or the equivalent.
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German (GER)
Modern Languages Building,
Room 571
(602) 621-7385

Professors David H. Chisholm, Max
Dufner (Emeritus), Louis F. Helbig,
Steven D. Martinson, Renate A.
Schulz, David J. Woloshin (Emeritus)
Associate Professors Roland Richter,
Acting Head, Albrecht Classen, Den-
is I. Greene (Emeritus), Babette Luz
(Emerita)
Assistant Professors Barbara Kosta, Ka-
makshi P. Murti, C. Jane Rice, Mary E.
Wildner-Bassett
Lecturer John R. Wendel

The Department of German provides
struction designed to develop fluency in
oral and written communication, knowl-
edge of German literature, and insights
into German cultural tradition. A study-
abroad exchange program at the Univer-
sity 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 ser-
vice 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 Educa-
tion and Master of Education with a
Teaching major in German.
The major: 27 units beyond 200-level
courses, including 302a-302b, 315a-315b,
400a-400b, and 410a-410b. GER 307a-307b is highly recommended.
The supporting minor must be selected
with the assistance and approval of the
major advisor.
The German minor: includes 201, 202,
302a-302b, 315a-315b, 307a or 307b.
The German minor with an emphasis in
German culture: includes 8 units of lan-
guage study beyond 102, and 12 units
selected from the following: 275, 276,
320, 375, 410a-410b, and 455.
The teaching major: includes 302a or
302b, 315a-315b, 400b, 410a-410b, 475a or
475b, and 479 and 480. Candidates must
demonstrate oral proficiency in German
at the level of ACTFL/ETS Oral Profi-
ciency Advanced or the equivalent. The
work done in the College of Education
will include TTE 493b, which carries up
to 10 units of credit. The student may
proceed to student teaching after dem-
emonstrating the required level of oral prof-

The teaching minor: includes 302a or
302b, 315a-315b, 475a or 475b, 479 or 480
A minimum of 9 upper-division units
must be taken in the Department of Ger-
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 Cata-
log.
The department participates in the
honors program.
In addition to the courses listed below, the
Department of German is prepared
courses in the following
required level of oral prof-
The teaching minor: includes 302a or
302b, 315a-315b, 475a or 475b, 479 or 480
A minimum of 9 upper-division units
must be taken in the Department of Ger-
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 Cata-
log.

277. Eroticism and Love in the Middle Ages
(3) I II Introduces the student to the culture
and mentality of the Middle Ages focusing on
attitudes toward love, sex and marriage.
Concepts of the body, of human relationship,
and eroticism will be highlighted. (Identical
with ENGL 277 and SPAN 277)

285. Introduction to Humanities Computing
(3) Basic concepts and tools for computer-
aided humanities research, with particular
emphasis on text analysis and the creative
process. No previous computer experience
required. (Identical with CLAS 285, ENGL 285,
FREN 285, LIN 285, FREN 285, SPAN 285)

201b-302b. Topics in German Literature
(3-3) Close readings of literary expression of
German thought, life and cultural developments.
P, 202. 302a is not prerequisite to 302b. Con-
sult department before enrolling.

307a-307b. Advanced Conversation (3-3) 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 prin-
ciples; 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
film from the mid-1945 period and the cinema
of the Federal Republic of Germany after 1945
to the present.

375. Love, Madness and Decay in fin-de-
siècle Vienna (3) II II S Explores the themes of
love, madness, decay and death as they ap-
pear in the works of major writers, artists,
composers and thinkers associated with Vienna
during the turn of the century, 1880-1920.
P, freshman composition, junior standing.

400a-400b. History of German Literature
(3-3) Historical survey of German literary de-
velopment from the beginning to the modern
period; lectures in German, alternating with
conferences in English. P. 6 units of upper-
division German. 400a is not prerequisite to
400b. Consult department before enrolling.

405. History of the English Language (3) I II
(Ideal with ENGL 405) May be convened with
505.

410a-410b. Cultural Development of Ger-
many (3-3) Social, political, religious, and ar-
tistic elements entering into the growth and
development of Germany; lectures in English.
410a is not prerequisite to 410b. Consult de-
partment before enrolling. Writing-Emphasis
Course. P. Satisfaction of the upper-
division writing-proficiency requirement (see
"Writing-Emphasis Courses" in the Academic
Policies and Graduation Requirements section of
this catalog).

455. Music and German Literature (3) I
1994-95 The interrelationship between music
and German literature from the 18th through
the 20th century. Concentrates on major
works of German drama, poetry and prose,
and their musical settings. Lectures in En-
glish. Readings primarily in English, some
German. P, 202. (Identical with MUS 455)
May be convened with 555.
475a-475b. **Advanced Oral Expression and Written Composition (3-3)** CDT Practical training in writing and speaking 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. Consult department before enrolling. May be convened with 575a-575b.

479. **Issues in Foreign Language Teaching (3)** I Modern methods of language teaching with emphasis on German as a foreign language. May be convened with 579.

480. **Applied Linguistics for Foreign Language Teaching (3)** II Issues in and methods of applied linguistics with emphasis on Germanic languages. May be convened with 580.

485. **Linguistic and Computer-assisted Approaches to Literature (3)** [Rpt. /6 units] I 1994-95 Application of computers to literary style, authorship, vocabulary measures, indexes and concordances, metrics and verification. P, 3 units of literature at the 300 level or above. (Identical with FREN 485, CLAS 485, LING 485, RUSS 485, and SPAN 485) May be convened with 585.

496. **Seminar**
- b. **Culture (3)** [Rpt./2] I II P, 6 units of upper-division German.

497. **Workshop**
- a. **Literature (1-5) [Rpt./5 units]** I II P, 6 units of upper-division German.
- b. **Pedagogy (1-5) [Rpt./5 units]** I II May be convened with 597a.
- c. **Culture (1-5) [Rpt./5 units]** I II May be convened with 597b.
- d. **Linguistics (1-5) [Rpt./5 units]** I II May be convened with 597c.
- e. **Translation (1-5) [Rpt./5 units]** I II May be convened with 597d.

500. **Intensive Reading German for the Sciences and Humanities (4)** Rapid acquisition of reading proficiency in German. No prior knowledge of German is necessary. Proficiency certification obtained from this course fulfills graduate foreign language requirement in some departments (consult department for information). Credit for nonmajors only. Credit is not available for German majors.

501. **Appropriating and Reshaping the Past (3)** I 1994-95 Examines the creative reception of cultural artifacts found in oral traditions, religion, politics, historical events and the arts in German-speaking cultures. P, 6 units of upper-division German.

502. **Genre as a Category for Organizing Experience (3)** I 1993-94 Examination of individual texts in relation to theories of genre, with attention to shifting definitions of genre and resistance to generic categories. P, 6 units of upper-division German.

503. **Erzihlung und Bildung in German Culture (3)** II 1993-94 Investigates theories of education and their reflection in literary works. The Bildungsroman, for instance, discloses central elements of German culture and society. P, 6 units of upper-division German.

505. **History of the English Language (3)** I II (Identical with ENGL 505) May be convened with 405.

506. **Representing the Other (3)** II 1993-94 Explores narratives that construct the Other, the foreigner, and the outsider, discloses the politics of racism, sexism and exclusion using texts from various fields. P, 6 units of upper-division German.

507. **Criticism and Creativity in German Culture (3)** II 1994-95 Examines the relationship between theories of literature and literary practice, and the question of the nature of writing in general. P, 6 units of upper-division German.

508. **Traditions and Modernism (3)** I 1993-94 Provides a critical overview of literary and intellectual currents of the "modern" period; explores the changing status and social function of literature. P, 6 units of upper-division German.

509. **Repression, Revolution, Revision (3)** I 1994-95 Maps various movements and literatures that resist the repression of history and stories. Focuses on narrative, memory and the construction of personal and national identities. P, 6 units of upper-division German.

510. **Communication and Miscommunication in Middle High and Later German Literatures (3)** II 1994-95 Explores the way German writers have dealt with basic issues of human communications. P, 302b, 315b.

512. **Bewolfl (3)** I II (Identical with ENGL 525, which is home)

517a. **Studies in Medieval Language and Literature (3)** (Identical with ENGL 527a which is home)

518. **Music and German Literature (3)** I 1994-95 For a description of course topics, see 475a-475b. 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.

518a-518b. **Advanced Oral Expression and Written Composition (3-3)** CDT For a description of course topics, see 475a-475b. 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.

519. **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.

520. **Applied Linguistics for 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 applied linguistic research. May be convened with 480.

523. **Linguistic and Computer-assisted Approaches to Literature (3)** [Rpt./6 units] I For a description of course topics, see 485. Graduate-level requirements include an additional oral report and an in-depth research paper. P, 3 units of literature at the 300 level or above. (Identical with ENGL 585, FREN 585, CLAS 585, LING 585, and RUSS 585) May be convened with 485.

581. **Testing and Evaluation in Foreign/Second Language Programs (3)** I Introduction to fundamental concepts, principles, and problems of psychometric measurement relevant to FL/L2 learning. Types of tests and their uses, test construction, analysis and interpretation of results. (Identical with CLAS 587, EAS 587, ENGL 587, FREN 587, RUSS 587, SPAN 587)

584. **Practicum**
- a. **Literature (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- b. **L2 Acquisition and Teaching (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- c. **Culture (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- d. **Linguistics (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- e. **Translation (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.

586. **Seminar**
- a. **Literature (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- b. **L2 Acquisition and Teaching (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- c. **Culture (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- d. **Linguistics (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.
- e. **Translation (1-5) [Rpt./5 units]** I II P, competency at fourth year undergraduate level of pass departmental placement examination.

597. **Workshop**
- a. **Literature (1-5) [Rpt./5 units]** I II May be convened with 497a.
- b. **Pedagogy (1-5) [Rpt./5 units]** I II May be convened with 497b.
- c. **Culture (1-5) [Rpt./5 units]** I II May be convened with 497c.
- d. **Linguistics (1-5) [Rpt./5 units]** I II May be convened with 497d.
- e. **Translation (1-5) [Rpt./5 units]** I II May be convened with 497e.

501a-501b. **Approaches to German Studies (3-3)** An overview of research materials, methods, theories and issues from which individual texts and concentrations in German studies can develop. Provides for the selection of faculty mentors.

596. **Seminar**
- a. **Literature (2-4) [Rpt.]** I II
- b. **Linguistics (2-4) [Rpt.]** I II (Identical with ENGL 696b)
Gerontology (GERO)
Geronimo Hotel
800 East University Boulevard
Suite 340
(602) 626-8104
Graduate Interdisciplinary Program in
Gerontology
Committee:
Professors Carol A. Barnes (Psychology),
Robert B. Bechtel (Psychology), John T.
Boyer (Internal Medicine), Herbert E.
Carter (Emeritus, Biochemistry),
Roger M. Enoka (Exercise and Sport
Sciences), Audrey L. Holland (Speech
and Hearing Sciences), Theodore H.
Koff (Public Administration and Pol-
cy), William A. Stini (Anthropology),
Charles W. Weber (Nutrition and Food
Science)
Associate Professors Keith F. Meredith,
Chair, Patricia C. Fairchild (Exercise
and Sports Sciences), Donna R. Iams
(Family and Consumer Resources),
Jessie V. Perigrin (Emerita, Nursing),
Pamela G. Reed (Nursing), Stella Mae
Smith (Special Education and Re-
habilitation)
Assistant Professors Iris R. Bell (Psychia-
try), Christine M. Sheehy (Nursing)

Because of its multidisciplinary nature,
courses in gerontology are located in a
number of departments. The Graduate
Interdisciplinary Program in Gerontol-
yogy plays a facilitating role in the coordi-
nation and development of aging studies
and will guide students who wish to in-
clude an emphasis in gerontology in their
course of study. Although the pro-
gram offers neither an undergraduate
nor graduate major, it is possible for stu-
dents to include an emphasis in geron-
tology in several ways. Students may
choose to incorporate courses into their
regular degree program to supplement
work in their major field. In addition
they can pursue a gerontological focus
through work in a practicum, internship,
independent study or thesis. While no
formal recognition is offered, it is possi-
ble to obtain a rich background in geron-
tology 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 curric-
ulum. At the graduate level the Program

offers a doctoral minor which is most ap-
propriate for students in areas such as
education, administration, health, nutri-
tion, and the social and behavioral sci-
ces. A minimum of 15 units is re-
quired. In addition it is possible for graduate students to obtain formal rec-
ognition through the Gerontology Cer-
tificate Program, an 18-unit course of
study similar to that offered in many
other colleges and universities in this
country. The program is designed pri-
marily for individuals planning to enter
or to continue in a profession which in-
volves provision of services and/or ad-
ministration of programs for the aging.
Students should consult with the
major department about developing a
gerontological emphasis within the ma-
jor field through course work, research,
thesis and dissertation. This most com-
monly occurs in the following academic
units: Counseling and Guidance, Psy-
chology, Special Education and Re-
habilitation, Speech and Hearing Sci-
ces, the School of Family and Consumer
Resources, the School of Public
Administration and Policy, and the
Colleges of Education, Nursing and
Pharmacy. In addition, graduate work
with a strong gerontological focus is
available in human services administra-
tion (M.P.A.) and nursing/geriatric nurse
practitioner (M.S.).

Courses in other departments identi-
fied as having content which deals
specifically with elderly and with aging
processes include: COUN 570, 571, EXSS
566, FS 413, 613, 636; I D 405/505, PA 423,
524, 527, 593f; PSYC 421/521, 427/527, and
SER 415/515, 455/555, 484/584.

Students wishing further information
should contact the coordinator at the ad-
dress above.

238. Theories of Biological Aging (2) II (Iden-
tical with NS 238)

413. Issues in Aging (3) II (Identical with FS
413)

435. Adult Development and Aging (3) I
(Identical with PSYC 435) May be convened
with 535.

437. Gerontology: A Multidisciplinary Per-
spective (3) I II (Identical with PSYC 437) May
be convened with 537.

447. Perspectives in Geriatrics Laboratory (1)
II (Identical with PHPR 447) May be convened
with 547.

485. Perspectives in Geriatrics (2) II (Identical
with PHPR 485) May be convened with 548.

547. Law of the Elderly (2) II (Identical with
PA 457) May be convened with 557.

570a. Human Adaptability (3) I (Identical
with ANTH 470a) May be convened with
570a.

535. Adult Development and Aging (3) I
(Identical with PSYC 535) May be convened
with 435.

537. Gerontology: A Multidisciplinary Per-
spective (3) I II (Identical with PSYC 537) May
be convened with 437.

547. Perspectives in Geriatrics Laboratory (1)
II (Identical with PHPR 547) May be convened
with 447.

548. Perspectives in Geriatrics (2) II (Identical
with PHPR 548) May be convened with 448.

557. Law of the Elderly (2) II (Identical with
PA 557) May be convened with 457.

570a. Human Adaptability (3) I (Identical
with ANTH 570a) May be convened with
470a.

576. Communicative Aspects of Aging (2) I
(Identical with SP H 576)

589. Health of the Older Adult (3) I (Identical
with NURS 589)

613. Issues in Aging (3) II (Identical with FS
613).

636. Economics of Aging (3) I (Identical with
FS 636).

695. Colloquium

a. Research in Gerontology (1) I II (Identifi-
cal with PHPR 695a)

Greek
(See Classics)

Health Education
(See Health-Related Professions)

Graduate Interdisciplinary
Programs
1010 N. Martin Avenue
(602) 621-8368
Interdisciplinary graduate programs are
offered by the following committees:
American Indian Studies
Applied Mathematics
Arid Lands Resource Sciences
Cancer Biology
Cognitive Science
Comparative Cultural and Literary
Studies
Environment and Behavior
Epidemiology
Genetics
Gerontology
Latin American Studies
Medieval Studies
Neuroscience
Nutritional Sciences
Pharmacology and Toxicology
Physiological Sciences
Planning
Remote Sensing
Second Language Acquisition and
Teaching
For course offerings in these programs, refer to the specific program in the Departments and Courses of Instruction section of this catalog.

For additional information, see "Office of Interdisciplinary Graduate Programs" under "The Graduate College section elsewhere in this catalog."

**Health-Related Professions (HLTH/OSH/EXSS/MEDT)**

Anne E. Atwater, Interim Director

The School of Health-Related Professions, an integral part of the Arizona Health Sciences Center, offers the following degree programs: the Bachelor of Science in Health Sciences with majors in exercise sciences, health education, physical education, medical technology, and occupational safety and health, and the Master of Science and Master of Arts degrees with a major in exercise and sport sciences.

**Community and Environmental Health**

1435 N. Fremont Ave., Room 111
(602) 882-5852

Associate Professors Richard L. Papenfuss, Head, Kam Nasser

Assistant Professors Clifton D. Crutchfield, Scott J. Leischow, Mark D. Van Ert

Instructor Sheila H. Parker

The Division of Community and Environmental Health provides instructional programs to prepare students for careers in school health education, community health education, and industrial hygiene and safety. Undergraduate studies lead to the Bachelor of Science in Health Sciences with the following majors: health education, occupational safety and health. Admission and degree requirements for these majors are listed in the School of Health-Related Professions section of this catalog (under Colleges and General Divisions).

Students selecting a teaching major other than health education may elect a teaching minor in health education in consultation with a College of Education advisor. The teaching minor in health education consists of 21 units, including HLTH 178, 278, 306, 330, 381, 430 or 432, and 434.

Students intending to minor in health education or to use health education as a general studies concentration area are expected to have a background in anatomy and physiology, nutrition, and principles of communicable diseases. Required courses include HLTH 178, 306, 330, 381, 430, 432, and 434.

**Health Education (HLTH)**

178. Personal Health and Wellness (3) I II Introduces and analyzes basic personal and community health problems, with emphasis on current scientific information essential to health promotion and maintenance of individual health. Credit for this course or 278, but not for both.

200. Introduction to Health Education (3) I II Determinants of health behavior, the process of health education, and the practice of health education. Open to majors/minors only. P. HLTH 178 or CR.

278. Health Science Promotion (3) II Basic concepts of health science, optimal health, lifestyle factors and health risks associated with the college-age population; emphasis on health promotion and intervention techniques; practical experience with individual and group health behavior change projects. Credit is allowed for this course or 178, but not for both.


330. Human Sexuality (3) I II Discussion of the basic aspects of human sexuality, including male and female reproductive physiology, congenital defects, venereal disease, myths and fallacies, variations of sexual response. Credit is allowed for 330 or SOC 324, but not for both.

381. School Health Education (3) I Emphasis on health science information applicable to health education classes; for students preparing to teach in the public schools.

393. Internship
   a. Pre-Med (3) I II 5 Open to pre-med students only.

400. Contemporary Community Health Problems (3) I II Analysis of the concept of community health services, human ecology, and conservation of human resources, with emphasis on modern miasmas such as air, water, and noise pollution; sociological problems of alcohol, alcoholism, and drug abuse.

430. Theory-based Approaches in Health Education/Health Promotion (3) I Analysis of the epidemiological data to determine the health problems of our people; behavioral relationships; and the study and application of theory-based educational strategies designed to prevent health problems. May be convened with 530.

432. Program Planning and Education in Health Education/Health Promotion (3) II Principles for planning, implementing, administering and evaluating health education programs utilizing the "PRECEDE Model" as a framework. May be convened with 532.

433. International Health (3) I Interpret the major health problems not only of the developed and emerging nations, but also the situations in underdeveloped countries; includes assistance programs by international health groups.


435. Safety Education and Accident Prevention (3) I I Analyzes the prevention of accident programs in schools, colleges, communities, and industry, with emphasis on specific protective measures pertaining to athletic, physical education, recreation, highway safety, and vocational training.

436. Traffic Safety Education (3) I Principles of accident prevention and traffic survival education, with emphasis on the certification of secondary school teachers preparing to teach driver education and training.

440. Survey of Health Education/Health Promotion Literature (3) I Examination of health education/promotion literature from ancient societies to present, including an analysis of current health literature from various professional, community, voluntary, public and international health organizations. Writing Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). May be convened with 540.

475. Alcohol Abuse and Alcoholism (1) I Review of the nature and ramifications of alcohol problems, as well as analysis of physical, psychological and social implications.

493. Internship
   a. Field Work in Health Education (3) I II Open to health education majors only.

530. Theory-based Approaches in Health Education/Health Promotion (3) I For description of course topics, see 430. Graduate students will be required to write an in-depth research paper. May be convened with 430.

532. Program Planning and Education in Health Education/Health Promotion (3) II For description of course topics, see 432. Graduate students will have the additional responsibility of writing a mock grant proposal. May be convened with 432.

535. Multicultural Health Beliefs (3) I Designed to provide a sensitivity by health promotion professionals to the varying multicultural health beliefs and needs of our society. Special emphasis on ethnic characteristics of minority populations in the State of Arizona with recommendations for programming strategies.

540. Survey of Health Education/Health Promotion Literature (3) I For description of course topics, see 440. Graduate students will have the additional requirement of completing an in-depth research paper. May be convened with 440.

**Occupational Safety and Health (OSH)**

402. Industrial Hygiene Instrumentation and Analysis (2-4) I Introduction to field sampling instrumentation and strategies, quality control, and statistical analysis, with emphasis on instrument selection and calibration. 2R, 3L, P. 486, CHEM 322, 323. May be convened with 502. Writing Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).
Exercise and Sport Sciences

Ina E. Gittings Building, Room 101
(602) 621-6989

Professors Anne A. Atwater, Acting Head, Roger M. Enoka, Timothy G. Lohman, Donna Mae Miller (Emerita), Frederick B. Roby, Mary P. Roby (Emerita), Charles M. Tipton, Jean M. Williams

Associate Professors Boyd B. Baker, William K. Coopwood (Emeritus), Gary D. Delforge, Patricia C. Fairchild, Bruce A. Larson, Richard A. Munroe (Emeritus), Kathryne E. Russell, Darrell G. Simko

Assistant Professors Ralph F. Fregosi, Kim C. Graber, Erik J. Henriksen, Kevin C. Kregel

Lecturers Thomas L. Akers, Michael E. Haddow, Monica Mize, Judy A. Sorenson, Ronald A. Sutherland

The Department of Exercise and Sport Sciences is concerned with advancing the body of knowledge in the exercise and sport sciences and preparing professionals for careers in exercise science, teaching, coaching, and research. Undergraduate majors in exercise sciences and physical education for the Bachelor of Science in Health Sciences are offered. Admission and degree requirements for both majors are listed in the School of Health-Related Professions section of this catalog (under Colleges and General Divisions).

Students selecting a teaching major other than physical education may elect a teaching minor in physical education in consultation with a College of Education advisor.

Interdisciplinary studies majors in the College of Arts and Sciences may elect to take at least 24 approved courses of units of work in exercise and sport sciences as Subject Area III. Students should consult either the exercise sciences major advisor or the physical education major advisor for Subject Area III approved courses.

The athletic coaching minor (not available to physical education majors): 285, 360, 373, 374, 375, 385, 394a; 4 units from 286 and 354, to include a minimum of 2 units in 354.

The exercise sciences minor: This minor requires at least 20 units of credit to be selected from course offerings in exercise and sport sciences. Specific course requirements include the following: 16 units consisting of EXSS 201, 202, 308, 420, 462, and four or more units selected from among EXSS 421, 445, 460, 495a, 496b. For further details, consult with the exercise sciences major advisor in the department. Students will be expected to have completed the prerequisites required by the courses in the minor.

The physical education teaching minor: CHEM 103a(103b), 104a(104b), EXSS 201, 202, 261 or 377, 285, 360, 371, 373, 374, 380, 381. A departmental skills requirement must be satisfied through proficiency examination or completion of a minimum of eight courses and 12 units from Professional Activity courses.

The department offers programs leading to the Master of Science and the Master of Arts degrees with a major in exercise and sport sciences. A minor in exercise and sport sciences is available for doctoral students with majors in other disciplines. Students wishing to specialize in exercise physiology at the doctoral level may do so through the interdisciplinary physiological sciences program. For admission and degree requirements, consult the Graduate Catalog.

Activity Courses

Activity courses without an a, b, c or d designation are considered to be beginning-level courses. Students who have completed a beginning-level course, but who do not meet the intermediate prerequisites, may repeat the beginning course for credit. Intermediate- and advanced-level courses may be repeated once for credit.

The department offers a free locker for students registered in activity courses. Failure to return the lock will result in a financial encumbrance.

100. Adapted Physical Activities (1) I II

103. Aerobic Dance (1) I II S
a. Beginning Aerobic Dance

109. Backpacking (1) I II S Two-day field trip.

110. Badminton (1) I II
  a. Beginning Badminton

114. Basketball (1) I II
  c. Intermediate Basketball

116. Body Dynamics (1) I II S

123. Cycling (1) I II

125. Fencing (1) I II S
  a. Beginning Fencing
  c. Intermediate Fencing

136. Beginning Folk Dance (1) S Daily, group instruction in folk dances of different regions of Mexico. Offered in Guadalajara only. 55.

137. Golf (1) I II S Fees
  a. Beginning Golf
  c. Intermediate Golf

138. Women's Gymnastics (1) I II
  a. Beginning Women's Gymnastics

141. Hiking (1) I II S Field trips.

145. Jogging (1) I II S
148. Karate (1) I II S
   a. Beginning Karate
   c. Intermediate Karate P, 148a

150. Lifeguard Training (1) I II S P, 169d.

159. Racketball (1) I II S
   a. Beginning Racketball
   c. Intermediate Racketball

164. Soccer (1) I II
   a. Beginning Soccer
   c. Intermediate Soccer

165. Social Dance (1) I II 2S.

166. Softball (1) I II
   a. Intermediate Softball

169. Swimming (1) I II S
   a. Beginning Swimming
   b. Swimming for Beginners with Limited Experience
   c. Intermediate Swimming
   d. Advanced Swimming

170. Swimming for Fitness (1) I II S, 169c.

173. Tennis (1) I II S
   a. Beginning Tennis
   b. Tennis for Beginners with Limited Experience
   c. Intermediate Tennis
   d. Advanced Tennis

176. Touch Football (1) I II

177. Triathlon Training (1) I II P, 169c.

181. Volleyball (1) I II S
   a. Beginning Volleyball
   c. Intermediate Volleyball
   d. Advanced Volleyball

184. Weight Training (1) I II S
   a. Beginning Weight Training

Anatomy and Physiology

201. Human Anatomy and Physiology I (4) I
   Study of structure and function of the human body. Topics include cells, tissues, integumentary systems, skeletal system, muscular system, and nervous system. Primarily for majors in exercise sciences, health education, medical technology, nursing, nutritional sciences, occupational safety and health, physical education, speech and hearing sciences. 3R, 3L.

202. Human Anatomy and Physiology II (4) II Continuation of structure and function of the human body. Topics include endocrine, circulatory, respiratory, digestive, urinary and reproductive systems. Primarily for majors in exercise sciences, health education, medical technology, nursing, nutritional sciences, occupational safety and health, physical education, speech and hearing sciences. 3R, 3L.

Professional Activity Courses

Open to physical education majors and minors only.

208. Aerobic Dance Fitness (1) I*

211. Badminton (1) I II*

213. Basketball (2) I II*

217. Folk Dance (1) I*

218. Football (1) II*

219. Golf (1) II* Fee.

221. Women's Gymnastics (2) II*

223. Handball-Racketball (1) I II*

225. Soccer (2) I*

227. Softball (1) I II*

228. Strength and Conditioning Training (1)* I II 2S.

229. Swimming—Lifeguard Training (2) I II S.

230. Tennis (2) I II*

231. Track and Field (2) II*

232. Volleyball (2) I II*

*Development of knowledge and skill competencies necessary for teaching each activity, with emphasis on skill progressions, practice opportunities, and error diagnosis and correction.

Main Courses

260. Water Safety Instructor (2) I II American Red Cross Water Safety Instructor Certificate will be issued to those students qualifying. P, current advanced lifesaving certificate. Sutherland

261. Advanced First Aid and Emergency Care (2) I II Instruction in first-aid and emergency care procedures. The American Red Cross Advanced First Aid and Emergency Care Certificate will be awarded to those students qualifying. Sutherland

262. Lifeguard Training Instructor (2) II Principles and techniques for teaching American Red Cross Basic Water Safety, Emergency Water Safety, Lifeguard Training, and Lifeguard Training Review courses. 4S. P, 150. Sutherland

267. Controlling Stress and Tension (2) I II S Psychophysiology of stress and its relationship to health, with emphasis on identifying and understanding personal stress patterns and learning appropriate stress management techniques such as relaxation, cognitive intervention strategies, meditation, autogenic training, and physical activity.

269. Peak Performance (2) I II Examines approaches to psychological training which lead to peak performance in sport and other endeavors. Develops individualized training procedures for maintaining optimal arousal, motivation, concentration, and confidence.


285. Principles of Teaching Physical Activities (3) I II General principles and practical experiences related to analysis of movement skills, correction of movement errors, and preinstructional planning applied specifically to teaching physical activities. Mize/Sorensen

286. Sports Officiating (1) I II Guiding principles and standards; rules, mechanics and procedures for officiating sports common to secondary school interscholastic and community club programs. Consult department before enrolling.
   a. Basketball (Men and Women's Rules) II
   b. Baseball-Softball I
   f. Volleyball II

288. Historical and Philosophical Perspectives of Sport and Physical Education (3) I II Study of the development of sport and physical education from ancient societies through the 20th century; history of philosophic thought and influences on current practices. Simko

304. Practicum

308. Introduction to Exercise Sciences (2) I Introduction to interdisciplinary nature of the exercise sciences; historical perspectives, areas of research, and career opportunities. P, 201, 202. Henricksen

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. P, PSYC 101. Fairchild

350. Movement Experiences for Elementary School Children (2) I Development of knowledge and skill competencies necessary for teaching fundamental movements, rhythms and dance, gymnastics, games and sports to children. Open to majors only. Mize

351. Elementary School Physical Education (2) I II S Purposes and practices of physical education at the elementary school level, instruction in recommended activities; teaching and evaluation techniques; class organization.

   b. Baseball (2) I II 1994-95.
   c. Basketball (2) I II 213.
   d. Football (2) I II P, 218.
   g. Tennis (2) I II 1993-94 P, 230.
   h. Track and Field/Cross Country (2) I II P, 231.

355. Physical Education Instruction Strategies (2) I Analysis of alternative models of teaching physical education; research of teaching physical education; and systematic analysis of physical education teacher effectiveness. Open to majors only. P, 285, 394B or CR. Graber

360. Functional Kinesiology (3) II Anatomical and mechanical factors affecting human movement, particularly in sport and exercise situations. Open to majors only. P, 201, 202, MATH 117R/S. Atwater

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, 201, 202.

373. Physiological Basis of Physical Education and Athletics (3) I Physiological responses and adaptations to physical activity in various populations and environments; emphasizes fitness evaluation and application of training principles for exercise and sport. P, CHEM 103a-103b, 104a-104b, EXSS 201, 202. Roby

374. Physiological Basis of Physical Education and Athletics Laboratory (1) I P CR 373. Roby
377. Techniques in Prevention and Treatment of Athletic Injuries (3) I II Prevention, treatment, and rehabilitation of athletic injuries; practical experience in application of preventive taping and bandaging. P, 201, 202. Delforde


381. Measurement and Evaluation (3) I II Tests and measurements in physical education; data analysis techniques for test evaluation, test construction, and grading; experience with tests of fitness, sport skills, and sociometric measurements.

385. Principles of Athletic Coaching (3) I Duties, responsibilities and ethics of the athletic coach; the role of interscholastic sport in public school settings; with emphasis on administrative functions, legal liability, facilities coordination, and game and contest management. P. 8 units of 200- or 300-level EXSS course work. Baker

394. Practicum
b. Physical Education Teaching (1) I II P, 285 and professional activities requirement.

397. Workshop
a. Physical Education Student Teaching Forum (1) I II Open to majors only. CR, TTE 493a or 493b.

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. Russell

420. Exercise Physiology (3) I Regulation and adjustment of physiological systems during acute exercise and adaptations with chronic exercise in various populations and environments; emphasizes physiological mechanisms. P. CHEM 103a-103b, 104a-104b. EXSS 201, 202, MATH 117/R/S, 118, PHYS 102a-102b. May be convened with 520. Fregosi

421. Exercise Physiology Laboratory (2) I P, CR, 420. May be convened with 521.

445. Evaluation and Regulation of Body Build and Composition (3) I Laboratory and field assessment of body fat, lean body mass and comatability, anthropology; body build and composition of the athlete; morphology of fat and lean tissue; exercise and dietary regulation of obesity and chronic underweight. P, 201 and 202. May be convened with 545.

452. Teaching Physical Education in the Elementary School (3) I Theory and methods of providing movement experiences for young children; emphasis placed upon curriculum development, methods of teaching, class organization, and management. Practical experience at the elementary level. Open to majors only. P, 221, 231, 285, 350. Mize

460. Biomechanics of Human Movement (3) I II Analysis of human motion focusing on the mechanical interaction between the human body and the external environment. 2R, 3L. P, 201, 202, or 462. May be convened with 560. Atwater/Enoka


477. Advanced Sport Injury Management (3) I II 1993-94 Advanced techniques in recognition, evaluation, treatment, rehabilitation and prevention of athletic injuries. 2R, 3L. P, 377 and a minimum of 300 clinical hours in athletic training or physical therapy.

491. Preceptorship

495. Colloquium
a. Research in Exercise Sciences (1-2) [Rpt./3 units] I II. Open to majors only. P, 420. May be convened with 595a.
b. Biomechanics (2) [Rpt./1] I P, 460 or 462. May be convened with 595b.
d. Environmental Physiology (2) [Rpt./1] I II P. 420. May be convened with 595d.
e. Endocrinology and Metabolism (2) [Rpt./1] I II P. 420. May be convened with 595e.
f. Integrative Cardiorespiratory Physiology (2) [Rpt./1] I II P. 420. May be convened with 595f.

496. Seminar
b. Introduction to Microcomputers (1) I II May be convened with 596a. Atwater

502. Principles of Neuroanatomy (4) I (Identical with ANAT 502)

510. Sport in Contemporary Society (3) I For a description of course topics, see 410. Graduate-level requirements include an in-depth research paper on one issue of contemporary sport. May be convened with 410. Russell

520. Exercise Physiology (3) I For a description of course topics, see 420. Graduate-level requirements include a research-paper requirement with approval from the instructor. P, CHEM 103a-103b, 104a-104b. EXSS 201, 202, MATH 117/R/S, 118. May be convened with 420. Fregosi

521. Exercise Physiology Laboratory (2) I P, CR, 520. May be convened with 521.


527. Psychology of Sport and Exercise (3) I Examines the effects of motivation, personality, attitudes, competition and group dynamics on sport performance as well as the psychological effects of exercise, exercise adherence and exercise addiction. Williams

528. Stress Management for Performance and Health (3) I Examine the psychological framework of stress as it relates to performance and the etiology of stress-related health disorders. Also examines and applies stress management interventions to enhance performance and promote health. Williams

529. Psychological Interventions and Ergogenic Aids for Peak Performance (3) II The development and effectiveness of ergogenic aid mechanisms, particularly psychological interventions, in enhancing performance. P, 528. Williams

536. Administration of Sports Programs (3) I Designed to provide a theoretical framework for students pursuing sports management careers and other interesting and exciting activities involved in the conduct of sports programs. Baker

545. Evaluation and Regulation of Body Build and Composition (3) I II For a description of course topics, see 445. Graduate-level requirements include an additional research project and case report. P, 201 and 202. May be convened with 445.

560. Biomechanics of Human Movement (3) I II For a description of course topics, see 460. Graduate-level requirements include a research-paper requirement with approval from the instructor. P, 201, 202, or 462. May be convened with 460. Atwater/Enoka

562. Neuromechanical Kinesiology (3) I II For a description of course topics, see 462. Graduate-level requirements include a research paper. P, 201, 202, MATH 118. May be convened with 462. Enoka


566. Physical Activity in Aging and Chronic Diseases: Psychosocial Aspects (3) I I Psycho-sociological dimensions of exercise programs designed for populations with chronic diseases as well as for older populations. Fairchild

570. Research Design in Exercise and Sport Sciences (2) I Study of research designs, methodologies and data analysis procedures pertinent to the exercise and sport sciences; emphasis is on the selection of research problems and interpretation of research articles. Lohman

571. Laboratory in 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 of research articles, and participation in research project. CR 570. Lohman

575. Statistical Analysis (3) II Analysis of research designs and data analysis procedures in the field of exercise and sport sciences with
emphasize 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. Lohman

580. Evaluation of Athletic Injuries (3) I Advanced study of the etiology, pathology, and clinical signs of common athletic injuries. Emphasis on clinical evaluation of athletic injuries by the athletic trainer. P. 577, 800 hrs. of clinical experience in athletic training. Delforge

581. Therapeutic Modalities (2) II Advanced study of the role of hydrotherapeutic and electrotherapeutic agents in the rehabilitation of athletic injuries. P. 580.

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 their relationship to sport injuries. 2R, 3L, P. CR 580. Hillman


584. Rehabilitation of Athletic Injuries (3) II Principles in the 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) II Current issues and trends in athletic training and sports medicine with emphasis on the professional preparation of athletic trainers and the role of the certified athletic trainer in athletic health care delivery systems. P. 580. Delforge

586. Physical Education and the Law (3) I Investigation and analysis of legal parameters within which the physical educator and coach operate and their responsibilities to athletes, sports directors and the public. Emphasis will be placed on procedural methodologies, quality control, the use of controls and standards, and interpretation of laboratory test results. P. CR 571L. Hillman

587. Legal Aspects of Sports Administration (3) II Development of administrative and coaching techniques from the legal perspective. Analysis of personnel procedures, purchase of equipment, athletic associations, certification, transportation, medical procedures, officiating, and the handicapped athlete as influenced by litigation. P. 586. Baker

588. Internship a. Sports Medicine (2) I P, 581, 584. b. Sport Psychology (1-3) [Rpt./6 units] I II S 3-9L, Open to majors only. May be convened with 495a. P, 582 or 529.

590. Colloquium a. Research in Exercise Sciences (1) [Rpt./6 units] I II. Open to majors only. May be convened with 495a. b. Biomechanics (2) [Rpt./1] II P, 460 or 462. Graduate-level requirements include a literature review paper. May be convened with 495a. c. Current Issues in Space Physiology (2) [Rpt./1] I P, 520.

d. Environmental Physiology (2) [Rpt./1] II P, 520. May be convened with 495d.

e. Endocrinology and Metabolism (2) [Rpt./1] II P, 520. May be convened with 495c.

596. Seminar a. Laboratory Rotations (1-3) I II S 3-9L. Open to majors only. P, 570, 571.

695. Colloquium a. Motor Control (2) [Rpt./8 units] II P, PSIO 480 and consult department before enrolling. (Identical with NEUR 695a, PSIO 695a, PSYC 695a, SP H 695a)

793. Internship a. Sport Psychology (1-3) [Rpt./2 units] I II S P, 528 or 529.

Medical Technology (MEDT)

1435 N Fremont Avenue, Room 124 (602) 626-4084
Clinical Associate Professor Harold L. Potter, Jr., Director
Clinical Assistant Professor JoAnn Thomas
Clinical Instructors Deborah Wyckoff, Marlis Dinning

Medical technology is the health profession responsible for preparing individuals for careers in hospitals or clinics which require clinical laboratory analysis including quantitative, qualitative and morphological measurements which assist the physician in clinical diagnosis and treatment.

The Division of Medical Technology offers an accredited program of studies leading to the Bachelor of Science in Health Sciences with a major in medical technology. Admission and degree requirements for this major are listed in the "School of Health-Related Professions" section of this catalog (under Colleges and General Divisions).
547. Principles of Laboratory Science (3) [Rpt. /1] II Basic principles of laboratory mathematics, biostatistics, body fluids analysis, urinalysis, quality control and laboratory safety. P, consult program director before enrolling. May be convened with 576.


550. Clinical Laboratory Chemistry (5) [Rpt. /1] II For a description of course topics, see 472L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical serology or blood banking. P, CR, 472R/572R, consult program director before enrolling. May be convened with 472L.

551. Lectures in Clinical Immunology (5) [Rpt. /1] II For a description of course topics, see 472L. Graduate-level requirements include a research paper on selected topics relating to clinical immunology and immunohematology. P, consult program director before enrolling. May be convened with 473R.


555. Seminar a. Topics for Medical Technology Interns (1) I Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see “Writing- Emphasis Courses” in the Academic Guidelines section of this catalog). Consult with program director before enrolling.

556. Lectures in Clinical Hematology (5) [Rpt. /1] II For a description of course topics, see 472L. Graduate-level requirements include a research paper on selected topics related to clinical laboratory hematology. P, consult program director before enrolling. May be convened with 473R.

557. Lectures in Clinical Bacteriology (5) [Rpt. /1] II For a description of course topics, see 474R. Graduate-level requirements include a research paper relating to clinical bacteriology and immunology. P, CR, 474R/574R, consult program director before enrolling. May be convened with 473L.

558. Principles of Laboratory Science (3) [Rpt. /1] II For a description of course topics, see 476. Graduate-level requirements include a research paper on selected topics that focus on the use of statistical analysis for biological systems, or on selected topics relating to new techniques in body fluid analysis or urinalysis. P, consult program director before enrolling. May be convened with 476.


History. A Bachelor of Arts in Education and a Master of Education with a teaching major in history are also available. For information on graduate degrees, please see the Graduate Catalog.

The major: 33 units, including 396a, 3 units in a course dealing with the period before 1500, and 6 units in three of the following areas: United States, Latin America, Europe, and Afro-Asia. No fewer than 18 units must be upper-division. No more than 3 units of independent study or 6 units of internship may be applied toward the major. If a student takes more than 9 units of history courses to fulfill the Study Areas requirements in General Education, he or she may count those hours beyond nine toward the history major.

The supporting minor should be selected from foreign languages, the humanities, the social sciences, and other subjects as may be individually justified.

The teaching minor: 21 units, to include: 106, 107; two courses from 101, 102, 161, 190, 272; and three upper-division courses.

The department participates in the honors program.

101. History of Western Civilization: Backgrounds and Formation to 1648 (3) GRD I S The western heritage of ideas, values, and artistic expression in interaction with economic, social, and political processes and experiences.

102. History of Western Civilization: Emergence of the Modern World - Since 1648 (3) GRD II S The western heritage of ideas, values, and artistic expression in interaction with economic, social, and political processes and experiences.

103. Topics in Civilization (3) I II [Rpt./9 units] Topical approaches (e.g., slavery, imperialism) to issues in civilization.

106. History of the United States from 1607 to 1877 (3) I II CDT Political, economic, and social history of the American people from the founding of colonial Jamestown to 1877.

107. History of the United States from 1877 to the Present (3) I II CDT Political, economic, and social history of the American people from the end of Reconstruction to the present.

117. History of England to 1603 (3) I Survey of English history from pre-history to 1603, with emphasis on legal and constitutional history.

118. History of England from 1603 to the Present (3) II Survey of English history from 1603 to present, with emphasis on political and social history.

160. Colonial Latin America (3) I Survey of the history of Spanish America and Brazil from the Age of Discovery to Independence.

161. Modern Latin America (3) II Survey of Latin American history from Independence to the present.

170. Indian Civilization (3) (Identical with NES 170)

171. Ancient Civilizations of the Near East (3) I (Identical with NES 171)

172. Islamic Civilization: Traditional and Modern Middle East (3) II (Identical with NES 172)

174. Chinese Civilization (3) I (Identical with CHN 174)

190. Introduction to African History (3) I II S Introduction to the major themes and social, political, cultural, and economic developments in sub-Saharan African history. Will cover precolonial, colonial, and postcolonial periods. (Identical with AAS 190)

204. Ancient History: Greek History (3) I A political, social, and cultural history of Greek civilization from the Bronze Age to the death of Alexander the Great. (Identical with CLAS 204)

205. Ancient History: Roman History (3) II A survey of Roman civilization from the founding of the monarchy to the emperorship of Constantine the Great. (Identical with CLAS 205)

214a-214b. European Cultural History (3-3)
214a: Ancient Europe to Absolutism. 214b: Age of Revolution to Present. 214a is not prerequisite to 214b.

233. History of the Mexican American (3) I Survey from the 16th century to the present, with emphasis on political, social, political and economic trends in their historical context. (Identical with MAS 233)

234. Indians in U.S. History (3) History of Indians in U.S. development from 1500 to the present with emphasis on relations between competing Indian groups and between Indians and whites.

244. Western America (3) Survey of the patterns of American expansion and settlement in the western United States.

245. Frontier America (3) Survey of the patterns of frontier expansion and settlement in the eastern and mid-western United States.

253a-253b. History of Women in the United States (3) Changing role of women in American society from colonial times to the present. (Identical with W S 253a-253b)

270. Modern East Asia: A History (3) II (Identical with EAS 270)

271. The History of Christianity (3) S The history of Christianity is presented with its many shifts, shadows and differing stages, from the Apostle's Council in 48, through Vatican II (1962-65). (Identical with RELI 271)

272. Japanese Civilization (3) II The study of the evolution of Japanese social values, aesthetic expression, religion, and political institutions in order to understand Japan's cultural heritage and contemporary society. (Identical with JPN 272)

318. English Legal and Constitutional History (3) I II 1994-95 Survey of the origins and development of the English common law from the Anglo-Saxons to the present.

319. History of Modern Ireland (3) I II 1994-95 Survey of Irish history from the Union in 1800 to the present; the course will emphasize the political, cultural, and religious bases of Irish history.

318. English Legal and Constitutional History (3) I II 1994-95 Survey of the origins and development of the English common law from the Anglo-Saxons to the present.

319. History of Modern Ireland (3) I II 1994-95 Survey of Irish history from the Union in 1800 to the present; the course will emphasize the political, cultural, and religious bases of Irish history.


339. Cultural Traditions, Technology and Business (3) Traces the technological aspects of North Atlantic civilization and culture with emphasis on the role of technology in nineteen and twentieth century capitalist development.

345. New American West (3) I II S The major social, political, and economic changes in the twentieth century American West; the commonalities and conflicts within the region.

347. The Old South (3) Social, economic, cultural and political history from Jamestown to Secession. (Identical with AAS 347)

348. The South Since the Civil War (3) From the Civil War to the present. (Identical with AAS 348)

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. (Identical with AAS 351 and LA S 351)

361. The U.S.-Mexico Border Region (3) S Evolution of the borderlands since the mid-nineteenth century, with emphasis on binational interaction and interdependence. (Identical with MAS 361 and LA S 361)

368. Colonial Mexico (3) I From discovery through the War for Independence. (Identical with LA S 368 and MAS 368)

369. Mexico Since Independence (3) II Struggle for political, economic and social stability; international relations, cultural patterns. (Identical with LA S 369 and MAS 369)

370a-370b. History of the Jews (3-3) I II Survey of major political, socioeconomic, and cultural developments in the history of Diaspora Jewry. 370a: Modern Jewish history. 370b: The Jew in the medieval world (to the 17th century). (Identical with JUS 370a-370b and RELI 370a-370b)

372a-372b. History and Religion of Israel in Ancient Times (3-3) (Identical with JUS 372a-372b)

374. The Holocaust (3) II 1993-94 Socio-economic 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 JUS 374 and RELI 374)

375. History of China (3) (Identical with CHN 375)
409. 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 409) May be convened with 509.

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. P, 3 units of European history. (Identical with RELI 410) May be convened with 510.

411. European Social and Intellectual History to 1750 (3) I Dominant themes in European intellectual history from the end of the Middle Ages to the period of the Enlightenment. Reading and discussions of texts from Petrarch to Locke. P, 3 units of any history course. May be convened with 511.

412. European Intellectual History: 1750 to 20th Century (3) II Dominant themes in European intellectual history from about 1750 to the 20th century. Reading and discussions of texts from David Hume to Friedrich Nietzsche. P, 3 units of any history course. May be convened with 512.

413. War and Peace in Europe (3) II European background to contemporary international relations from the Congress of Vienna through the outbreak of World War II. May be convened with 513.

414. Cultural History of Germany to 1714 (3) I The political, social, economic and cultural history of Germany from the late Middle Ages to about 1800. P, 3 units of any history course. May be convened with 514.

415. Cultural History of Germany 1714 to 1989 (3) II The political, social, economic and cultural history of Germany from the period of the French Revolution to the present. P, 3 units of any history course. May be convened with 515.

416. Tudor-Stuart England (3) I An intensive study of English history from the accession of Edward IV to the Hanoverian dynasty. (Identical with RELI 416) May be convened with 516.

417. History of Modern Britain (3) II An intensive study of English history from the accession of George III to the present. May be convened with 517.

418. France under the Old Regime, 1589-1789 (3) II French political development, institutions, and culture from Henry IV to the eve of the French Revolution. May be convened with 518.

419. The French Enlightenment (3) I Cultural history of France in the 18th century, with emphasis on the works of the philosophers. May be convened with 519.

420. The French Revolution and Napoleon (3) I II The origins and progress of the Revolution in France. May be convened with 520.

421. History of Russia: Early Period (3) I Political, socio-economic, and cultural history of Russia in medieval and early modern times. (Identical with RUS 421) May be convened with 521.

422. History of Russia: Modern Period (3) II Political, socio-economic, and cultural history of Russia in the modern era until the Bolshevik Revolution. (Identical with RUS 422) May be convened with 522.

423. Intellectual History of Russia (3) II The historical significance of social, political, and revolutionary thought in 19th- and 20th-century Russia. P, 3 units of any history course. (Identical with RUS 423) May be convened with 523.

424. 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. P, 3 units of any history course. (Identical with RUS 424) May be convened with 524.

425. History of the Soviet Union (3) I The Bolshevik Revolution and problems of Soviet Russian history from 1917 to the present. P, 3 units of any history course. (Identical with RUS 425) May be convened with 525.

428. Antisemitism (3) II Exploration of broad range of social, cultural, political, economic and religious issues with a specific emphasis on questions of ethnicity and race as they appeared in German Central Europe and in an often multinational context in the period 1860-1920. (Identical with PSYC 426 and RELI 428)

431. 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. P, 3 units of any U.S. history survey course. May be convened with 531.

432. The Era of the American Revolution (3) II Origins, progress, and character of the struggle against Great Britain; internal political, constitutional, social, and economic developments; the problems of the "Critical Period" and the making of the Constitution. P, 3 units of any U.S. history course. May be convened with 532.

433. Jefferson and the New Nation, ca. 1790-1828 (3) I Major ideological, political economic, and social conflicts and developments, North and South, during the first decades of the American nation. P, junior or senior standing and 3 units of any U.S. history course. May be convened with 533.

434. Jacksonian Era, 1828-1856 (3) II Political, economic, and social developments from the "reign" of Andrew Jackson through the collapse of the Whig Party in the 1850s. P, junior or senior standing and 3 units of any U.S. history course. May be convened with 534.

435. 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 AAS 435) May be convened with 535.

436. Civil War and Reconstruction, U.S. 1861-1875 (3) II Political, constitutional, economic, and military developments in the U.S.
and the Confederacy during and after the Civil War. (Identical with AAS 436) May be convened with 536.

437. U.S. 1876-1919 The Gilded Age and Progressive Era (3) Examination of economic, social and political developments in years of rapid industrialization from the end of Reconstruction through World War I. P, 3 units of any history course. May be convened with 537.

438. U.S. 1918-1945 From World War I through World War II (3) Prosperity, Depression 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 world affairs from the Yalta Conference to the present. P, 3 units of any history course. May be convened with 540.

442. History of American Society and Thought: Pre-Civil War (3) I American political, religious, cultural and philosophical ideas as expressed in colonial, revolutionary and pre-Civil War society. May be convened with 542.

443. History of American Society and Thought Since the Civil War (3) II The transformation of American minds since the Civil War as expressed in literary, philosophical, religious, and other cultural forms. May be convened with 543.

444. History of Arizona (3) I I Economic, social, and political development of the state from Spanish times to present. May be convened with 546.

449. History of American Foreign Relations to 1914 (3) I Examines the rise of America from a struggling colony to a world class power, including its relations with Europe, Latin America and Asia. P, 3 units of any history course. May be convened with 549.

450. History of American Foreign Relations Since 1914 (3) II Examines the pivotal role played by the United States in world affairs since World War II, focusing on America's struggle with revolutionary movements in Europe, Asia and Latin America. P, 3 units of any history course. May be convened with 550.

451. The United States and East Asia: 1840 to the Present (3) II An examination of American interaction with Japan and China since the Opium Wars, with special attention given to economic, cultural, and military relations and conflicts. P, 3 units of any history course. (Identical with EAS 451) May be convened with 551.

452. American Ethnic History (3) II A history of the various ethnic minorities in America from Colonial times to the present, with emphasis on adjustment, acculturation and degrees of assimilation. P, 3 units of any history course. May be convened with 552.

453. History of Women and Work (3) I History of women and work in western and non-western nations from prehistoric times to the present. P, 3 units of any history or women's studies course. (Identical with W S 453) May be convened with 553.

454. Spanish Inquisition (3) I The Inquisition in Spanish, European, and ethnic history; its bureaucracy and procedures; its festivities, its victims; New and Old Christians, and witches. (Identical with JUS 454 and RELI 454)

456. Central America: From Colonialism to Revolution (3) II Social, economic, and political history of Central America from colonial period to the present focusing on the origins of contemporary crisis. (Identical with LA S 456) May be convened with 556.

457. The Mexican Revolution (3) S A detailed examination of Mexico's social upheaval of 1910, and its implications for contemporary Mexican society. Offered in Guadalajara only. May be convened with 557.

458. Feminism: A Comparative History (3) II International history of feminism as an ideology and a political movement from the 17th century to the present. P, 3 units of any history or women's studies course. (Identical with W S 458) May be convened with 558.

461. The Ethnohistory of Mesoamerica and the Andes (3) II 1994-95 The impact of conquest and Spanish rule on the native peoples of Mexico, Central America, Peru, Bolivia, and Ecuador. Topics include: conquest and ecology; land and labor; religion and culture; adaptation and resistance. 2R, 1D, P (for undergraduates) 160 or 351 or 368. May be convened with 561.

463. Asian Marxism (3) II (Identical with EAS 463) May be convened with 563.

464. History of Argentina (3) I Survey of Argentine history and culture from the colonial era to the present. P, junior or senior standing and 3 units of any lower-division Latin American history course. (Identical with LA S 464) May be convened with 564.

466. History of Brazil (3) II History of Brazil from 1500 to the present. (Identical with LA S 466) May be convened with 566.


472. History of Medieval India (3) I Survey of Indian history from the 7th century to 1750. (Identical with NES 472) May be convened with 572.
topics. See 450. Graduate-level requirements include an in-depth research paper and additional course readings. May be convened with 450.

551. The United States and East Asia: 1940 to the Present (3) 1994-95 For a description of course topics, see 451. Graduate-level requirements include an in-depth research paper and additional course readings. (Identical with EAS 551) May be convened with 451.

552. American Ethnic 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. History of Women and Work (3) I 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.

556. Central America: From Colonization to Revolution (3) II For a description of course topics, see 456. Graduate-level requirements include an extra four-page book review and a ten-page research paper. (Identical with LA S 556) May be convened with 456.

557. The Mexican Revolution (3) S For a description of course topics, see 457. Graduate-level requirements include extra readings and an in-depth research paper. Offered in Guadalajara only. May be convened with 457.

558. Feminism: A Comparative History (3) II For a description of course topics, see 458. Graduate-level requirements include a lengthy research paper that will use primary materials and demonstrate familiarity with secondary materials on their topic. May be convened with 458.

559. History of Books and Printing (3) I (Identical with LI S 559)

561. The Ethnography of Mesoamerica and the Andes (3) II 1994-95 For a description of course topics, see 451. Graduate-level requirements include an additional essay. May be convened with 451.

563. Asian Marxism (3) II (Identical with EAS 563) May be convened with 463.

564. History of Argentina (3) I For a description of course topics, see 464. Graduate-level requirements include an in-depth research paper on an approved topic. (Identical with LA S 564) May be convened with 464.

566. History of Brazil (3) II For a description of course topics, see 466. Graduate-level requirements include a paper on the role of Carlos Lacerda. (Identical with LA S 566) May be convened with 466.

567. Contemporary Latin America (3) I For a description of course topics, see 467. Graduate-level requirements include an in-depth paper on a topic approved by the instructor. (Identical with LA S 567) May be convened with 467.

568a-568b. Asia and the West (3-3) 1993-94 For a description of course topics, see 468a-468b. Graduate-level requirements include additional research or writing. See instructor for details. (Identical with NES 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. (Identical with LA S 569) 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 NES 570) May be convened with 470.

572. History of Medieval India (3) I 1993-94 For a description of course topics, see 472. Graduate-level requirements include additional research or writing; see instructor for details. (Identical with NES 572) May be convened with 472.

573. History of Modern India and Pakistan: 1750-Present (3) II For a description of course topics, see 473. Graduate-level requirements include additional research or writing; see instructor for details. (Identical with NES 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 JPN 574a-574b-574c). May be convened with 474a-474b-474c.

575a-575b-575c-575d-575e. Periods in Chinese History (3-3-3-3-3) (Identical with CHN 575a-575b-575c-575d-575e) May be convened with 475a-475b-475c-475d-475e.

576. Modern Chinese History (3) (Identical with CHN 576) May be convened with 476.

577a-577b. History of the Middle East (3-3) (Identical with NES 577a-577b) May be convened with 477a-477b.

578. Modern History of the Middle East (3) (Identical with NES 578) May be convened with 478.

579. The Ottoman Empire to 1800 (3) II 1993-94 For a description of course topics, see 479. Graduate-level requirements include an in-depth research paper. May be convened with 479.

581. Work, Motherhood and Female Identity in America 1945 to the Present (3) (Identical with W S 581) May be convened with 481.

582. Social History of China (3) (Identical with CHN 582) May be convened with 482.

583. Gender and African History (3) I II S For a description of course topics, see 483. Graduate-level requirements include a research paper and additional discussion sessions. (Identical with WS 583) May be convened with 483.

588. History of Byzantium (3) II For a description of course topics, see 488. Graduate-level requirements include a research paper. (Identical with CLAS 588) May be convened with 488.

590. Philosophy of History (3) I For a description of course topics, see 490. Graduate-level requirements include a research paper. May be convened with 490.

592. History of Sufism (3) II For a description of course topics, see 492. Graduate-level requirements include an additional research paper on a topic selected in consultation with the professor. (Identical with NES 592) May be convened with 492.

595. Colloquium d. Latin American Studies Special Topics (3) (Rpt./10) (Identical with LA S 595d, which is home) May be convened with 495d.

t. Chinese History Since 1949 (3) II (Identical with CHN 595t, which is home) May be convened with 495t.

596. Seminar m. Mexican-American Heritage Bibliography - A Library Seminar (3) (Rpt./6 units) (Identical with MAS 596m, which is home)

Certain colloquia and seminars in other departments may be used for history graduate credit.
History and Philosophy of Science (HPSC)
Social Sciences Building, Room 213
(602) 621-3120

Graduate Interdisciplinary Program in History and Philosophy of Science
Committee:
Professors Henry C. Byerly (Philosophy), Chair, Robert M. Harnish (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)

Honors Center (HONR)
Slonaker House
(602) 621-6901

The Honors Center provides special opportunities to those students who demonstrate the highest levels of creativity, curiosity, maturity, and academic achievement. Responsibility for the program is shared between academic departments and the Honors Center. Departments generally assume responsibility for those courses which are endemic to their respective disciplines while the Honors Center participates in this joint venture by offering seminars and colloquia that are broader, often interdisciplinary in focus, and by exposing students to a variety of noncredit, cultural opportunities designed to enrich campus life.

In the Schedule of Classes students receive prior to registration, all honors courses are identified by the suffix "H" attached to the course number (History 106H) or to a section designation positioned under the course number (History 106, section 5H). Honors courses are reserved exclusively for honors students.

In order to graduate with honors, a student must: (1) maintain and graduate with a 3.5 grade-point average, (2) complete 30 units in university-wide, college, or departmental honors courses (18 units if entering as a junior or senior), (3) complete both semesters of 498H as part of the 30-unit honors requirement, and (4) submit a completed honors thesis to the Honors Center prior to graduation. The format of the program is structured such that a student can fulfill the academic honors requirements by enrolling in at least one honors course each semester, plus completing the required 498H sequence (6 units).

Course offerings sponsored by the Honors Center and the participating academic departments include, but are not limited to, those listed below. It is important to note that, in order to develop an appropriate blend of honors offerings, these courses may not be offered every semester or year. Students should check the Schedule of Classes each semester to determine if a specific course is available.

Honors Center Courses

280H.* Student Planning Board (2) I II Open to select students interested in working in the Honors Program organization. Prior permission required.

295H.* Honors Colloquium (1-3) I II Small group discussions exploring special topics. Open to all Honors students.

391H.* Honors Preceptorship (1-3) I II Open to select upper-division students interested in gaining teaching or practical experience in a department. (Prior permission required.)

396H.* Honors Proseminar (3) I II A small, interdisciplinary class focusing on specialized topics.

399H.* 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

Anatomy
Independent laboratory opportunities available.

Anthropology
102.* Introduction to Cultural Anthropology (3) I
111.* Exploring Physical Anthropology (3) II
396H. Honors Proseminar (3) II

Architecture
452H. Honors Senior Project (6) I

Astronomy
101L.* Astronomy Lab (1) I
400a.* Theoretical Astrophysics (3) I
400b.* Theoretical Astrophysics (3) II

Biochemistry
182.* Introductory Biology II (4) II
Additional independent laboratory opportunities are available.

Chemistry
105a-105b. Honors Fundamentals of Chemistry (4-5) I II
242a-242b. Honors Lectures in Organic Chemistry (3-3) I II
396H. Honors Proseminar (3) II

Civil Engineering
214.* Statics (3) I II
217.* Mechanics of Materials (3) I II
Additional independent research opportunities available.

Communication
396H. Honors Proseminar (3) I

Ecology and Evolutionary Biology
182.* Introductory Biology II (4) II
Additional independent laboratory opportunities available.

Economics
200.* Basic Economic Issues (3)
332.* Intermediate Macroeconomics (3) I II
361.* Intermediate Microeconomics (3) I II
418.* Introduction to Econometrics (3)
424.* European, Chinese, Japanese Economic History (3)
460.* Industrial Organization (3) I
461.* Economics of Regulated Industry (3) II
481.* Economics of Wage Determination (3) I

Education
350.* Schooling in America (3)

Educational Psychology
301. Child Development (3)
310. Learning in the Schools (3)

English
103H. Freshman Composition (3) I II
104H. Freshman Composition (3) I II
109H. Advanced Freshman Composition (3) I II
495. Colloquium
a. Honors for Juniors (3) I II
b. Honors for Seniors (3) I II

Family and Consumer Resources
396H. Honors Proseminar (1)
### Fine Arts

- **207**: Western Civilization and the Arts: The 20th 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)
- **396H**: Honors Proseminar (3) I
- **397a**: Teaching Geosciences (2-3)

### Humanities

- **250a-250b-250c**: Introduction to Humanities (3-3-3)
- **396H**: Honors Proseminar (3) I II

### Linguistics

- **201**: Introduction to Linguistics (3)

### Management and Policy

- **305**: Management and Organizational Behavior (3) II
- **320**: Legal, Social and Political Environment (3) II

### Management Information Systems

- **111**: Introduction to Computing (3)
- **373**: Basic Operations Management (3)

### Marketing

- **361**: Introduction to Marketing (3) II
- **450**: Buyer Behavior (3) II
- **459**: Product Management (3) II
- **471**: Marketing Policies and Operations (3) II

### Mathematics

- **125b**: Calculus (3) II
- **215**: Introduction to Linear Algebra (3)
- **223**: Vector Calculus (4)
- **254**: Introduction to Ordinary Differential Equations (3)

### Media Arts

- **200**: Fundamentals of Theory and Aesthetics in Media Arts (3)

- **209**: Survey of Film History (3) II
- **222**: Major AM Broadcast Genre (3) II

### Microbiology

- **181**: Introductory Biology I (4) I
- **182**: Introductory Biology II (4) II

### Molecular and Cellular Biology

- **181**: Introductory Biology I (4) I
- **182**: Introductory Biology II (4) II

### Music

- **120a**: Musical Skills and Structure (3) I
- **120b**: Musical Skills and Structure (3) II

### Nursing

- **279**: Nurse as Consumer and User of Research (3)
- **350**: Pathophysiology (3)
- **372**: Nurse as Care Provider for Developing Families (5)
- **383**: Nurse as Care Provider in Mental Health (5)
- **396H**: Honors Proseminar (1-3) I II

### Philosophy

- **111**: Introduction to Philosophy (3) I
- **396H**: Honors Proseminar (3) I

### Physics

- **110**: Introductory Mechanics (4) I II
- **116**: Introductory Electricity and Magnetism (4) I II
- **396H**: Honors Proseminar (3) II

### Plant Science

- **100**: Plant Science (3)
- **101**: Plant Science Laboratory (1)

### Political Science

- **102**: American National Government (3) I
- **250**: Contemporary National Politics (3) II
- **396H**: Honors Proseminar (3) I II

### Psychology

- **101**: Introduction to Psychology (3) I II
- **230**: Psychological Measurement and Statistics (3)

### Public Administration and Policy

- **342**: Criminology (3) II

### Russian and Slavic Languages

- **101a-101b**: Elementary Russian (4-4)
- **201a-201b**: Intermediate Russian (4-4)
- **396H**: Honors Proseminar (3) I

### Sociology

- **396H**: Honors Proseminar (3) I

### Spanish

- **101, 102**: First Year Spanish (4-4)
- **201, 202**: Third and Fourth Semester Spanish (4-4)

### Theatre Arts

- **100**: Acting for the General College Student (3)
- **396H**: Honors Proseminar (3) II

Note: *Honors section available. Consult Schedule of Classes for information.

### Other Honors Courses

In addition to the courses listed above, all departments and colleges participating in the Honors Center offer the following standardized courses (available only to students who are members of the Honors Center):

- **199H**: Honors Independent Study Grades available A-B-C-D-E-I-W
- **299H**: Honors Independent Study Grades available A-B-C-D-E-I-W
- **399H**: Honors Independent Study Grades available A-B-C-D-E-I-W
- **499H**: Honors Independent Study Grades available A-B-C-D-E-I-W

- **498H**: Honors Thesis (3) [Rpt/6 units] An honors thesis is required of all students graduating with honors. Students ordinarily sign up for this course as a two-semester sequence. The first semester the student performs research under the supervision of a faculty member; the second semester the student writes an honors thesis. Grades available A-B-C-D-E-I-W.

Individual departments frequently offer honors courses in addition to those listed above. Information on these specific programs may be obtained from the Honors Center or from the respective college honors advisors.

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**Humanities (HUM)**

Harvill Building, Room 347

(602) 621-3933

Associate Professor Ingeborg M. Kohn, Director

Senior Lecturers Ann Kerwin, Donna E. Swaim, Bella Zweig

Lecturers Mark Luprecht, Richard Poss, and Richard H. Wilkinson

The Humanities Program provides interdisciplinary courses designed to deepen consciousness of ethical and aesthetic concerns pertinent to human experience from ancient times to the present. These courses explore essential questions about being human and the way human beings symbolize and express themselves.
Hydrology and Water Resources (HWR)

Geology Building, Room 122
(602) 621-5082

Professors Sorosh Sorooshian, Head (Systems and Industrial Engineering), Nathan Buras, Dinshaw Contractor (Civil Engineering), Donald R. Davis, Stanley N. Davis (Emeritus), Robert E. Dickinson (Atmospheric Physics, Tree Ring Lab), Lucien Duckstein (Systems, and Industrial Engineering), Daniel D. Evans (Emeritus), Martin M. Fogel (Emeritus), Martha Gilliland, Richard H. Hawkins (Watershed Management), Simon Ince (Civil Engineering), Helen Ingram (Political Science), Charles W. Kreitler, Austin Long (Geosciences), William B. Lord (Agricultural and Resource Economics), Thomas Maddock III, Shlomo P. Neuman, William J. Shuttleworth, Eugene S. Simpson (Emeritus), Ernest T. Smerdon (Civil Engineering)

Associate Professors Roger C. Bales, Randy L. Bassett, Michael D. Bradley, Bonnie Colby (Agricultural and Resource Economics), Katherine Hirschboeck (Tree Ring Lab), T.-C. Jim Yeh Assistant Professors Marc Brusseau (Soil and Water Science), Martha H. Conklin, Kevin Lansey (Civil Engineering)

Hydrology and water resources include the origin, distribution, and properties of the waters of the Earth, as well as the development and management of water resource systems for multiple purposes. The faculty offers competence in hydrogeology, hydrogeochemistry, environmental hydrology, groundwater and surface-water hydrology, hydrometeorology, hydroclimatology, 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 and Doctor of Philosophy degrees with majors in both hydrology and in water resources administration. See College of Engineering and Mines section of this catalog for the undergraduate requirements. For information regarding graduate degrees, please see the Graduate Catalog.

The department participates in the honors program.

101A-101B. Water and the Environment (4-4) I II Relation of physical and biological sciences to the understanding of the water cycle; man's impact on water resources, with emphasis on factors affecting the availability and quality of water in arid and humid regions. 3R, 3L. Field trips. 101a is not prerequisite to 101b. For nonmajors only. Clark

107a. Introduction to Global Change (4) I (Identical with GEOS 107a)

107b. Introduction to Global Change (4) II Examination of the ways humanity alters the global environment: effects of pollution on atmosphere, oceans, fresh waters, and climate (carbon cycle, acid deposition, ozone shield, greenhouse effect). 3R, 3L. 107a is not prerequisite to 107b. For non-majors only. (Identical with GEOS 107b). Bales/Leavitt

195. Colloquium a. Water, The Environment and Society (1) I II Freshmen only

250. Principles of Hydrology (3) II Introduction to the hydrologic cycle and review of main processes, such as precipitation, evaporation and transpiration, runoff, infiltration, and ground water. Some concepts and tools
for water resources management are discussed. 2R, 3L. Soroooshian

396. Proseminar
a. Hydrology (1) [Rpt.] II D. Davis

407. Subsurface Hydrology (3) I Introduction to groundwater flow through saturated and unsaturated soils and rocks; single and multiple borehole hydraulic tests; stream-aquifer interfaces; computer test flow and transport analysis. Field methods. Fee. P, PHYS 116, MATH 125b, CE 321 or A ME 331a.

408. Vadose Zone Monitoring (2) II 1994-95 Laboratory and field methods for characterizing water flow and contaminant transport through unsaturated geologic media. 6L. P, 407 or S W 470. May be convened with 508.

410. Field Hydrology (Surface Water) (1) S Field methods of collection, compilation, and interpretation of data in surface water. Stream gaging, hydrography and limnology exercises; evaporation studies; slope-area method of indirect discharge measurement; flood plain mapping; preparation of hydrologic reports. Daily field work. Fee. P, 250 or 423 or 440. May be convened with 514. Ince

415. Introduction to Water Resources Policy (3) II Water resources policy including the identification of local problems of water use, the elements of water planning, water rights, and a consideration of institutional structures and processes. P, MATH 125a. (Identical with GEOG 415) May be convened with 515. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see “Writing-Emphasis Courses” in the Academic Policies and Graduation Requirements section of this catalog). Bradley

423. Hydrology (3) I (Identical with C E 423) May be convened with 523.

427. Computer Applications in Hydraulics (3) II (Identical with C E 427) May be convened with 527.

431. Hydrogeology (3) I II Hydrologic and geologic factors controlling the occurrence and dynamics of groundwater on regional and local scales. 2R, 3L. Field methods, field trips. P, MATH 125a, PHYS 116, MATH 125b, CHM 103a-103b, MATH 125b, knowledge of computer language; CR, 450L. Fee. May be convened with 550R. Bassett

450L. Environmental Hydrology Laboratory (1) Laboratory procedures related to chemistry of surface and subsurface water. P or CR, 450R or equivalent. Fee. May be convened with 550L. Bassett

457. Low Temperature Geochemistry (3) II (Identical with GEOG 457) May be convened with 557.

460. Watershed Hydrology (3) I (Identical with WS M 460) May be convened with 560.

461. Population and Resources (3) I (Identical with GEOG 461)

476. Natural Resource Economics (3) II (Identical with AREC 476)

478. Global Change (3) II (Identical with GEOG 478) May be convened with 578.

481. Environmental Policy (3) I (Identical with POL 481) May be convened with 581.

482. Applied Groundwater Modeling (3) I Introduction to ground-water flow and transport modeling, with emphasis on model construction and simulation. 2R, 3L. May be convened with 582. Maddock

483. Physical Oceanology and Limnology for Hydrologists (2) I Oceanography, distribution, and characteristics of oceanic water; advective and convective processes; estuarine and shoreline processes; effect on coastal aquifers; classification and hydrologic regimen of lakes. P, MATH 125b. May be convened with 583. Bales

490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.

500. Ecosystemology for Urban Planning (3) I Introduction to conceptual tools used in complex ecosystems, particularly cities and urban areas; integration of human residents with larger natural systems (human ecology); environmental impact assessment (EIA) and statement (EIS). Water resource planning and impact on regional ecosystems; technical, legal, ethical dimensions of water transfer. (Identical with PLNG 500) Bradley

503. Subsurface Fluid Dynamics (3) I Dynamics of immiscible fluids in porous and fractured media; anisotropy and scale; advective solute transport; consolidation and land subsidence; multi-aquifer systems; free surface flow and salt water/fresh water interfaces. P, MATH 223 or (preferably) 322 or 422a or 422b, C E 321 or A ME 331a. (Identical with CE 503) Neuman

504. Numerical Methods in Subsurface Hydrology (4) II Finite difference, finite element and boundary integral methods for subsurface fluid flow and mass transport; applications to aquifers, unsaturated soils, seepage through earth structures. P, MATH 422a or consult department before enrolling. (Identical with CE 504) Neuman

505. Vadose Zone Hydrology (3) II Fundamentals of multiphase flow and transport in the vadose zone. Methods for characterization of hydraulic properties and mathematical solutions for particular cases. P, 407 or 503 or 518 or S W 470.

506. Water Quality Dynamics (3) II Chemical and physical methods are used to study the quality of ground and surface waters with emphasis on organic contamination, colloids, and surface processes including sorption phenomena. Equilibrium and dynamic models of water chemistry. P, 517R/L. Conklin

508. Vadose Zone Monitoring (2) II 1994-95 For a description of course topics, see 408. Graduate-level requirements include in-depth laboratory reports. P, 407 or 503 or 508 or S W 470. May be convened with 408.


514. Field Hydrology (Surface Water) (1) S For a description of course topics, see 414. Graduate-level requirements include an in-depth term paper. P, MATH 125a. (Identical with GEOG 515) May be convened with 415. Bradley

516. Hydrologic Transport Processes (3) I Development and application of equations describing mass and energy transport in subsurface environment. P, 503 or 535, SIE 270. Yeh

517R. Fundamentals of Water Quality (3) I Introduction to chemical processes affecting the behavior of major and minor chemical species in the aquatic environment. Physical, equilibrium, organic, and analytical principles as applied to natural waters. 517R may be taken in conjunction with or independent of 517L; however, 517R is a prerequisite to 517L. P, MATH 125b, PHYS 116, and MATH 125b; CR, or P, MATH 254, Bales/Bassett/Conklin

517L. Fundamentals of Water Quality Laboratory (1) I Field and laboratory methods in water quality sampling and analysis. Includes both wet chemical and instrumental methods of analysis. Fee. P, CR, 517R. Bales/Bassett/Conklin

518. Survey of Subsurface Hydrology (3) I Survey of physical, mathematical, geologic, and engineering concepts fundamental to subsurface hydrologic processes. P, CR, A

520. Water Resources Management, Planning, and Rights: A Policy Approach (3) II An introduction to basic concepts and issues of water resources management and administration, emphasizing water law and rights, water resources planning, institutional and organizational arrangements, and policy processes such as adjudication and rule-making. Bradley/Lord

521. Introduction to Water Resources Systems Analysis (3) I Quantitative analytical methods in water resources planning and management; introduction to systems analysis, benefit/cost, multi-objective planning, and risk assessment. P, MATH 125a. Buras/Davis/Maddock

522. Well Logging Interpretation (3) II (Identical with G EN 522)

523. Hydrology (3) I (Identical with C E 523) May be convened with 423.

524. Hydroclimatology (3) I Precipitation formation processes, the surface and atmospheric branches of the hydrologic cycle, land-surface-atmosphere interaction, surface energy balance, evapotranspiration, heat and moisture fluxes into the soil. P, consult department before enrolling. Shuttleworth

525. Water Quality Modeling (3) I (Identical with C E 525)

526. Water Quality Management (3) II Optimization and systems analysis techniques used in modeling; current models used in formulation and implementation of water quality policy. P, 525. (Identical with C E 526) Buras

527. Computer Applications in Hydraulics (3) I (Identical with C E 527) May be convened with 427.

531. Hydrogeology (3) II For a description of course topics, see 431. Graduate-level requirements include a research paper on a topic related to hydrogeology but not covered in lectures. P, GEOG 531. (Identical with GEOIS 533) Kreitler

535. Advanced Subsurface Hydrology (3) II Advanced acquifer and well hydrodynamics; heterogeneity, unsaturated flow; natural and artificial recharge; groundwater and surface-water interaction; mass and heat transport. P, MATH 223 or 522 or 422a or 422b. (Identical with GEOIS 535) Yeh

536. Ground-Water Resource Evaluation (3) II Hydrologic and geologic techniques for evaluating aquifer systems with case studies of ground-water management on local and aquifer scales, their environmental and societal impacts; case studies of ground-water contamination. Fee. Field methods, field trips. (Identical with GEOIS 536) Kreitler

540. Advanced Surface Water Hydrology (3-4) II For a description of course topics, see 440. Graduate-level requirements include an in-depth paper or project. 3R, 1D. Discussion section is optional for graduate students. Field trip. P, 519 or 523. May be convened with 440. Ince

543. Quantitative Planning Methods in Water Resources Administration (3) I For a description of course topics, see 443. Graduate-level requirements include a research paper on an applied aspect of the course. P, micro-economics. MATH 125a. May be convened with 443. D. Davis

545. Statistical Hydrology (3) II For a description of course topics, see 445. Graduate-level requirements include an in-depth research paper. P, CHEM 103a-103b, MATH 125b, knowledge of computer language. May be convened with 450R. D. Davis

550R. Environmental Hydrology (3) II For a description of course topics, see 450R. Graduate-level requirements include an in-depth research paper. P, CHEM 103a-103b, MATH 125b, knowledge of computer language. May be convened with 450R. D. Davis

550L. Environmental Hydrology Laboratory (1) II For a description of course topics, see 450L. Fee. P, CR, 550R or equivalent. May be convened with 450L. D. Davis

557. Low Temperature Geochemistry (3) II (Identical with GEOIS 557) May be convened with 457.

560. Watershed Hydrology (3) I (Identical with WS M 560) May be convened with 460.

563. Isotope Hydrology (3) II (Identical with GEOIS 563)

570. Computer Simulation of Hydrochemical Processes (3) I Introduction to the fundamentals of solving complex water chemistry problems using computer codes as tools. Equilibrium, mass transfer, or 1-D transport models with multielement chemistry, thermodynamic concepts, and use of equations in models; placing natural chemical processes into an interpretable framework, evaluation of error and uncertainty. P, CR, 506 (recommended) or 517D/R. R. Bassett

576. Advanced Natural Resource Economics (3) I (Identical with AREC 576)

577. Advanced Topics in the Economics of Environmental Regulation (3) II (Identical with AREC 577)

578. Global Change (3) II (Identical with GEOIS 578) May be convened with 478.

581. Environmental Policy (3) I II (Identical with POL 581) May be convened with 481.

582. Applied Groundwater Modeling (3) I For a description of course topics, see 482. Graduate-level requirements include an in-depth research paper and/or project. May be convened with 482. Maddock

583. Physical Oceanology and Limnology for Hydrologists (2) II For a description of course topics, see 483. Graduate-level requirements include an in-depth research report. P, MATH 125b. May be convened with 483. D. Davis

584. Advanced Applied Groundwater Modeling (3) II Advanced applied groundwater flow and transport topics see 443 Graduate and unsaturated media using variety of current software packages. 2R, 1L. P, 482 or 582 or equivalent course.


595. Colloquium a. Global Climate Change (2) I (Identical with ATMO 595b, which is home)

596. Seminar a. Advanced Topics in Hydrochemistry (1-3) I

603. Advanced Topics in Subsurface Hydrology (2) II 1994-95 Topics to be selected among (a) geostatistical and stochastic analyses of flow and transport, (b) well hydraulics and pumping test analysis, and (c) flow and transport in fractured rocks. P, 503 or 535. Newman

605. Soil Water Dynamics (3) II (Identical with SWIS 605)

642. Analysis of Hydrologic Systems (3) I Presentation and evaluation of a variety of mathematical modeling techniques, presentation of theoretical basis of linear/nonlinear systems, advantages and limitations of various approaches, e.g., linear vs. nonlinear, lumped vs. distributed, used in hydrologic modeling; interaction between function development and model calibration requirements. P, MATH 254. Soroudi/ian

643. Water Resources Systems Analysis (3) I Applications of mathematical programming to the analysis of interactions of hydrology, engineering, economics, and socio-institutional environment in regional water resources systems. P, 521 or consult department before enrolling. Buras


655. Stochastic Hydrology (3) I 1993-94 Advanced application of statistics and probability to hydrology; multivariate regression, Bayesian techniques, stochastic processes, time series and frequency analysis. P, MATH 361; 519 or 545 or basic statistics and hydrology. D. Davis/Maddock

695. Colloquium a. Hydrology and Water Resources Administration (1-3) I II For majors only; consult department before enrolling.

696. Seminar b. Unsaturated Flow (1-3) I II


645. Stochastic Hydrology (3) I 1993-94 Advanced application of statistics and probability to hydrology; multivariate regression, Bayesian techniques, stochastic processes, time series and frequency analysis. P, MATH 361; 519 or 545 or basic statistics and hydrology. D. Davis/Maddock
The department offers a major in journalism for the degrees of Bachelor of Arts and Master of Arts. For graduate admission and degree requirements, consult the Graduate Catalog. A Bachelor of Arts in Education with a teaching major in journalism also is available.

The major in journalism: 26 units in addition to the general education requirements for the Bachelor of Arts degree described in the College of Arts and Sciences section of this catalog. All majors must complete 205, 405, 208, 301, 302, 320, 413, 450, or 451 and 439 or 470. Students must complete one advanced course from among JOUR 411, 412, 417, 418, 419, and 451. No more than 35 units of journalism will count toward the 125 units needed for the degree. Journalism majors must complete at least 9 units in English writing or literature in addition to freshman English.

The supporting minor: Students are strongly advised to minor or obtain a second major in economics, English writing or literature, history, political science, a modern language, anthropology, psychology, sociology or the natural sciences.

The teaching major: 30 units, including 205, 405, 208, 301, 302, 320, 411 or 413; 450, 470.

The teaching minor: 20 units, including 205, 405, 208, 301, 302, 421 or 422 and 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 presents 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 and the legislature for community newspapers. During the spring semester, the department awards the Don Bolles Fellowship to permit one student to work in Phoenix covering the legislature.

Guadalajara Exchange: Students interested in Latin American reporting are offered a one-year exchange program with the School of Journalism at the Autonomous University of Guadalajara in Mexico. The Department of Journalism is accredited by the Accrediting Council on Education for Journalism and Mass Communications.

151. News in Mass Communications (3) I, II Designed to acquaint the nonjournalist with communications techniques used by newspapers, wire services, information agencies, news magazines and broadcast news; analysis of social and historical influence on the news media.

205. Reporting the News (3) I, II Gathering, evaluating, and writing news. P. CR 208, First-year Composition, knowledge of typing. Consult department before enrolling. (Identical with M AR 205)

206. Advanced Reporting (3) I, 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 An 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 Reporting and interpreting the news through pictures.

302. Photojournalism Laboratory (1) I Open to majors only. P. CR 301.

320. Editing (2) 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, II (Identical with M AR 362)

381. Reporting for Broadcast News (3) I (Identical with M AR 381)

396H. Honors Proseminar (3) I

403. Advanced Photojournalism (3) I, II Reporting and interpreting the news through photos, photo documentaries, and photo analysis. Open to majors only. P, 301, 302. May be convened with 303.

405. The Study of News (3) I Critical study and problem analysis of the media. Field work may include publication of conclusions. May be convened with 305.

406. Magazine Color Photography (3) S Techniques for taking and editing color photographs to illustrate magazine articles. Preparation of resumes and photo portfolios. Graduate-level requirements include additional readings and two additional photo assignments. Field trips. May be convened with 506.

411. News Features (3) I Writing the basic news feature article, specialized reporting and writing techniques. P. 206. May be convened with 511. Writing-Emphasis Course. P. Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

changing requirements for socially responsible and professional journalism in a democratic society. Case studies involve questions of bias, accuracy, privacy and national security. (Identical with LA S 439) May be convened with 539.

450. Community Journalism: The Tombstone Epitaph (3) [Rpt.] I II Class members work as editorial staff to produce the local newspaper for Tombstone, Arizona. Intensive study of problems and responsibilities of community newspapers. P, 206, 208, 301, discussion of preparation with instructor. May be convened with 550.

451. Community Journalism: El Independiente (3) [Rpt.] I II Class members work as editorial staff to produce a publication for the community of South Tucson. Intensive study of problems and responsibilities of journalism. P, 206, 208, 301, discussion of preparation with instructor. May be convened with 551.

470. The Press and Society (3) I II Critical study of press performance in current affairs;
The Committee on Judaic Studies offers an interdisciplinary program of study in the language, history, religion, culture and literature of Judaism and the Jews. It centers itself around goals and values in the areas of knowledge, skill-building, attitudes and responsible citizenship.

The major in Judaic studies leads to the Bachelor of Arts degree. The major requires 34 credit hours including JUS 195, 273, and 30 upper-division credit hours—13 hours of Hebrew, 9 in history, 3 in culture/religion, 3 in literature, and 6 elective hours.

The minor in Judaic Studies consists of 20 hours including JUS 195, 273, 10 hours of Hebrew, and 6 hours in history.

All courses are chosen in consultation with and approved by a committee advisor.

103a-103b. Elementary Modern Hebrew (5-5) CDT Intensive introduction to basic oral skills, reading and writing to accomplish simple conversation and read easy Hebrew with comprehension (Identical with NES 103a-103b)

273. Introduction to Judaism (3) I 1994-95 Exploration of Judaism in its diversity to its history and to proponents of its present forms, from Sephardi to Ashkenazi and from Orthodox to Reform. Focusing on the adaptive answers of Judaism to a variety of challenges, this course will encourage an understanding of the interplay between texts, rituals, symbols and community institutions in the 3500 years of Jewish adaptations.

321. Women in Judaism (3) Images of Jewish women in Jewish and other texts. Texts include religious, historical and literary genres from biblical, medieval, and modern sources. The course will deal with Jewish women as mothers, leaders, stereotypes, and current feminist viewpoints. (Identical with W S 321)

370a-370b. History of the Jews (3-3) II (Identical with HIST 370a-370b)

372a-372b. Religion and History of Israel in Ancient Times (3-3) Survey of the history and religion of ancient Israel. 372a: Biblical period through the Babylonian Exile; introduction to the Hebrew Bible. 372b: Ezra-Nehemiah to the Roman Empire, with emphasis on the formation of rabbinic Judaism. (Identical with HIST 372a-372b, NES 372a-372b and RELI 372a-372b)

374. The Holocaust (3) II 1993-94 (Identical with HIST 374)

377. Modern Israel (3) Evolution of the State of Israel from the rise of Zionism in 19th Century Europe to the present. Emphasis on interactive generative processes and understanding of the interplay between past processes and present socio-political realities. (Identical with HIST 377, NES 377 and POL 377)

382. Archaeology and the Bible (3) II Focuses on the relationship between archaeological investigations and the study of the Bible. In combination with a discussion of how archaeology can assist in reconstructing many aspects of the cultural and social milieu of the Bible, this course will survey major discoveries which illuminate the Bible. (Identical with NES 382 and RELI 382)

403a-403b. Intermediate Modern Hebrew (5-5) CDT Instruction to achieve moderate fluency in conversation, reading and writing. P. 103b or qualification by an equivalency exam. (Identical with NES 403a-403b)

409a-409b. Biblical Hebrew (3-3) I 1993-94 (Identical with NES 409a-409b) May be convened with 509a-509b.

430. Prophecy in Ancient Israel (3) II 1993-94 Traces the origins and nature of Israelite prophecy within its ancient Near Eastern cultural context. Focus on the literary forms and philosophical issues with which several major prophets deal. (Identical with RELI 430) May be convened with 530.

435. Jewish Mysticism (3) II 1993-94 Surveys the ideology, symbolism, and major themes of Jewish mysticism as evidenced in several prominent mystical texts. The core of this course will be reading the texts in English translation and the development of skills in reading and understanding a Jewish mystical text. (Identical with NES 435 and RELI 435) May be convened with 535.

453. Advanced Hebrew (3) [Rpt.] I II Advanced instruction in Biblical, Rabbinic, and/or modern Hebrew language and literature. P. 403b or 409b. May be convened with 553.

454. Spanish Inquisition (3) I 1994-95 (Identical with HIST 454)

455. Introduction to Rabbinic Literature (3) II 1994-95 Major ethical and legal texts of rabbinic Judaism for critical understanding of the different modes of rabbinic thought and writing through study of different forms of rabbinic literature in English translation. (Identical with RELI 455)

495. Colloquium f. Ancient Near East (3) [Rpt.] I II Advanced instruction in Biblical, Rabbinic, and/or modern Hebrew language and literature. P. 403b or 409b. May be convened with 553.

530. Prophecy in Ancient Israel (3) II 1993-94 For a description of course topics, see 430. Graduate-level requirements include a research paper. (Identical with RELI 530) May be convened with 430.

535. Jewish Mysticism (3) II For description of course topics, see 435. Graduate students will be required to write a paper approximately 15 pages in length. (Identical with NES 535) May be convened with 435.

596. Seminar w. Feminist Approaches in the Bible (3) II (Identical with NES 596w and RELI 596w) May be convened with 496w.

Landscape Architecture
(See Renewable Natural Resources)

Latin
(See Classics)

Language, Reading and Culture (LRC)

Education Building, Room 517
(602) 621-1311

Professors Judy Nichols Mitchell Head, Patricia L. Anders, Gary D Fenstermacher, Kenneth G. Goodman, Yetta M. Goodman, Amelia Melnik (Emerita), Manuel D. Pacheco, Gavriel Salomon, William J. Valmont

Associate Professors Adela A. Allen, John M. Bradley, Margaret B. Fleming (Emerita), Luis C. Moll, Richard Ruiz Assistant Professors Dana L. Fox, Teresa McCarty, Kathleen G. Short, Octaviana Trujillo

Clinical Assistant Professor Arminda R. Fuentevilla
Adjunct Assistant Professor Kathleen McDonough

The department is committed to scholarship and leadership in the development of a knowledge base consisting of theory, research and practice related to language and reading in the context of culture. The department's research, teaching and service addresses bilingualism, biliteracy, bilingual/multicultural education, language acquisition and variation, literacy development and the relationships of language, culture, teaching and learning.

The department offers programs leading to the Master of Education degree in...
bilingual/bicultural education and the Master of Arts degree with majors in bilingual/multicultural education and in language, reading and culture. The department also offers programs leading to the Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees with a major in language, reading and culture. At the time of catalog production, the Master of Education degree program with a major in reading was under review. Prospective students should consult the department for information regarding the status of this program. For information on graduate admission and graduate degree programs, please consult the Graduate Catalog.

197. Workshop
a. Investigating Learning Strategies (3) I II S.

304. Decoding Skills in the Elementary School (2) I II Basic decoding skills needed in reading; methods and materials used in teaching reading.

406. Foundations of Reading Instruction in Spanish (3) I II Introduction to the theoretical and practical aspects of the reading process, with attention to essential decoding and comprehension skills; special application for teaching Spanish-speaking children to read. Taught in Spanish. P, Spanish fluency. (Identical with MAS 406)

410. Foundations of Bilingual Education (3) I II Socio-cultural factors, language practices and education; analysis of theories and practices affecting bilingual learners; historical, social and cultural influences; relationship of theory to the characteristics and needs of the bilingual learner. (Identical with MAS 410) May be convened with 510.

412. Educating the Culturally Diverse (3) I II Issues faced in education associated with ethnic and linguistic pluralism in the United States; analysis of the interaction of school, community, cultural and family factors in the education of diverse populations. May be convened with 512.

414. Bilingual Reading and Writing (3) I II Analysis of reading and writing situations encountered by bilingual students; phonological, semantic and syntactic aspects of instruction; methods and materials. May be convened with 514.

418. Methods and Materials in Bilingual Education (3) I II Analysis and evaluation of methods and materials used in bilingual education programs; effective strategies in first and second language instruction; concurrent and separate language approaches and cooperative models. P, 504. May be convened with 518.

428. 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. May be convened with 528.

430. 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 computer use; communications networking; computer networking. May be convened with 530.

435. Content Area Literacy in a Multicultural School (3) I II Prepares teachers to integrate knowledge of cultural diversity and literacy processes with their content and specialization. May be convened with 535.

436. Classroom Communications and Interaction (3) I II The teacher's role in promoting effective communication and interaction in classrooms: analysis of both verbal and nonverbal uses of language. May be convened with 536.

480. Children's Literature in the Classroom (3) I II S Analysis and discussion of classic and contemporary children's literature of all genres, and its relationship to language, reading and culture. May be convened with 580.

504. Language and Culture in Education (3) I II Introduction to aspects of language and culture that affect education, particularly in reading, writing and the language arts; discussion of social and political concerns.

505. Essentials of Reading and Writing (3) I II Survey of reading and writing relationships: development, instruction, and evaluation.

507. Teaching of Reading: Decoding and Comprehension (3) I II Linguistic, psychological and cultural bases of decoding and comprehension; theories that influence practice; materials and practices that facilitate learning to read.

510. Foundations of Bilingual Education (3) I II For description of course topics, see 410. Graduate-level requirements include an in-depth research paper or other project. May be convened with 410.

512. Educating the Culturally Diverse (3) I II For description of course topics, see 412. Graduate-level requirements include an in-depth research paper or other project. May be convened with 412.

514. Bilingual Reading and Writing (3) I II For a description of course topics, see 414. Graduate-level requirements include an in-depth research paper or other project. May be convened with 414.

518. Methods and Materials in Bilingual Education (3) I II For a description of course topics, see 418. Graduate-level requirements include an in-depth research paper or other project. May be convened with 418.

527. Developing Language Arts Curriculum (3) I II Curriculum theory and models; staff development for implementing change; scope and sequence; planning effective learning experiences. P, 504 and 505.

528. Bilingual Curriculum Development (3) I II For description of course topics, see 428. Graduate-level requirements may include an in-depth research paper or other project on an aspect related to the course. May be convened with 428.

530. Computer Application for Teachers (3) I II For a description of course topics, see 430. Graduate-level requirements include an in-depth research paper or other project. May be convened with 430.

532. Pre-Reading and Beginning Reading Development (3) I II For description of course topics, see 432. Graduate-level requirements include an in-depth research paper or other project on an aspect related to the course. May be convened with 432.

536. Classroom Communications and Interaction (3) I II For a description of course topics, see 436. Graduate-level requirements include an in-depth research paper or other project on an aspect related to the course. May be convened with 436.

537. Classroom Diagnosis and Instruction (3) I II Procedures for diagnosing and developing reading and writing skills for pupils of below-average achievement level. P, 505, 507 or CR.

551. Reading, 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.

553. Language Acquisition and Development (3) I II Study of the development of language in young children; focus on oral language and its relationship to emergent literacy; instructional strategies that build on language development.

554. Applied Linguistics in Education (3) I For a description of course topics, see 416. The application to curriculum, teaching and learning of concepts from linguistics, psycholinguistics and sociolinguistics. P. 551 or CR.

557. 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 literacy-related practices. P, 504, 505 or CR.

580. Children's Literature in the Classroom (3) I II S For a description of course topics, see 460. Graduate-level requirements include an in-depth research paper or other project. May be convened with 460.

581. Multietnic Literature and Literacy (3) I For a description of course topics, see 480. Graduate-level requirements include an in-depth research paper or other project. May be convened with 480.

583. Literature Discussions (3) I For a description of course topics, see 483. Graduate-level requirements include an in-depth research paper or other project on an aspect related to the course. May be convened with 483.
cussion groups, text-sets, reader response and collaborative learning.

595. Colloquium
a. Issues in Language, Reading and Culture (1-3) II P, 504, 505 [Rpt./12 units]
b. Language, Learning, and Reading Disabilities (3) II (Identical with SER 595b, which is home)
c. Issues in Educating Bilingual/Multicultural Children (1-3) II S [Rpt./9 units]
da. Applications of Language and Literacy (3) [Rpt./9 units] II S

597. Workshop
a. Southern Arizona Writing Project (3-9) [Rpt./12 units] II S (Identical with ENGL 597a)
b. Misuse in Teacher Education (2-3) II
c. Teaching of English (3) I II S [Rpt./3] (Identical with ENGL 5970, 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) I II Organizational patterns of language arts curricula; approaches to improvement of language arts instruction; personnel relations. Designed for the language arts supervisor and school administrator. P. 527.

634. Reading Comprehension: Theories, Research and Methods (3) I II Factors affecting cognitive development; methods of influencing growth in reading comprehension; examination and analysis of instructional materials; research related to comprehension and cognitive development. P. 507.

635. Reading and Writing in Content Areas (3) I II Methodology appropriate for reading and writing to learn content; compatible organizational models; program implementation. P. 504, 505, 507 or 551 or CR.

636. Reading Diagnostic Laboratory (3-6) [Rpt./6 units] I II Supervised practice in reading assessment; identification of factors influencing reading achievement, evaluation, construction, and administration of assessment procedures; development of interview techniques. P. 507, 537.

639. Reading Instructional Laboratory (3-6) [Rpt./6 units] I II Supervised practice in teaching and writing, preparing; analyzing and critiquing special instructional programs for students. Open to majors only. P. 507, 537.

653. Written Language Development (3) I II 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 510 and 514.

696. Seminar
a. Language, Reading and Culture (1-3) [Rpt./6] P, 15 graduate units including 504, 505.

Latin American Studies (LAS)
1522 E. Drachman St.
(602) 622-4002
Latin American Center
Director Donna J. Guy
Assistant Director Raul P. Saba
Graduate Interdisciplinary Program in Latin American Studies
Committee:
Professors Nathan Buras (Hydrology and Water Resources), Donald W. Carson (Journalism), Ken Clark (Architecture), T. Patrick Culbert (Anthropology), Celestino Fernández (Sociology), Roger Fox (Agricultural and Resource Economics), Donna J. Guy (History), Lain A. Gyurko (Spanish and Portuguese), Boris S. Kozolchyk (Law), Oscar Martinez (History), Michael C. Meyer (History), Andrew Nichols (Family and Community Medicine), Leland Pederson (Geography and Regional Development), José Promis (Spanish and Portuguese), Eliana Rivero (Spanish and Portuguese), Jacqueline Sharkey (Journalism), Arthur Silvers (Public Administration and Policy), Charles M. Tatum (Spanish and Portuguese), Edward J. Williams (Political Science)
Associate Professors Kevin Gosner (History), Keith McElroy (Art), Alfonso Moises (Media Arts), Richard Obregon (Music), Richard Ruiz (Language, Reading and Culture), Kathleen Schwartzman (Sociology), Barbara Timmermann (Pharmaceutical Sciences)
Assistant Professors Maria Jose Barbosa (Spanish and Portuguese), Bert J. Barickman (History), Paul G. Buchanan (Political Science), Virginia Escalante (Journalism), Daniel Nugent (Anthropology), Ana Virginia Perches (Spanish and Portuguese), Raul P. Saba (Latin American Studies), Stacie Widdifield (Art), Amy Williansen (Spanish and Portuguese)
Instructional Specialist Sr. Kieran McCarty (MASRC)
Lecturer Nivea P. Parsons (Spanish and Portuguese)

Associate Law Librarian Francisco Avalos (Law Library)
Associate Research Anthropologist James Greenberg (BARA)

The Latin American Area Center offers an interdisciplinary program designed primarily for students planning government, business, teaching, or other careers. The center offers a Bachelor of Arts degree, a Master of Arts degree, and a doctoral minor in Latin American studies. A student with an interest in the Latin American area selects a concentration in one department and enrolls in concentration related studies, cultural or professional, in other departments.

Undergraduate students majoring in Latin American Studies must complete a minimum of 30 upper-division units for the major. At least 12 of these must come from a concentration in one of the following areas: anthropology, art history, geography and regional development, history, political science, Portuguese, or Spanish. A maximum of 18 upper-division units, with no fewer than six in any one area, must be selected from two or three areas offering related studies: agricultural economics, anthropology, art history, economics, geography and regional development, history, journalism, political science, Portuguese, sociology or Spanish.

At some point in their programs students must also take the interdisciplinary Latin American Studies colloquium (LA S 495a). Depending on its subject matter, this course may be counted toward their area of concentration or toward one of their related studies. Competence in Portuguese or Spanish is required and may be demonstrated by completing Portuguese 206 or Spanish 251b with a grade of B or by an equivalency exam.

Although most Latin American studies-related courses do not have prerequisites, students planning to major in the field are strongly advised to take some of the introductory and survey courses related to Latin America at the lower-division level. In all cases, students majoring or minoring in Latin American studies should consult with an advisor at the Latin American Area Center early in their undergraduate programs.

For graduate admission and degree requirements, students should consult the Graduate Catalog.

The department participates in the honors program.

319. Mexican American Culture (3) I (Identical with ANTH 319)
322. Introduction to Prehispanic, Hispanic and Chicano Art (3) II 1994-95 (Identical with ARH 322)
Law (LAW)

Law Building, Room 110
(602) 621-1373


Associate Professors Lynn A. Baker, Jane B. Korn
Assistant Professors Ronald J. Rinaldi

The College of Law offers course work leading to the Juris Doctor degree. The course program has been thoroughly revised and expanded to include a modernized set of required courses and a wide variety of problem-method courses, seminars and clinical programs. For course descriptions and degree requirements, please see the College of Law Catalog.

600. Contracts (5)
601a -601b. Introduction to Legal Process and Civil Procedure (3-2)
602. Criminal Procedure (4)
603. Research and Writing (2)
604a -604b. Torts (2-3)
605. Property (5)
606. Constitutional Law I (3) I
607. Appellate Practice and Moot Court I (1)
608. Evidence (4)
609. The Legal Profession (2)

610. Health Law (3) I II
611. Employment Law (3) I II
612. Family Law (3) I II
613. Law and Medicine (3) I II
615. Constitutional Law II (4) II
616. Corporations (3) I II
617. Corporate Finance (2) II P, 616.
618. Antitrust Law (3) I II
619. Estates and Trusts (4) I II
620. Immigration Law (3) I
621. Administrative Law (3) I II
622. Law Review (1-3) I II
623. Conflict of Laws (3) I II
624. Labor Law (3) I
625. American Legal History (2) I II
626. Jurisprudence (3) I II
627. Copyright (2) I II
628. Comparative Law (3) I
629. Agency and Partnership (2) I II
630. Law and Humanities (3) I II
631. Indian Law (3) I (Identical with AINS 631)
633a -633b. Commercial Transactions (3-3) I II
633a is not prerequisite to 633b.
635. Basic Insurance (3)
637. Real Estate Planning (3) I II
638. Real Estate Transactions (3) I
639. Community Property (2) I
640. Mining and Public Land Law (3) I II
641. Water Law (3) I
642. Federal Jurisdiction (3) I II
643. Arizona Civil Procedure (3) I II
644a -644b. Remedies (1-3)
645a -645b. Trial Practice (2-3) I II P, 608, 609.
646. Federal Income Taxation (5) I II
647. Corporate Taxation (3) I II P, 646.
648. Estate and Gift Taxation and Basic Estate Planning (3) I
649. Trusts (3) I II
650. Criminal Law (3) I II
651. Income Taxation of Estates and Trusts (2) I II P, 646.
652. Sentencing Law (2) I II
654. Securities Regulation (3) I II
655. International Humanitarian Law (3) I II
656. Land-Use Planning (3) I II
657. Moot Court Board (2-2) I II 661a: Moot Court National Team. 661b: Moot Court Board.
658a -658b. Debtor-Creditor Law (1-2) I II
659. Statutory Interpretation (2) I II P, 608.
660. Remedies (1-3) I II P, 608, 609.
661. Bankruptcy (3) I II
662a -662b. Debtor-Creditor Law (1-2) I II 662a is not prerequisite to 662b.
663. Individual Income Tax (3) I II
664. Law and Social Science (2) II
665a -665b. Interviewing, Counseling and Negotiating (I-I) I II 665a is not prerequisite to 665b.
666. Lawyering Skills Outside the Courtroom (2) I II P or CR, 696c or substantial clerking experience.
667. Law and Economics (3) I II
668. Pretrial Litigation (3) II P, 608.
669. Environmental Law (3) II GRD
670. International Law (3) I II
671. Law of Mass Media (2) I II
672. State and Local Government (3) I II
673. Advanced Legal Writing (2) II [Rpt./4 units]
674. The English Legal System (1) I
675. International Civil Litigation (1) I II
676. Patent Law (2) I II
677. Law and the Elderly (2) I II P 1993-94 GRD
679. European Economics Community (1) II
680. Natural Resources Law (3) I II GRD
681. Advanced Legal Research (1-2) II P, 603.
682. Colloquium
b. Women and the Law (2) I II
683. Seminar
b. Advanced Civil Procedure (3) I II
b. Clinical Practice (3-4) I II P, 608, 609
b. Tribal Law (2) I II GRD
b. Business Planning (3) II P, 616, 647
b. Legal Ethics (3) GRD
b. International Environmental Law (3) I II
b. Open to majors only. P, first year law courses.
b. Debtor-Creditor Game (1) II
b. United States Supreme Court and the Problem of Constitutional Interpretation (2) I II
b. Advanced Writing (3) II
b. Mental Health Law and Therapeutic Jurisprudence (2) I II
b. Tax Policy (3) I II
b. Public Interest Law (2-3) I II
b. Problems in Corporate Litigation (2) I II
b. Open to majors only. P, first year law courses.

Library Science (LIS)

1515 East First Street
(602) 621-3565

School of Library Science

Professors Charlie D. Hurt III, Director, Ellen Altman, Donald C. Dickinson, Margaret F. Maxwell (Emerita), Lawrence Clark Powell (Emeritus), Elinor C. Saltus (Emerita), Arnulfo D. Trejo (Emeritus)
401. Introduction to the Organization of Information (3) Introduction to the theories and practices used in the organization of information. Overview of formal and informal standards and practices for access to information in collections. May be convened with 501.

403. Library Collection Development (3) Principles of collection development; evaluation and review of materials; selection tools; acquisition of materials; problems in selection, including censorship. May be convened with 503.

404. Foundations of Library and Information Services (3) Elements of librarianship, historical background, types of libraries, the role of the library in American life, current issues. May be convened with 504.

405. Basic Reference (3) Survey of general reference sources; discussion of reference techniques. May be convened with 505.

407. Library Management (3) Introduction to management concepts, the organizational structure of libraries, systems analysis, financial administration and the utilization of library personnel. May be convened with 507.

410. Introduction to Information Science (3) Methods, theories and technology of information science; elements of computer programming and systems design; implementation and management of computer systems in libraries and information centers. May be convened with 510.

411. Information Storage and Retrieval (3) Student involvement in on-line interactive systems. May be convened with 511.

416. Introduction to Microcomputers in Libraries (3) Examination of the place and function of microcomputers in the library and information environment. Emphasis on hardware and software concepts. Hands-on learning with operation systems, word-processing, spreadsheet creation and database management.

430. Public Librarianship (3) Administration of tax-supported libraries serving the general public, including problems of government relationships, community responsibilities, financial support, buildings, personnel, collections. May be convened with 530.

440. Academic Librarianship (3) Present trends in academic libraries, including financial administration, collection evaluation, personnel requirements and building needs. May be convened with 540.

441. Children's Literature in Spanish (3) (Identical with SPAN 441)

450. Special Librarianship (3) Mission, organization and administration of the special library. May be convened with 550.


481. School Library Administration and Organization (3) Services, finances, personnel, evaluation, quarters, organization and technical services in the school library. May be convened with 581.

485. Literature for Adolescents (3) Literature to meet recreational and developmental needs of the junior and senior high school age, including some books for adults. Reviewing and book talks. May be convened with 585.

501. Introduction to the Organization of Information (3) For a description of course topics, see 401. Graduate-level requirements include additional assignments and a higher level of performance. May be convened with 501.


503. Library Collection Development (3) For a description of course topics, see 403. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 403.

504. Foundations of Library and Information Services (3) For a description of course topics, see 404. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 404.

505. Basic Reference (3) For a description of course topics, see 405. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 405.

506. Research Methods (3) Need and opportunities for research in librarianship; types of research; research methodology; study of research design; elementary statistics.

507. Library Management (3) For a description of course topics, see 407. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 407.

509. Information Sources for Agricultural Scientists (1) (Identical with PL S 509)

510. Introduction to Information Science (3) For a description of course topics, see 410. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 410.

511. Information Storage and Retrieval (3) For a description of course topics, see 411. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 411.

512. Automation in Libraries (3) 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) Introduction to quantitative methods for the design, analysis and control of library systems.

519. Cartographic Information Management (3) Cartographic format as an information transfer medium. History of cartography and problems in interpretation of cartographic products. Role and place of maps in the information environment.


526. Introduction to Bibliography (3) Introduction and critical examination of various styles of bibliographic description; practical application in construction of a systematic bibliography.

530. Public Librarianship (3) For a description of course topics, see 430. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 430.

540. Academic Librarianship (3) For a description of course topics, see 440. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 440.

550. Special Librarianship (3) For a description of course topics, see 450. Graduate-level requirements include a greater number of assignments and a higher level of performance. May be convened with 450.


559. History of Books and Printing (3) Survey of the history of books and printing from early times to the present, including development of the alphabet, manuscript books, the invention and dissemination of printing and modern printing techniques. (Identical with HIST 559)

561. History of Children's Literature (3) Survey of literature for children in England and America from earliest times to the close of the 19th century, together with study of cultural and social values reflected in the literature. (Identical with ENGL 561)

570. Literature of Science and Technology (3) Creation, organization, and dissemination of scientific and technical literature; reference function and problems of bibliographic control. A science background is not required.

571. Information Sources and Services in the Social Sciences (3) Information resources and services in history, geography, political science, sociology, anthropology, psychology, education, economics and business.
Linguistics (LING)

Douglass Building, Room 200E
(602) 621-6897

Professors D. Terence Langendoen, Head, Richard Demers, Merrill Garrett (Psychology, Speech and Hearing Sciences), Robert M. Harnish (Psychology), Jane Hill (Anthropology), Adrienne Lehrer (Speech and Hearing Sciences), Susan Steele

Associate Professors Diana Archangelii, Michael Hammond, Richard T. Oehrle, Ofelia Zepeda

Assistant Professors Andrew Barss, Paul Bloom (Psychology), Molly Diesing, Simin Karimi (Near Eastern Studies), Janet Nicoll

The Department of Linguistics offers instruction in introductory, intermediate, and advanced topics in phonology, syntax, and semantics. It also offers course work in Native American languages of the Southwest (e.g., Navajo and O’odham) and courses on the native languages of North America. Undergraduate majors in linguistics can expect to be prepared to undertake professional graduate studies in linguistics and related areas or to pursue careers in such language-related fields as education, publishing, and certain sectors of business.

The Department of Linguistics offers programs leading to a Bachelor of Arts, a Master of Arts, and a Doctor of Philosophy in linguistics. For graduate admission and degree requirements, please see the Graduate Catalog. The major for the Bachelor of Arts: 30 units, including 201, 300, 310 and 315, and one year of work in an uncommonly taught language (e.g., Greek, Latin, Russian, or any non-Indo-European language). The remainder is to be selected in consultation with the undergraduate advisor.

Majors are urged to continue their foreign language study beyond the minimum 16 units required by the college.

Course work for the supporting minor is selected in consultation with the undergraduate advisor. A minor in linguistics requires a minimum of 20 units including 101 or 201, and two of 300, 310 and 315.

The department participates in the honors program.

101. Introduction to Language (3) I II S Survey of linguistic concepts and methods: communication among animals; physiology of human speech; elementary phonetics, syntax, and language change; language and the brain; language and thought.

102. Linguistics for Native American Communities (3) S Introduction to descriptive linguistics for Native Americans; practical linguistic and social issues in Native American languages; phonetics and phonology; orthography; dialects and language change; classroom applications. (Identical with AINS 102)

201. Introduction to Linguistics (3) II Fundamentals of linguistics; phonetics, phonology, morphology, syntax, semantics and language acquisition; provides basis for further study in the field.

203a-203b. Elementary Navajo Language (3) Speaking, reading, writing, understanding and transcribing. (Identical with AINS 203a-203b)

210. Native Languages of North America (3) II S Genetic and typological diversity of North American native languages; areal features, i.e., characteristics spread over a geographical region; and the history of the study of these languages, concentrating on individuals and the problems of classification. (Identical with AINS 210)

220. The Structures and Sources of American English Words (3) II S Linguistic principles governing the internal structure of English words and the ways in which new words are created, with a focus on spelling, sounds and morphemes. (Identical with ENGL 222)

260. Speech Science (4) I (Identical with SP H 260)

285. Introduction to Humanities Computing (3) S (Identical with GER 285)


303. Gender and Language (3) I 1994-95 (Identical with ANTH 303)

307a-307b. Elementary O’odham (Papago) Language (3-3) Speaking, reading, writing, and oral comprehension in the O’odham (Papago) language. (Identical with AINS 307a-307b)

310. Morphology and Morpho-syntactic Properties of the World’s Languages (3) I II Introduces the student to the commonly shared features of word building rules in the world’s languages and provides an introduction to the theoretical issues involved in languages for which the word/sentence distinction does not exist. Students will have many problem sets containing data from dozens of languages. P, 101 or 201.
315. Introduction to Phonology (3) I II. This course examines the sound structure of a wide variety of human languages, with an aim of finding principles that derive patterns in its sounds and sound patterns. In addition, the course will explore the relationships among the various phonological levels, such as segmental analysis, transcription, and the properties of sounds and patterns. P, 101 or 201.

320. Language and Social Issues (3) I II S. 1993-94. Focuses on the theme that individuals identify with or prefer in part on the basis of the language or dialect they use. Examines the role of the individual as a language user and the problems of self-identity and of social differentiation, not only in our multi-lingual-multicultural country, but in the world as well.

376. Introduction to the Philosophy of Language (3) I 1994-95 (Identical with PHIL 376)


402. Japanese Sociolinguistics (3) [Rpt. /1] I (Identical with JPN 436) May be convened with 525.

426. Introduction to Arabic Linguistics (3) II (Identical with ARB 426) May be convened with 526.

436. Japanese Sociolinguistics (3) [Rpt. /1] I (Identical with JPN 436) May be convened with 536.

445a-445b. Structure of a Non-Western Language (3-3) [Rpt. /2] In-depth linguistic analysis of selected phonological, syntactic, and semantic problems in a non-Western language, concentrating on native languages of the Southwest area. P, 101. (Identical with AINS 445a-445b) May be convened with 545a-545b.

451. Language Acquisition (3) II (Identical with SP H 451) May be convened with 551.

463. Linguistics and the Study of Literature (3) II 1994-95 (Identical with ENGL 461) May be convened with 561.

465. Philosophy of Language (3) (Identical with PHIL 465) May be convened with 563.

465. Pragmatics (3) II (Identical with PHIL 465) May be convened with 565.

473. Natural Language Processing (3) I Introduction to the processes underlying speech production and comprehension: speech sounds, words, parsing, semantics and pragmatics. P, 101. (Identical with PHIL 473 and PSYC 473) May be convened with 573.

474. Linguistic Perspectives on Mexican-American Spanish and Bilingualism (3) I II (Identical with SPAN 474) May be convened with 574.

476. Language and Culture (3) II (Identical with ANTH 476) May be convened with 576.

477. Discourse and Text (3) II 1993-94 (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) [Rpt. /6 units] II (Identical with GER 485). May be convened with 585.

488. Computational Linguistics (3) I 1994-95 Fundamentals of formal language theory; syntactic and semantic processing, the place of world knowledge in natural language processing. P, 388 or a course in one of the following: formal languages, syntax, data structures, or compilers. (Identical with C SC 488 and PSYC 488) May be convened with 588.

495. Colloquium a. Linguistics (1) [Rpt. /3] I II May be convened with 595a.

496. Seminar 595b. Linguistics in Japanese Linguistics (3) [Rpt. /2] II (Identical with JPN 496c, which is the home) May be convened with 596c.

500. Linguistics for Nonmajors (3) I II 1993-94. Conceptual foundations, methodology, and current theoretical frameworks. Students will carry out actual linguistic analysis. For students in fields other than linguistics.

501. Formal Foundation of Linguistics (3) I A survey of the aims of linguistic research and introduction to the basic mathematics of formal linguistics; logic, sets, algebras, graphs, feature structures, formal language theory.

502. Gender and Language in Japan (3) II 1994-95 (Identical with JPN 502) May be convened with 402.

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. Government Binding Theory (3) II Continuation of 503, focusing on government, control, binding, thematic relations, and the theory of logical form.


506. 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.

511. Introduction to Japanese Linguistics (3) (Identical with JPN 511) May be convened with 411.

512. Advanced Japanese Linguistics (3) (Identical with JPN 512) May be convened with 412.

514. Foundations of Phonological Theory II (3) I II Investigation of the evidence and arguments for non-linear representations (autosegmental and metrical) and of the organization of the phonological component of grammar, including evidence for its interaction with morphological structures and rules.

515. Phonological Phonetics (3) I 1994-95 Study of the acoustic and articulatory properties of sounds and patterns of sounds that occur in human language. Focus on the significance of the properties of sounds for phonological theory, in particular, distinctive feature theory. Role of psycho-acoustic studies as a source of evidence for phonological theory.

519. Linguistic Structure of Modern Chinese (3) (Identical with CHN 519) May be convened with 419.

520. Linguistic Structure of Modern Chinese (3) (Identical with CHN 520) May be convened with 420.

522. Linguistic Semantics and Lexicology (3) I II 1994-95 For a description of course topics,
see 422. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with PHIL 522) May be convened with 422.

525. Language Variation (3) 1993-94 II For a description of course topics, see 430. Graduate-level requirements include mastery of the formalism, solving data-set problems, and a higher level of performance. (Identical with ANTH 552) May be convened with 425.

526. Introduction to Arabic Linguistics (3) II (Identical with ARB 526) May be convened with 426.

535. Morphology (3) I Morphology is the internal structure of words and the relationship between words and the syntactic, phonological, and semantic properties of the units that include them. Course work includes the development of morphological theory.

536. Japanese Sociolinguistics (3) [Rpt. /1] I (Identical with JPN 536) May be convened with 436.

540. Linguistic Change and Diachronic Theory (3) I 1993-94 Current theories in historical linguistics, including the study of the mechanisms and consequences of language change and the methods of linguistic reconstruction. Particular languages and areas of linguistics vary with the instructor. (Identical with NES 540)

544. Syntactic Analysis (3) I 1994-95 An examination of the syntactic diversity presented by natural human languages and an exploration of the issues that such diversity presents for syntactic analysis. Topics include AUX, word order, constituency, and subjects.

545a-545b. Structure of a Non-Western Language (3-3) [Rpt. /2] For a description of course topics, see 445a-445b. Graduate-level requirements include a higher level of performance. (Identical with ANTS 545a-545b) May be convened with 445a-445b.

551. Language Acquisition (3) II (Identical with SPH 551) May be convened with 451.

553. Lexical and Syntactic Development (3) I II (Identical with PSYC 553)

561. Linguistics and the Study of Literature (3) II 1994-95 (Identical with CCLS 561) May be convened with 461.

563. Philosophy of Language (3) (Identical with PHIL 563) May be convened with 463.

564. Formal Semantics (3) I Introduction to model-theoretic investigations of natural language interpretation, including coordination, quantification, referential relations, tense, aspect and modality (Identical with PHIL 564)

565. Pragmatics (3) (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 PSYC 573) May be convened with 473.

574. Linguistic Perspectives on Mexican-American Spanish and Bilingualism (3) I II (Identical with SPAN 574) May be convened with 474.

576. Language in Culture (3) II (Identical with ANTH 576) May be convened with 476.

577. Discourse and Text (3) II 1993-94 (Identical with ANTH 577) May be convened with 477.

580. Historical Comparative Linguistics (3) I (Identical with ANTH 580) May be convened with 480.

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 PSYC 588) May be convened with 488.

595. Colloquium a. Linguistics (1) [Rpt./3] I II May be convened with 495a.

596. Seminar a. Topics in Japanese Linguistics (3) [Rpt./2] I II (Identical with JPN 596c, which is the home) May be convened with 496c.

600. Current Issues in Linguistic Research (3) [Rpt./1] I II Current research in linguistics, with emphasis on relationships among syntax, semantics, and phonology.

604. Seminar a. Syntax and Semantics (3) [Rpt./2] I II b. Topics in Psycholinguistic Theory (3) [Rpt./2] I II

c. Current Issues in Syntactic Theory (3) I II [Rpt./2]

d. Current Issues in Syntactic Theory (3) I II [Rpt./2]

e. Linguistic Investigations and Applications (3) I II [Rpt./2] (Identical with COMM 696f and PSYC 696f)

679. Workshop a. Linguistic Theory (3) I Open to majors only.

### Management and Policy (MAP)

McClelland Hall, Room 405
(602) 621-1035

Professors Michael R. Gottfredson, Head, Lee R. Beach, Terence Connolly, Edwin B. Flippo (Emeritus), Barbara A. Gutek, Travis W. Hirschi (Sociology), James P. Logan (Emeritus), June M. Morrison (Emerita), Raymond A. Mulligan (Emeritus), Thomas R. Navin (Emeritus), Gregory B. Northcraft, Amnon Rapoport, George W. Summers (Emeritus)

Associate Professors Lawton R. Burns, Marvin Forman, H. Brinton Millward, David A. Tansik, Robert E. Tindall

Assistant Professors Terri L. Griffith, Kenneth W. Koput, Sherry K. Schneider, Christina Shalley

The Department of Management and Policy offers coursework focusing on organizational behavior and policymaking in the public and private sectors. The curriculum is designed to prepare students for a wide variety of managerial and staff positions, as well as for postgraduate work in such fields as business, public administration, and law. The department participates in the following undergraduate degree:

Bachelor of Science in Business Administration with a major in human resources. For degree requirements, please see the College of Business and Public Administration section of this catalog.

The Master of Science with a major in management and policy is also available, and the department participates in the Master of Public Administration, and the Doctor of Philosophy with a major in management. For admission and degree requirements, please see the Graduate Catalog.

The department participates in the honors program.

305.* Management and Organizational Behavior (3) I II GRD Integration of classical and organizational behavior approaches to management in private and public organizations in various cultures. Special sections of this course are offered for participants in the University Honors Program. P. ECON 376

306.* Legal, Social and Political Environment of Business (3) I II Introduction to the social, legal and political environment of business. The relationship between business and government; regulation and interest groups, the legal process.

330.* Human Resources Management (3) I II GRD Policies and current practices in utilizing human resources effectively at all organizational levels.

376.* Statistical Inference in Management (3) Further topics in statistical analysis and inference applied to managerial decision making. P. STAT 275. (Identical with ECON 376 and MKTG 376)

420.* Advanced Business Law (3) I II GRD Negotiable instruments, partnerships, corporations, and property rights. P. CR 320 or admission to B.P.A. graduate programs.

426.* Wills, Estates, and Trusts (3) I Wills, inheritances, estates, and trusts; the administration of estates, including the duties and liabilities of executors and trustees; basic estate and gift tax laws applicable to estate planning.

430.* Human Resources Policies (3) II An integrative, case-oriented course focusing on problems and policies in the procurement, development, compensation, and motivation of personnel. P. 330 and 6 units in human resources major.

432.* Bargaining and Negotiation in Organizations (3) Examination of the state of the art of bargaining and negotiation and the development of bargaining skills in a wide variety of business and interpersonal settings. P. 305.
435. International Management (3) I II S
Analysis of management opportunities and challenges for enterprises; strategies of firms expanding internationally. (Identical with PA 435) May be convened with 535.

444. * Group-Process Methods in Management (3) II Application of behavioral science knowledge to group functioning in organizations. Emphasis on case studies of actual group events. Open only to BPA majors. P, 305, FIN 311, MKTG 361. Writing.

455. * Preventive Health Care Policy and Administration (3) I Preventive health care activities, analysis of public policies relating to such care, and discussion of general issues in this administration including health promotion, health education, environmental health, and the nature and functions of public health departments and planning agencies.

471. * Management Policies (3) I II Analysis plus case studies of management in business enterprises. Open only to BPA majors. An honors section of this course will be available for entrepreneurship program students. P, 305, FIN 311, MKTG 361. Writing.

480. * Men, Women and Work (3) I II Survey of research on topics that have to do with gender and organizations. Topics include social determinants of career choice, perceptions and performance of men and women as managers, occupational sex segregation, work and family issues, implications of technological change for women's employment, affirmative action and comparable worth. P, 305. (Identical with W S 480).

481. * Finance and New Venture Development (4) I (Identical with FIN 481)

483. * Marketing Planning and Operational Decision-Making (4) II New product development; marketing programming and strategy; bargaining technique; individual and group decision-making processes. Open only to entrepreneurship program students. P, 305, FIN 311, MKTG 361. (Identical with MKTG 483).

484. * Development of New Venture Plans (4) II Preparation and presentation of a comprehensive business plan. Integration of financial, operational, and marketing elements. Open only to entrepreneurship program students. P, 305, FIN 311, MKTG 361. (Identical with MKTG 484).

486. * Managerial Judgment and Decision (3) II Development of a working understanding of decision analysis (DA) and its use in decision making. Emphasis on practical applications in professional and personal decisions.

496. * Seminar a. Honors (3) [Rpt.] 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.

500. Management Case Analysis and Presentation (3) I II Written analysis of cases and other reports; development of skills in analyzing, decision making, and written and oral presentation, with emphasis on the total situation of each case considered.

502. Organization Theory and Behavioral Relations (3) I II The interactions, effects, and interrelationships of managers, employees, and organizational structures and systems. Open only to students admitted to a B.P.A. graduate program.

503. Human Resource Management (3) I Principles, methods, research relevant to management of an organization's human resources, with emphasis on the psychology of management, training, development, compensation. P, 305 or 502.

504. Organization Development and Change (3) I II Concepts and skills relevant to persons concerned with problem diagnosis and organizational development and change. P, 305 or 502.

505. Organizational Power (3) II Development of organizational power and influence techniques for individuals and groups. Uses cases and practical experience to build on motivation, negotiation, and group dynamic skills. P, 502.

532. Conflict and Cooperation in the Dyad (3) I Critical exposition of the essential ideas of two-person game theory and the findings of experimental research on social interactions in the dyad.

535. International Management (3) I II S
For description of course topics, see 435. Graduate-level requirements include additional research and writing on more complex issues. (Identical with PA 535) May be convened with 435.

537. Finance for New Ventures (3) I (Identical with FIN 537)

538. Marketing, Negotiation and Decision Tactics (3) II Development of bargaining and decision-making skills through simulated negotiations and role playing. Open only to students in the entrepreneurship program. P, 305, FIN 500a-b, 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, 305, FIN 500a-b, FIN 511, MKTG 500. (Identical with FIN 539).

545. Interactive Behavior in Small Groups (3) II Critical survey of the essential ideas of n-person game theory (2-2) and the findings of experimental research on social dilemmas, bargaining and coalition formation.

556. Gender Issues in Organizational Behavior (3) Reviews the research on several topics having to do with gender and organizations, including: social determinants of career choice, occupational sex segregation, perceptions of men and women as managers; gender issues in motivation, leadership, and job satisfaction; work and family issues; implications of technological change for women's employment; organizational change including affirmative action and comparable worth. (Identical with SOC 556).

560. Trends in Management Theory (3) I
Review of management practices from the Industrial Revolution to modern high technology organizations. Focus on contemporary organizational issues and managerial responses to them. P, 305 or 502.

568. Environmental Scanning and Business Strategy (3) II (Identical with MKTG 568)


580a-580b. Theory of Management and Organization (3-3) 580a: Analysis of behavior in organizational systems; review of classical, behavioral, and contingency theories of management with a focus on internal systems phenomena. 580b: Organizations in their environments; analysis of organizations in the context of their environmental interfaces. P, 305 or 502. 580a is not prerequisite to 580b.


595. Colloquium

600. Behavioral Science Theory and Method in Management (3) [Rpt./II] I Conceptual and theoretical frameworks for the analysis of management problems from a behavioral science perspective. Emphasis on formulation of research questions and alternative research strategies for answering them.

635. Issues in Rural Health Care (3) II (Identical with NURS 635)

696. Seminar
a. Development Administration (1-3) I II
b. Program Planning and Development (1-3) I II
c. Performance Measurement and Accountability (1-3) II
d. Judgment and Decision Making (3) [Rpt./II] II P, 586

698. Environmental Scanning and Business Strategy (3) II (Identical with MKTG 698)

Management Information Systems (MIS)
McClelland Hall, Room 430 (602) 621-2748
The department offers the Bachelor of Science in Business Administration with majors in management information systems and operations management. Interested students should follow the program of studies in the College of Business and Public Administration section of the catalog.

Management information systems: Education in management information systems enables students to establish careers involving the analysis, design, implementation, use and management of computerized information systems in an organizational environment. Course work is available at the graduate and undergraduate levels.

Operations management: This major offers preparation for management careers in manufacturing and service operations. Emphasis is placed on operation and control of inventory systems, materials management, plant and project scheduling, and service design. Both quantitative and computer-based techniques are used for specific applications in these areas.

A Master of Science with a major in management information systems is also available. Management information systems is also a part of the Master of Business Administration. A Doctor of Philosophy degree is available.

111. Introduction to Computing (3) I II S Basic computer hardware and software concepts, computer terminology problem solving, and program development concepts, with emphasis on problem definition and systems development, introduction to a general purpose programming language and hands-on experience using application software systems.

121. Introduction to Business Programming (3) I II S Cobol and Pascal programming language; file organization maintenance, and structured programming techniques. P: 111.

301. * Data Structures and Algorithms (3) I II S Application system development techniques, fundamental data structures and algorithms; design and implementation of selected software procedures using Pascal. P: 121. MATH 123.

307. Computer Architecture and Data Communications (3) I II S Computer architecture, operating systems principles, systems software, data communications, networks, protocols and distributed processing.

331. * Database Management Systems (3) I II S Introduction to database management systems; relational, CODASYL, and hierarchical models; security concurrency, integrity and recovery issues; query languages. (Identical with CS 331)

341. * Information Systems Analysis and Design (3) I II S The analysis and logical design of business data processing, management information and management control systems; project management and cost/benefit analysis; techniques for stating and analyzing information systems requirements; use of automated and non-automated techniques for logical system design. CR 307.

342. * Data Structures and Algorithms (3) I II S (Identical with CS 342)

372. * Comparative Programming Languages (3) I II (Identical with CS 372)

373. * Basic Operations Management (3) I II S GRD Quantitative techniques applied to design, operation, control and improvement of manufacturing systems. Topics include forecasting, facility planning and layout, inventory management, quality control and just-in-time manufacturing. P: STAT 275, MATH 123.

396H. * Honors Proseminar (3) II

411. * Social Issues of Computing (3) I II S Broadcast survey of the individual, organizational, cultural, social and ethical issues provoked by current and projected uses of computers. May be convened with 511.

421. * Advanced Systems Modeling and Simulation (3) I Simulation concepts, simulation software, modeling of systems, model validation, selecting input probability distributions, random variance generation, statistical analysis of output data, and simulation language. P: fundamental knowledge of probability and statistics. (Identical with CS 421)

422. Mathematical Programming and Applications (3) I Formulation and solution of mathematical programming models for decision making. Topics include linear programming, network flow models and integer programming. These models are applied in systems design, manufacturing, logistics, finance, and other areas. P: MATH 119. May be convened with 522.

441. * Information System Design and Implementation (3) I II S Design of computer-based solutions to individual and organizational problems; involves an analysis of subsystems of user interfaces, hardware/software selection and evaluation, and system implementation; explores interface between systems and individuals and systems and organizations. P: 331, 341.

450. * International Dimensions of Information Technology (3) I National and regional information technology development strategies and policies; IT and national sovereignty; development and control of "information highways;" impact of public and business policies on information systems design and use; international institutions and IT; convergence of information systems across countries, regions and international economic sectors. May be convened with 550.

451. * Advanced Business Programming (3) I Business systems programming environment; basic and advanced COBOL; file organization and access methods; external sort and multi-key files; 4GLs in data processing. P: 301. May be convened with 551.

453. * Software Systems (3) I II Software development and software engineering; brings together the elements of programming language, operating system, and development techniques taught in C SC C programming language and the Unix operating system. May be convened with 553.

461. * Accounting Information Systems (3) I II (Identical with ACCT 461)

471. * Policy Formation and Management Information Systems (3) I II S Integration of the MIS activity with the functional operations of the business organization; utilization of case studies and a computer simulation model to enhance executive decision making relative to planning, organizing, controlling, and actuating. Open only to BPA majors. P: FIN 311, MAP 305, MKTG 361, Senior Standing. Writing-Emphasis Course. P: Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

473a-473b. * Production and Operations Management (3-3) I-3/ II-3 Production systems, including service type industries; activities entailed in selecting, designing, operating, controlling, and updating systems. 473a: Forecasting, aggregate planning, MRP, inventory models under uncertainty, scheduling. P: 373. 473b: Capacity expansion and facility location, facility layout, assembly line balancing, new technologies (GT, FMS, CAD/CAM) project management, case studies in manufacturing and services. May be convened with 573a-573b.

474. * Current Topics in Operations Management (3) II Coverage of new techniques and technologies in operations management. Examples of topics that may be covered are JIT, OPT, robotics, P: 473b or CR. May be convened with 574.

475. * Productivity Improvement (3) I Topics in productivity measurement, evaluation and control: work measurement, job design, statistical quality control, productivity improvement through effective management. P: 373. May be convened with 575.

476. * Management of Service Operations (3) I Application of operations management concepts to service organizations; exploration of critical issues such as facility location, layout, scheduling, and capacity management; case analyses of service firm projects. P: 373. May be convened with 576.

477. * Materials and Logistics Management (3) I Organization, management and control of material flows processes; logistical strategies and relationships of procurement, handling, warehousing, transportation, and inventory control. P: 373, 473a. May be convened with 577.

478. * Project Management (3) I Definition of problems and projects, organizational forms, developing the work breakdown structure, scheduling techniques (PERT and CPM), control mechanisms and cost reporting, and progress reports. Lectures and case analyses. P: 305, 373. May be convened with 578.
47a. *Computer Models for Operations Management (3) II Use of available software packages to analyze complex operations management problems. P. 473a/473b or CR. May be convened with 579.

*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.

480. Introduction to Expert Systems (3) I II
An in-depth technical background on the concepts and skills essential to analysis, design and development of business expert systems. Topics include applications and development in A1 knowledge-based systems, architecture, knowledge representation and acquisition, and Prolog; focus on business problem solving. May be convened with 580.

501. Management Information Systems (3) I Introduction to managerial issues raised by the use and implementation of information technologies in business. Emphasis is on organizational and technical foundations of information systems; problem solving skills using PC-based software.

507a-507b. Information Systems Architecture and Data Communications (3-3) I II Fundamental concepts of operating systems. The principles and techniques required for engineering and understanding operating systems are covered. Examples from real systems are given to illustrate application of particular concepts. Hardware architecture that is relevant for understanding operating systems is covered. P. 507a or equivalent course. (Identical with C SC 541a-541b)

515. Introduction to Expert Systems (3) I II
An in-depth technical background on the concepts and skills essential to analysis, design and development of business expert systems. Topics include applications and development in A1 knowledge-based systems, architecture, knowledge representation and acquisition, and Prolog; focus on business problem solving. May be convened with 580.

551. Social Issues of Computing (3) I II S For a description of course topics, see 411. Graduate-level requirements include an additional term paper. May be convened with 411.

521a-521b. Advanced Systems Modeling and Simulation (3-3) 521a: Simulation concepts, simulation software, modeling of systems, model validation, selecting input probability distributions, random variate generation, statistical analysis of output data and SIMAN simulation language. P. fundamental knowledge of probability and statistics, 521b: Modelling and analyzing complex business systems using advanced simulation and statistical techniques. A semester project is required. P. 521a or equivalent course. (Identical with C SC 521a-521b)

522. Mathematical Programming and Applications (3) I For a description of course topics, see 422. Graduate-level requirements include an additional term paper or program. May be convened with 422.

531a-531b. Data Structures and Database Management (3-3) 531a: Abstract data types, data structures and their implementation in Pascal programs. Data structures covered include stacks, queues, lists and trees. 531b: Introduction to database processing in comparison with file processing. Review of the organization and relevant data structures. Detailed study of various tools needed for logical and physical design. Detailed study of data flow diagrams and the entity-relationship model, Relational and CODASYL database models, as well as implementation aspects for a database system. Database applications using SQL/DS on the IBM 3090. P. 531a or equivalent data structures course and knowledge of the IBM 3090 (VM/CMS) environment.

541a-541b. Computer-Aided Information Systems Analysis and Design (3-3) Introduction to the management and techniques associated with software development, both domestically and internationally with focus on the analysis and design stages. Emphasizes international issues. Involves "hands-on" experience with Computer-Aided Software Engineering (CASE) tool. (Identical with C SC 541a-541b)

550. International Dimensions of Information Technologies (3) I For a description of course topics, see 550. Graduate-level requirements include the production of several medium-sized programs, with emphasis on the program life-cycle, maintainability, and life-cost. May be convened with 453.

554. Computer Graphics (3) I II Interactive computer graphics; user interface design; pictorial data structures and management. P. 531a.

567. Design and Control of Production Systems (3) I II Introduction to the basic concepts in operations management. Topics covered include project planning, aggregate planning, forecasting, capacity planning, inventory models, linear programming and simulation. Open only to graduate students in BPA.

570. Management and Evaluation of Information Systems (3) I II The methodologies of economics and management information systems applied to the problem of designing and evaluating information systems for a profit-maximizing firm. An MBA integrative course. Open only to students admitted to BPA graduate program. May be convened with 570.

574. Current Topics in Operations Management (3) I II For a description of course topics, see 474. Graduate-level requirements include an additional term paper or program. May be convened with 474.

575. Productivity Improvement (3) I For a description of course topics, see 475. Graduate-level requirements include an additional term paper or program. May be convened with 475.

576. Management of Service Operations (3) I For a description of course topics, see 476. Graduate-level requirements include an additional term paper or program. May be convened with 476.

577. Materials and Logistics Management (3) I For a description of course topics, see 477. Graduate-level requirements include an additional term paper or program. May be convened with 477.

578. Project Management (3) I For a description of course topics, see 478. Graduate-level requirements include an additional term paper or program. May be convened with 478.

579. Computer Models for Operations Management (3) I For a description of course topics, see 479. Graduate-level requirements include an additional term paper or program. May be convened with 479.

580. Introduction to Expert Systems (3) I II For a description of course topics, see 480. Graduate-level requirements include an additional term paper. May be convened with 480.

583. Stochastic Models in Management Science (3) I II Markov chains, models or arrival processes, continuous-time Markov chains, queuing theory, models of computer and manufacturing systems. P. MATH 123.

584. Combinatorial Optimization and Integer Programming (3) I Introduction to the formulation, solution and implementation of integer programming models, for decision making where the choices are discrete. Topics include network flow models, computational complexity, branch-and-bound and cutting-plane methods. P. 422 or 522.

585. Manufacturing Strategy (3) I II 1994-95 Strategic issues in operations management. Topics include process choice and positioning, product profiling, focused manufacturing, infrastructure development, integration of marketing, accounting and manufacturing strategy and JIT manufacturing. P. 572 or consent of instructor.


588. Systems Design for Management (3) I II Focuses on automated tools to support managers in organizations including office automation, decision support systems, GDSS, applications and methodologies for designing, implementing, and evaluating such systems and their organizational impact.

Marketing (MKTG)
McClelland Hall, Room 320
(602) 621-7479

Professors Ambar G. Rao, Head, Dipankar Chakravarti, Joseph W. Newman (Emeritus), John H. Wieland (Emeritus)

Associate Professors Merrie L. Brucks, Bernard J. Jaworski, Deborah J. MacInnis, Christopher P. Puto, Richard A. Scott, Melanie R. Walldorff
Assistant Professors Helen H. Anderson, Jonathan Frenzen, Susan E. Hecker, Pallassana Kannan, Praveen Kopalle, Jayashree Mahajan

Marketing is the process of planning and executing conception, pricing, promotion, and distribution of ideas, goods, and services to create exchanges that satisfy individual and organizational objectives. Graduates may qualify for positions in product management, sales and sales management, retailing, advertising and promotion, marketing research, industrial marketing, distribution channels, and international marketing.

An undergraduate major in marketing is offered within the Bachelor of Science in Business Administration as described in the College of Business and Public Administration section of this catalog. The department offers a Master of Science degree with an emphasis on marketing research and also participates in the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration.

The department participates in the honors program.

361.* Introduction to Marketing (3) I II Role of marketing in the economy and in business and nonprofit organizations; environmental factors affecting marketing; nature of marketing management decisions. P, ECON 201.

370.* Marketing for Nonprofit Organizations (3) I II Application of marketing concepts and tools for public agencies, health services, public transportation, the arts, schools, museums, churches, etc.; role of marketing planning, research, product and service development, pricing, promotion, public relations. Not acceptable for credit toward the marketing major. P, 361.

376.* Statistical Inference in Management (4) (Identical with MAP 376)

440.* Marketing Research (3) I 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, 376, 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, 376, 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 strategy for programs, budgets, media selection, evaluation of effectiveness. P, 361, 376, MATH 123.

454.* Management of Sales Operations (3) I II The sales function and its relationship to the total marketing program; sales strategies and objectives, development and administration of sales organizations, control, evaluation of sales operations. P, 361, 376, MATH 123. May be convened with 554.

455.* Management of Distribution Systems (3) I Nature and function of channels in the distribution of goods and services; economic and behavioral problems in wholesaling and retailing; marketing logistics. P, 361, 376, MATH 123.

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 retail store, its environment, personnel, 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, 376, MATH 123.

470.* Marketing and Public Policy (3) I Trends in public opinion, legislation and practices of governmental regulatory bodies; implications for marketing decision making; role of marketing research in public policy development. P, 361.

471.* Marketing Policies and Operations (3) I II An integrative, capstone course focusing on comprehensive marketing programs; development, control, and auditing of marketing organizations and operations. P, 440, 450; 3 additional units of marketing at the 400 level; FIN 311, 315, or 316; 3 senior standing; P, satisfaction of the upper-division writing proficiency requirement (see "Writing Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

480.* New Venture Market and Industry Analysis (4) I Assessment of market opportunity; competitive strategy development, market structure analysis, forecasting techniques. Open only to entrepreneurship program students. P, 361, Econ, 330, FIN 311. (Identical with ECON 480)

483.* Marketing Planning and Operational Decision-Making (4) I II (Identical with MAP 483)

*Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.

500. Marketing Management (3) 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 Application of communications theory and research findings in advertising, sales promotion, public relations, selling; planning, conduct and administration of programs of information and persuasion. P, 500.

536. Innovation and Economic Growth (3) I Role of entrepreneurship and innovation in economic growth. Development of the new venture idea and assessment of market potential. Open only to students in the entrepreneurship program. P, ECON 400a, FIN 511, MKTG 500. (Identical with ECON 536)

538. Marketing, Negotiation and Decision Tactics (3) I II (Identical with MAP 538)

550. Consumer and Organizational Buyer Behavior (3) I Nature of the purchase decision process for goods and services. Theories, con-
551. Marketing Decision Support Systems for Managers (3) II Applications of contemporary computer-based, quantitative models and data analysis techniques to aid marketing management decisions. P. 500.

552. Statistical Decision Making (3) I II Probability and statistical analysis; random variables, sampling distributions, hypothesis testing, Bayesian analysis, time series, statistical investigation. Open only to students admitted to a BBA graduate program. P. MIS 400, or MATH 119 and 123.

554. Management of Sales Operations (3) I II For a description of course topics, see 454. Graduate-level requirements include an in depth research paper. P. 361, 376, MATH 123. May be convened with 454.

556. Industrial Marketing (3) II Problems and methods of marketing decision making in industrial, government, and high-tech markets. P. 500.

559. Product Strategy (3) 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) II Marketing planning and strategies for foreign environments; cultural, political, economic factors affecting the international marketer, multinational corporation and multinational market groups. P. 500.

565. Management for Global Competitive Success (3) II Developing comprehensive strategies and programs for delivering quality goods and services to consumers as a basis for global competitive success. P. 500 or consult department before enrolling.

568. Environmental Scanning and Business Strategy (3) I II An MBA integrative course. How information from the economy can be used to develop a firm’s competitive strategy. Multi-disciplinary, using concepts from economics, marketing, and management. Open only to BBA graduate students. Includes case method approach to problems facing top management in making and effecting a strategic plan. P. 500, ECON 500, FIN 511. (Identical with ECON 508 and MAF 568)

572. Marketing Research for Managers (3) I Specification of management information needs, evaluation of research proposals and findings, marketing and analyzing data, administrative aspects of research and decisions. P. 500.

582a-582b. Multivariate Analysis in Management (3-3) 582a: Multiple, polynomial, stepwise regression including indicator variables, inference, remedial measures. 582b: Analysis of variance and covariance, principal components, discriminant analysis, canonical correlation. P. 552. 582a is not prerequisite to 582b.

574. Survey and Qualitative Marketing Research Methods (3) I Survey 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.

673. Experimental Research Methods in Marketing (3) I Statistical, methodological and interpretative issues in the design of laboratory and field experiments/quasi-experiments for marketing and consumer research. P. 500.

695. Colloquium a. Research in Marketing (1) [Rpt./7] I II


Materials Science and Engineering (MSE)

Mines Building, Room 131 (602) 621-6070

Professors Donald R. Uhlmann, Head, Paul D. Calvert, William G. Davenport, Louis J. Demer (Emeritus), J. Brent Hicks, Kenneth A. Jackson, Kenneth L. Keating (Emeritus), W. David Kingery, David C. Lynch, Thomas M. Morris (Emeritus), Daniel J. Murphy (Emeritus), David R. Poirier, Sriman Raghavan, Sigmund L. Smith (Emeritus), Richard A. Swalin, Terry T. Tribett (Emeritus), Michael C. Weinberg;

Associate Professors Dunbar P. Birnie III, Michael Peter (Emeritus, W. David Kingery, Louis J. Demer (Emeritus), J. Brent His- Paul D. Calvert, William G. Davenport, Louis J. Demer (Emeritus), J. Brent Hicks, Kenneth A. Jackson, Kenneth L. Keating (Emeritus), W. David Kingery, David C. Lynch, Thomas M. Morris (Emeritus), Daniel J. Murphy (Emeritus), David R. Poirier, Sriman Raghavan, Sigmund L. Smith (Emeritus), Richard A. Swalin, Terry T. Tribett (Emeritus), Michael C. Weinberg;

Assistant Professors Brian D. Fabes, Supanan Seraphin, 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 has committed its resources to expanding the Department of MSE. A wide range of courses, covering the many facets of MSE, is now offered at both the undergraduate and graduate levels.

The department offers the degrees of Bachelor of Science in Materials Science and Engineering, Master of Science with a major in materials science and engineering, and Doctor of Philosophy with a major in materials science and engineering.


195. Colloquium b. Materials Science and Engineering (1) (Identical with ENGR 195b)

222. Introduction to Materials Science (3) I Introduction to the structure of materials and how structure influences properties. Elementary crystallography, crystal chemistry, and microstructural effects are covered. Examples are taken from all classes of materials: metals, semiconductors, ceramics, polymers, glasses, and composites. 3ES. P. 110 or CHEM 103b, and MATH 125b; or consult department before enrolling.

224. Materials and Energy Balances in Materials Processing (3) II Analysis of materials processing using material and energy balance computations. Stoichiometry, nonreacting and reacting systems, first law of thermodynamics, degree of freedom analysis. Applications to the processing of conventional and new materials. 3ED. Field trip. P. CHEM 103b or MSE 110; ENGR 101.

240. Thermodynamics of Materials (4) I Introduction to the laws of thermodynamics, entropy, free energy, and the concept of equilibrium as applied to materials for conventional and advanced technological applications. 4ES. P. MATH 125b or consult department before enrolling.

251. Social Constraints on Engineering (3) I Influence of consumers, organizations, state and national governments and international treaties on engineering in the USA, Japan and selected other nations. (Identical with ANTH 251 and ENGR 251)

255. Materials Science in Modern Society (3) I Selection and use of materials. Recycling, conservation and disposal. Energy consumption and materials. How current developments may change the way we live. 3ES. (Identical with ENGR 255)

256. Laboratory for Materials Science (1) I Laboratory exercises involving materials. This laboratory accompanies 255. 1ES. CR, 255. (Identical with ENGR 256)

257. Materials Science of Art and Archaeological Objects (3) I II The methods, content and practice pertinent to the study of art and archaeology. Materials science provides one of the keys to interpreting objects in their historical and cultural context. 3ES. (Identical with ANTH 257, ART 257 and ENGR 257)
501. Planning for Discovery: Problem Selection and Proposal Preparation (3) II Generation and organization of ideas into an effective research program. Problem selection, research planning, research proposal preparation and presentation. (Identical with ENGR 501)

502. Research Proposal Preparation (3) I Organization and planning of a specific research initiative in consultation with a potential advisor, to expedite the selection and definition of a dissertation topic. (Identical with ENGR 502)

503. Applied Surface Chemistry (3) I Fundamentals of surface phenomena, characterization of solid-vapor, solid-liquid and liquid-vapor interfaces, applications in ceramics, electronic and biomedical materials processing. P, a basic course in physical chemistry.

505. Advanced Extractive Metallurgy (3) II For a description of course topics, see 405. Graduate-level requirements include a mathematical model. Field trip. P, 380. May be convened with 405.

509. Transport Phenomena (3) I For a description of course topics, see 409. Graduate-level requirements include either a term paper or computer model. P, 240, MATH 254. May be convened with 409.


511. Mineral Processing (3) I (Identical with MNE 511) May be convened with 411.

512. Physical Chemistry of Materials (3) I For a description of course topics, see 412. Graduate-level requirements include a research paper or project. May be convened with 412.

523. Electrochemistry in Materials Science (3) I For a description of course topics, see 423. Graduate-level requirements include a special project. P, 240. May be convened with 423.

524. Physics and Chemistry of Ceramic Materials (3) II For a description of course topics, see 424. Graduate-level requirements include an advanced topic term paper. P, 260 or consult department before enrolling. May be convened with 424.

531. Science and Technology of Magnetic Recording Materials (3) I For a description of course topics, see 431. Graduate-level requirements include a term paper. P, a basic course in chemistry or materials science. May be convened with 431.

532. Solid-Fluid Reactions (3) I (Identical with CH E 532)


534. Advanced Topics in Electronic Materials (3) [Rpt./2] 1994-95 Topics to be selected from ferroelectrics, opto-electronics, wave guides, and semiconductor materials (Identical with ECE 534 and OPTI 534)

535. Corrosion and Degradation (3) II For a description of course topics, see 435. Graduate-level requirements include a term paper. P, 331R; 412 or CHEM 480b or CR. (Identical with CH E 535) May be convened with 435.


540. Thermodynamics of Condensed Phases (3) I For a description of course topics, see 440. Graduate-level requirements include a term paper. P, 240. May be convened with 440.

542a-542b. Materials Engineering Design (2-2) For a description of course topics, see 442a-442b. Graduate-level requirements include defense of the design project before the student's research committee. May be convened with 442a-442b.

544. Design Competition (3) II Students utilize their research experience in formulating and developing a materials design project which they present and defend before a review panel. Team design and research is emphasized. Graduate-level requirements include defense of the design project before the student's research committee. May be convened with 444.

551. Atomic Computational Techniques in Materials Science (3) II Monte Carlo and molecular dynamics techniques; classical and quantum dynamical models; application to calculation of materials properties (structural, thermodynamic, transport, electronic properties).

552. Nondestructive Evaluation of Materials (3) II For a description of course topics, see 452. Graduate-level requirements include a term paper. P, 331R or 360, or CR. May be convened with 452.


554. Electronic Packaging Principles (3) I II (Identical with ECE 554)

555. Physical Metallurgy and Processing of Steel (3) I For a description of course topics, see 455. Graduate-level requirements include a research term paper or computer model. 2R, 3L, P, 331R or 360, 409 or AME 442. May be convened with 455.

557. Integrated Circuit Laboratory (3) I II (Identical with ECE 557) May be convened with 457.

560. Materials Science of Polymers (3) II For a description of course topics, see 460. Graduate-level requirements include additional computational and written exercises. May be convened with 460.

561. Biological and Synthetic Materials (3) II 1995-94 For a description of course topics, see 461. Graduate-level requirements include additional computational and written exercises. May be convened with 461.

562. Structure and Properties of Polymers (3) I 1994-95 For a description of course topics, see 462. Graduate-level requirements include additional computational and written exercises. May be convened with 462.

565. Microelectronic Packaging Materials (3) II For a description of course topics, see 465. Graduate-level requirements include an additional term paper. (Identical with ECE 565) May be convened with 465.

570. Technology of Polymers and Ceramics (3) I For a description of course topics, see 470. Graduate-level requirements include the writing and presentation of an additional term paper. May be convened with 470.

571. The Formation and Structure of Glass (3) I For a description of course topics, see 471. Graduate-level requirements include a research paper or project. May be convened with 471.


579. Culture and Materials Technology (3) I (Identical with ANTH 579) May be convened with 479.

580. Experimental Methods for Microstructural Analysis (3) II For a description of course topics, see 480. Graduate-level requirements include an additional term paper. May be convened with 480.

585. Technological Forecasting (3) I For a description of course topics, see 485. Graduate-level requirements include an additional term paper. May be convened with 485.

586. Technology and Society (3) I For a description of course topics, see 486. Graduate-level requirements include an additional term paper. May be convened with 486.

588. Scanning Electron Microscopy (3) I For a description of course topics, see 488. Graduate-level requirements include additional lab work. Consult department before enrolling. May be convened with 488.

589. Transmission Electron Microscopy of Materials (3) I For a description of course topics, see 489. Graduate-level requirements include an additional term paper and presentation. P, 480 or 580, or consult department before enrolling. May be convened with 489.

595. Colloquium

a. Materials (1) [Rpt./5] II

602. Modern Methods in Materials Science (2) [Rpt./4 units] II Discussion of several recent theoretical methods or experimental techniques which have been applied to the study of materials. Topics vary from year to year.

652. Statistical Thermodynamics in Materials Science (3) I Introduction to classical and
and Bachelor of Science in Engineering Mathematics (College of Engineering and Mines), Bachelor of Arts in Education (Elementary Education—College of Education) and Bachelor of Science in Education (Secondary Education—College of Education), Master of Arts, Master of Science, Master of Education and Doctor of Philosophy.

The major for the B.A. and B.S. consists of a core of basic courses and one of five possible options. It must include 33 units in mathematics courses numbered 124 or above. The core courses are CSCI 115, MATH 124 or 125a, 125b, 215, 223, 323, and 355. Advanced students need not take lower numbered courses.

The comprehensive mathematics option: The core above and 413, 415, 424, and 425.

The industrial and applied mathematics option: One of the sequences 454-455, 454-456, 464-466a, or 475a-475b; either 424 or 425; one of 410, 413, or 415.

The computational science option: Either of the sequences 415, 416 or 475a, 475b; one of 443, 447, or 479; and one more of the above courses or 413.

The probability and statistics option: 425, 464, 466a and either 413 or 468.

The economics and finance option: 425, 464, either 410 or 413, one of 466a or 479. The minor must be in either economics or finance. The economics minor should consist of ECON 200 or 210; 361 or 411; 300; and 12 additional upper-division units in economics. The finance minor should consist of ACCT 200 and 210; either ECON 201a-201b or 210; FIN 311 and 421; plus six additional upper-division units in finance.

The minor in mathematics with the College of Arts and Sciences: A minimum of 20 units including 124 or 125a, 125b, 215 and at least nine additional upper-division units.

The mathematics education option for the Bachelor of Science in Education (College of Education): The core above and 397, 405, either 315 or 415, either 362 or 464, and either 330 or 430. In order to be accepted into the secondary teacher preparation program of the College of Education with a major in mathematics, a student must have successfully completed the following four mathematics courses: 124 or 125a, 125b, 223 and 215. Furthermore, students who do not have a GPA of 2.5 in those four courses may not enroll in 315, 330 or 397 without special permission.

The elementary education major area of specialization: 301 plus 12 units selected in consultation with a mathematics department advisor.

The engineering mathematics major: Requirements are given in the College of Engineering section.

Mathematics (MATH) Mathematics Building, Room 108 (602) 621-6892


Associate Professors William E. Conway, Carl L. DeVito, Nicholas M. Ercolani, David Gay, Oma Hamara, Thomas G. Kennedy, Theodore W. Laetsch, Daniel Madden, William G. McCallum, John N. Palmer, Douglas M. Pickrell, Wayne Raskind, Zhen -Su She, Frederick W. Stevenson, Richard B. Thompson, Maciej P. Wojtkowski, Bruce Wood, A. Larry Wright

Assistant Professors Bruce J. Bayly, Mossey Brio, Kwok Chou, Martha Civi, Samuel Evans, Paul Fan, Leonid Friedlander, Robert S. Maier, Marek Rychlik, Douglas Ulmer, Jan Wehr, Xia Xin

Lecturers Robert C. Dillon (Emeritus), John L. Leonard, Stephen G. Tellman

Mathematics forms a foundation for all technical disciplines and is an excellent preparation for a career or graduate study in many subjects. The department offers courses in pure mathematics, applied mathematics, probability and statistics, computational mathematics, engineering mathematics, and mathematics education. Planned minors in numerous professional fields are available; interested persons should consult with a Mathematics Department advisor to help choose the option, minor, and additional course work that best prepares for their chosen career.

Mathematics is available as a major for the following degrees: Bachelor of Arts and Bachelor of Science (College of Arts and Sciences), Bachelor of Science in Engineering Mathematics (College of Engineering and Mines), Bachelor of Arts in Education (Elementary Education—College of Education) and Bachelor of Science in Education (Secondary Education—College of Education), Master of Arts, Master of Science, Master of Education and Doctor of Philosophy.

The minor for the B.A. and B.S. consists of a core of basic courses and one of five possible options. It must include 33 units in mathematics courses numbered 124 or above. The core courses are CSCI 115, MATH 124 or 125a, 125b, 215, 223, 323, and 355. Advanced students need not take lower numbered courses.

The comprehensive mathematics option: The core above and 413, 415, 424, and 425.

The industrial and applied mathematics option: One of the sequences 454-455, 454-456, 464-466a, or 475a-475b; either 424 or 425; one of 410, 413, or 415.

The computational science option: Either of the sequences 415, 416 or 475a, 475b; one of 443, 447, or 447; and one more of the above courses or 413.

The probability and statistics option: 425, 464, 466a and either 413 or 468.

The economics and finance option: 425, 464, either 410 or 413, one of 466a or 479. The minor must be in either economics or finance. The economics minor should consist of ECON 200 or 210; 361 or 411; 300; and 12 additional upper-division units in economics. The finance minor should consist of ACCT 200 and 210; either ECON 201a-201b or 210; FIN 311 and 421; plus six additional upper-division units in finance.

The minor in mathematics with the College of Arts and Sciences: A minimum of 20 units including 124 or 125a, 125b, 215 and at least nine additional upper-division units.

The mathematics education option for the Bachelor of Science in Education (College of Education): The core above and 397, 405, either 315 or 415, either 362 or 464, and either 330 or 430. In order to be accepted into the secondary teacher preparation program of the College of Education with a major in mathematics, a student must have successfully completed the following four mathematics courses: 124 or 125a, 125b, 223 and 215. Furthermore, students who do not have a GPA of 2.5 in those four courses may not enroll in 315, 330 or 397 without special permission.

The elementary education major area of specialization: 301 plus 12 units selected in consultation with a mathematics department advisor.

The engineering mathematics major: Requirements are given in the College of Engineering section.

Prerequisites: Because of the nature of mathematics, the department recommends that students refrain from enrolling in any course that carries prerequisites unless those prerequisites have been completed with a grade of "C" or better. Students without university credit in the prerequisites for 117R, 117S, 118, 119, 121, 123, 124, 125a will be required to have an appropriate score on the math readiness test to be enrolled in these courses. The department strongly recommends that students not enroll in any prerequisite for courses in which they have already received credit.

Students must have proof of having taken the math readiness test in order to register for mathematics courses numbered below 125b. Test scores are valid for one year.

The department participates in the honors program.

301. Survey of Mathematical Thought (3) A study of the nature of mathematics and its role in civilization, utilizing historical approaches and computational examples. Not applicable to the mathematics major. P, fulfillment of university entrance requirements in math without deficiency.

116R. Introduction to College Algebra (3) I II Lecture. Not applicable to the mathematics major or minor. Basic concepts of algebra, linear equations and inequalities, relations and functions, systems of equations. Either 116R or 125a, 125b, 215. P, 116R or 116S or an acceptable score on the math readiness test.

116S. Introduction to College Algebra (3) I II Self-Study. Similar to MATH 116R except taught in a self-study tutorial format. Not applicable to the mathematics major or minor. P, two entrance units in algebra or an acceptable score on the math readiness test.

117R. College Algebra (3) I II Lecture. Not applicable to the mathematics major or minor. Basic concepts of algebra, linear equations and inequalities, relations and functions, systems of equations. Either 117R or 117S, 118, 121, 123, 124, 125a, 125b, 215, 223, 323, and 355. Advanced students need not take lower numbered courses.

117S. College Algebra (3) I II Self-Study. Similar to MATH 117R except taught in a self-study tutorial format. Not applicable to the mathematics major or minor. P, either one 1/2 unit in Algebra or 117R or 117S or 118 or 121 or 123 or 124 or 125a or 125b or 215 or 223 or 323 or 355.

118. Plane Trigonometry (3) I II Lecture. A study of the nature of mathematics. Not applicable to the mathematics major or minor. Students with credit in 118 will obtain only one unit of graduation credit for 117R. P, 118R or 118S or 119 or 121 or 123 or 124 or 125a or 125b or 215 or 223 or 323 or 355.

119. Finite Mathematics (3) I II Elements of set theory and counting techniques, probability theory, linear systems of equations, ma-
trix algebra; linear programming with simplex method, Markov chains. P, 117R/S or an acceptable score on the math readiness test.

120.4 Calculus Prep (3) I II S Reviews manipulative algebra and trigonometry; covers uses of functional notation, partial fraction decomposition and analytic geometry. For students who have high school credit in college algebra and trigonometry but have not attained a sufficient score on the math readiness test to enter calculus. Students with credit in MATH 117R/S will obtain only one unit of graduation credit. Students with credit in 118 will obtain two units of graduation credit. P, high school credit in college algebra and trigonometry, and an acceptable score on the math readiness test. Graphing calculator will be required in this course.

121. Basic Mathematical Procedures (3) I II S Evaluating mathematical expressions, introduction to basic programming, right triangle trigonometry, exponents and logarithms, probability and introduction to statistics. P, 116R/S.

123. Elements of Calculus (3) I II Introducatory topics in differential and integral calculus. P, 117R/S or an acceptable score on the math readiness test.

124. Calculus with Applications (5) Introduction to calculus with an emphasis on understanding and problem solving. Concepts are presented graphically and numerically as well as algebraically. Elementary functions, their properties and uses in modelling; the key concepts of derivative and definite integral; techniques of differentiation, using the derivative to understand the behavior of functions; applications to optimization problems in physics, biology and economics. Use of graphing calculators and/or computers. Credit allowed for 124 or 125a, but not both. P, 120 or 117R/S and 11B, or acceptable score on math readiness test. Graphing calculator will be required for this course.

125a. Calculus (3) I Introduction to calculus with an emphasis on understanding and problem solving. Concepts are presented graphically and numerically as well as algebraically. Elementary functions, their properties and uses in modelling; the key concepts of derivative and definite integral; techniques of differentiation, using the derivative to understand the behavior of functions; applications to optimization problems in physics, biology and economics. Use of graphing calculators and/or computers. Course assumes a background in college algebra and trigonometry. P, an acceptable score on math readiness test. Credit allowed for 124 or 125a, but not both.

125b. Calculus (3) Techniques of symbolic and numerical integration, applications of the definite integral to geometry, physics, economics and probability; differential equations from a numerical, graphical, and algebraic point of view; modelling using differential equations, approximations by Taylor series. P, 124 or 125a. Graphing calculator will be required for this course.

129. Calculus with a Computer (2) I II Designed to supplement regular calculus courses. The use of computers to solve calculus problems emphasizing numerical and geometrical understanding of calculus. P CR, 125b.

200. Problem-Solving Laboratory (1) [Rpt/4] I II Development of creative, mathematical, problem-solving skills, with challenging problems taken from calculus, elementary number theory and geometry. P, 125b.

202. Introduction to Symbolic Logic (3) (Identical with PHIL 202)


301. Understanding Elementary Mathematics (4) I II Development of a basis for understanding the common processes in elementary mathematics related to the concepts of number, measurement, geometry and probability. 3R, 3L. Open to elementary education majors only, P, 117R/S, or 121, or an acceptable score on the math readiness test.

315. Introduction to Number Theory and Modern Algebra (3) II Elementary number theory, complex numbers, field axioms, polynomial rings; techniques for solving polynomial equations with integer and real coefficients. P, 323.

322. Mathematical Analysis for Engineers (3) I II Complex functions and integration, line and surface integrals, Fourier series, partial differential equations. Credit allowed for this course or 422a, but not for both. P, 254 or 355.

323. Intermediate Analysis (3) I II Elementary manipulations with sets and functions, properties of real numbers, topology of the real line, continuity, differentiation, sequences and series of real valued functions of a real variable, with emphasis on proving theorems. P, 215. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

330. Topics in Geometry (3) I Topics to be selected from 2- and 3-dimensional combinatorial geometry, postulational Euclidean geometry, Euclidean transformational geometry, symmetry, and 2-dimensional crystallography. P, 215.

344. Foundations of Computing (3) II (Identical with C SC 344)

355. Analysis of Ordinary Differential Equations (3) I II Basic solution techniques for linear systems, qualitative behavior of nonlinear systems, numerical methods, computer studies; applications drawn from physical, biological and social sciences. P, 215 and C SC 115 or knowledge of FORTRAN, PASCAL, or another high level computer language.

362. Introduction to Probability Theory (3) I II Sample spaces, random variables and their properties, with considerable emphasis on applications. P, 123 or 125b.


397. Workshop a Mathematics Education (1) I II Open only to teaching majors in MATH P, 315 or 330. P, 125b.

399.4 Matrix Analysis (3) I II General introductory course in the theory of matrices. Advanced-degree credit not available to math majors. P, 254 or 355.

403. Foundations of Mathematics (3) I II Not applicable to B.A. or B.S. degrees for math majors. (Identical with TTE 405)


413.4 Linear Algebra (3) I II Vector spaces, linear transformations and matrices, eigenvalues, bilinear forms, orthogonal and unitary transformations. P, 215. May be convened with 513.

415. Introduction to Abstract Algebra (3) I II Introduction to groups, rings, and fields. P, 323. May be convened with 515.


421. Fourier Series and Orthogonal Functions (3) I Linear spaces, orthogonal functions, Fourier series, Legendre polynomials and Bessel functions. P, 254 or 355. May be convened with 521.

422a-422b.4 Advanced Analysis for Engineers (3-3) Laplace transforms, Fourier series, partial differential equations, vector analysis, integral theorems, matrices, complex variables. Credit allowed for 422a or 422b, but not for both. P, 254 or 355. 422a is not prerequisite to
order partial differential equations; second

455.4 Elementary Partial Differential Equations (3) II Theory of characteristics for first order partial differential equations; second

order elliptic, parabolic, and hyperbolic equations. P, 254 or 355. May be convened with 555.


466a. Theory of Statistics (3) I (Identical with STAT 466a) May be convened with 566a.

466b. Mathematical Principles of Numerical Analysis (3) (3) For a description of course topics, see 404. Graduate-level requirements include more extensive problem sets or advanced projects. P, 355. May be convened with 555.

502. Mathematical Logic (3) II 1993-94 For a description of course topics, see 402. Graduate-level requirements include more extensive problem sets or advanced projects. P, 355. May be convened with 555.

512. Combinatorial Mathematics (3) I 1994-95 Dedekind domains, complete fields, class groups and class numbers, Dirichlet unit theorem, algebraic function fields. P, 511b.

513. Linear Algebra (3) I 1994-95 Selections from such topics as finite groups, noncommutative groups, abelian groups, characters and representations. P, 511b.

518. Topics in Algebra (3) (Rpt. 1 unit) I II Advanced topics in groups, rings, fields, algebras; content varies.

519. Topics in Number Theory and Combinatorics (3) (Rpt. 1 unit) I II Advanced topics in algebra number theory, analytic number theory, class fields, combinatorics; content varies.

520a. Complex Analysis (3-3) 520a: Analyticity, Cauchy's integral formula, residues, infinite products, conformal mapping, Riemann mapping theorem, P, 424. May be convened with 582.

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 355. May be convened with 421.

522a. Advanced Analysis for Engineers (3-3) For a description of course topics, see 422a. Graduate-level requirements include more extensive problem sets or advanced projects. Not applicable to M.A., M.S., or Ph.D. degrees for math majors. P, 254 or 355. May be convened with 422a.
52.4 Elements of Complex Variables (3) I II For a description of course topics, see 424. Graduate-level requirements include more extensive problem sets or advanced projects. P, 223. May be convened with 424.

52.5 Real Analysis of One Variable (3) I For a description of course topics, see 425. Graduate-level requirements include more extensive problem sets or advanced projects. P, 223 and 323. May be convened with 425.

52.6 Real Analysis of Several Variables (3) II For a description of course topics, see 426. Graduate-level requirements include more extensive problem sets or advanced projects. P, 425. May be convened with 426.

52.7a-52.7b Principles of Analysis (3-3) Advanced-level review of linear algebra and multivariable calculus; survey of real, complex and functional analysis, and differential geometry with emphasis on the needs of applied mathematics. P, 410, 424, and a differential equations course.

52.8a-52.8b Banach and Hilbert Spaces (3-3) 1994-95 Introduction to the theory of normed spaces, Banach spaces and Hilbert spaces, operators on Banach spaces, spectral theory of operators on Hilbert spaces, applications P, 523a, 527b, or 583b.

52.9 Topics in Modern Analysis (3) [Rpt./6 units] I II Advanced topics in measure and integration, complex analysis in one and several complex variables, probability, functional analysis, operator theory; content varies.

53.0 Second Course in Geometry (3) II 1994-95 For a description of course topics, see 430. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215. Not applicable to M.A., M.S., or Ph.D. degrees in Mathematics. May be convened with 430.

53.4a-53.4b Topology-Geometry (3-3) Point set topology, the fundamental group, calculus on manifolds. Global geometry, de Rham cohomology, other topics. Examples will be emphasized. P, 415 and 425.


53.7a-53.7b Global Differential Geometry (3-3) 1993-94 Surfaces in R3; structure equations, curvature. Gauss-Bonnet theorem, parallel transport, geodesics, calculus of variations, Jacobian fields, conjugate points, topology and curvature; Riemannian geometry, connections, curvature tensor, Riemannian submanifolds and submersions, symmetric spaces, vector bundles. Morse theory, symplectic geometry. P, 534a-534b.

53.8 Topics in Geometry and Topology (3) [Rpt./6 units] I II Advanced topics in point set and algebraic topology, algebraic geometry, differential geometry; content varies.

53.9 Algebraic Coding Theory (3) II 1993-94 Construction and properties of error correcting codes; encoding and decoding procedures and information rate for various codes. P, 415. (Identical with ECE 539)

54.3 Theory of Graphs and Networks (3) II For a description of course topics, see 443. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215 or 223 or 243. (Identical with C SC 543) May be convened with 444.

54.6 Theory of Numbers (3) I 1994-95 For a description of course topics, see 446. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215. May be convened with 446.

54.7 Combinatorial Mathematics (3) II 1994-95 For a description of course topics, see 447. Graduate-level requirements include more extensive problem sets or advanced projects. P, 215 or 243. May be convened with 447.

55.0 Mathematical Population Dynamics (4) II (Identical with ECOL 550)

553a-553b Partial Differential Equations (3-3) 1994-95 Theory and examples of linear equations; characteristics, well-posed problems, regularity, variational properties, asymptotics. Topics in nonlinear equations, such as shock waves, diffusion waves, and estimates in Sobolev spaces. P, 523b or 527b or 583b.

555* Elementary Partial Differential Equations (3) II For a description of course topics, see 455. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 355. May be convened with 455.

556* Applied Partial Differential Equations (3) II For a description of course topics, see 456. Graduate-level requirements include more extensive problem sets or advanced projects. P, 322 or 421 or 422a. May be convened with 456.

557a-557b Dynamical Systems and Chaos (3-3) 1993-94 Qualitative theory of dynamical systems, phase space analysis, bifurcation, period doubling, universal scaling, onset of chaos, applications of chaos to physics, biology, ecology, fluid mechanics and optics. P, 422a-422b or 454.


564 Theory of Probabilities (3) I II For a description of course topics, see 464. Graduate-level requirements include more extensive problem sets or advanced projects. P, 322 or 323. (Identical with STAT 564) May be convened with 464.


566a Theory of Statistics (3) I (Identical with STAT 566a) May be convened with 466a.

568 Applied Stochastic Processes (3) II For a description of course topics, see 468.

Graduate-level requirements include more extensive problem sets or advanced projects. P, 464. (Identical with STAT 568) May be convened with 468.

573 Theory of Computation (3) II (Identical with C SC 573)

575a-575b Numerical Analysis (3-3) 1994-95 Error analysis, solution of linear systems and nonlinear equations, eigenvalues interpolation and approximation, numerical integration, initial and boundary value problems for ordinary differential equations, optimization. P, 475b and 455 or 456. (Identical with C SC 575a-575b)

577 Topics in Applied Mathematics (3) [Rpt./6 units] I II Advanced topics in asymptotics, numerical analysis, approximation theory, mathematical theory of mechanics, dynamical systems, differential equations and inequalities, mathematical theory of statistics; content varies.

578 Computational Methods of Algebra (3) II Applications of machine computation to various aspects of algebra, such as matrix algorithms, character tables and conjugacy classes for finite groups, cost enumeration, integral matrices, crystallographic groups. P, 415 and a knowledge of scientific computer programming language. (Identical with C SC 579).

579 Game Theory and Mathematical Programming (3) II 1993-94 For a description of course topics, see 479. Graduate-level requirements include more extensive problem sets or advanced projects. P, 410 or 413 or 415. (Identical with C SC 579) May be convened with 479.


583a-583b Principles and Methods of Applied Mathematics (3-3) Boundary value problems; Green's functions, distributions, Fourier transforms, the classical partial differential equations (Laplace, heat, wave) of mathematical physics. Linear operators, spectral theory, integral equations, Fredholm theory. P, 424 or 422b or CR, 520a.

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, 421 and 424, or 422b. 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, CR 475b. May be convened with 485.

586 Case Studies in Applied Mathematics (1-3) [Rpt./6 units] I II In-depth treatment of several contemporary problems or problem areas from a variety of fields, but all involving mathematical modeling and analysis; content varies.

587 Perturbation Methods in Applied Mathematics (3) I 1994-95 Regular and singular perturbations, boundary layer theory, multiscale and averaging methods for nonlinear waves and oscillators. P, 422a-422b or 454.
588. Topics in Mathematical Physics (3) [Rpt./36 units] I II Advanced topics in field theories, mathematical theory of quantum mechanics, mathematical theory of statistical mechanics, content varies.

589. Nonlinear Wave Motion (3) II 1994-95 Nonlinear partial differential equations describing wave phenomena in water, gases, plasmas, lasers; shocks, modulated wave trains, parametric resonance, solutions and exactly solvable equations. P, 422b or 456 or 455.

595. Colloquium
a. Math Instruction (1) [Rpt./12 units] I II

596. Seminar
a. Topics in Mathematics (1-3) [Rpt./12] S
b. Mathematical Software (3) [Rpt.] I P, 254 or 355, knowledge of "C" programming. May be convened with 496b.

636. Information Theory (3) II 1994-95 (Identical with ECE 636)

667. Theory of Estimation (3) I (Identical with STAT 667)

668. Theory of Testing Hypothesis (3) II (Identical with STAT 668)

697. Workshop
a. Problems in Computational Science (3) I II [Rpt./1] (Identical with PHYS 697a)

*Students without university credit in the prerequisites for these courses will be required to have an appropriate score on the math readiness test to be enrolled in these courses.

*Credit will not be given for this course if the student has credit in a higher level math course; these students will be dropped by the Registrar's Office. Students with unusual circumstances can petition the department for exemption from this rule. This policy does not infringe on the student's rights granted by the university policy on repeating a course.

*Credit will be allowed for only one of 424 or 422b. 422a-422b will not be considered a two-semester course at the 400 level in the Master of Arts degree program.

*Credit will be allowed for only one of 424 or 422b. 422a-422b will not be considered a two-semester course at the 400 level in the Master of Arts degree program.

Media Arts (MAR)
Modern Languages Building, Room 265
(602) 621-7352
Professors Caren J. Deming, Head, J. Michael Gillette, Peter Lehman Associate Professors Harry Atwood (Emeritus), Mary Beth Haralovich, Wesley B. Marshall, Alfonso Moises Assistant Professors H. Bruce Fowler (Emeritus), Denise J. Kervin, Donald Kirihara, Eileen R. Meehan, Robert J. Sabal, Beverly A. Seckinger, Peter Treistman Lecturer F.D. Nott
The department provides instructional programs designed to prepare students to assume leadership roles in the media as independent artists or as members of industries such as film, television, and cable television. Course work focuses upon history, theory, criticism, production, and management of the media arts. The department offers courses leading to the Bachelor of Arts in Media Arts and Bachelor of Fine Arts degree with a major in Media Arts. Advanced students have opportunities to obtain preprofessional experience through the department's internship program, through work on various departmental projects, and through work at the University's Public Broadcasting stations KUAT-TV, KUAT-AM, and KUAT-FM.

The Bachelor of Arts in Media Arts is for students planning careers in electronic journalism or media management, or seeking a well-balanced liberal arts education in preparation for graduate study at the M.A. or Ph.D. level.

Requirements: In addition to the general education requirements for the Bachelor of Arts in Media Arts, as described in the Faculty of Fine Arts (College of Arts and Sciences) section of this catalog, students must complete COMM 100 and 102 and one of the following English composition courses beyond the freshman requirement: ENGL 207, 307, or 308. Requirements in the major: 33 units of media arts courses, including 101, 200, 209 or 225, 221 or 222, 254 or 355, 305, 221 or 222, and 320 or 362 or 380.

At least 12 units must be upper-division courses. No more than 6 units of internship and independent study course work (493 and 499) may be counted toward the major; and no more than 6 units of production and practicum course work (110, 304, 305, 241, 314, 315, 316, 414, 415, 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 university credit. The department recommends that students develop basic typing and computer skills prior to taking 200-level courses in Media Arts.

The Bachelor of Fine Arts prepares students for creative roles in media production, primarily in video and film. This program also provides an appropriate basis for advanced study at the M.F.A. level.

Requirements: Including the general education requirements for the Bachelor of Fine Arts in Media Arts, as described in the Faculty of Fine Arts (College of Arts and Sciences) section of this catalog, all B.F.A. students must complete 45 units outside of Media Arts. One course must focus on gender, class, race, ethnicity, or non-western culture. This course must be approved by the major advisor and may be taken in the Department of Media Arts or in another department.

Requirements in the major include 56 units of media arts courses, including 101, 200, 304, 309 or 333, 314 or 315, 414 or 415 or 462, 362, 350 or 380, 6 units of media history and 6 units of media criticism/theory. The remaining 18 units are electives selected from other courses in media arts.

At least 30 units in the major must be university credit.

The teaching minor: 101, 110 or 304, 200, 209 or 225, 221 or 222, and Media Arts electives for a minimum total of 24 units.

Basic production facilities and equipment are provided by the department. Students are responsible for the cost of film/tape stock, processing, and other necessary supplies.

The department participates in the honors program.

Advanced Standing Policy

Enrollment in upper-division courses (those numbered 300-499) taught by the Department of Media Arts is restricted by an Advanced Standing Policy. This policy restricts enrollment in all upper-division courses in the department to students who have met qualifying requirements and who have approved Applications for Advanced Standing on file in the department. The policy applies to all undergraduate students irrespective of their catalog in force when they entered the University.

Students entering the major by intracampus transfer are subject to all of the provisions of the Advanced Standing Policy in effect at the time of their acceptance to major status.

All students having been absent from the University for more than two consecutive semesters must reapply for Advanced Standing and meet all provisions of the Advanced Standing Policy in effect at the time of their return.

All undergraduate students seeking to register for the restricted upper-division courses must make application and have their eligibility established. Information and application forms are available in the Department Office, Modern Languages Building 265.

In general, permission to enroll in the restricted courses is granted subsequent to receipt of complete documentation of a student's eligibility. Conditional permission to register for restricted courses is granted only to Media Arts majors who are completing any outstanding requirements and whose grade-point average meets the current eligibility level.

Ineligible students either erroneously or inadvertently enrolled in restricted courses will have their enrollments cancelled.
Advanced Standing Requirements

Eligibility requirements for advanced standing are as follows:

**Media Arts Majors:** Applicants must have
1. credit for a minimum of 56 units;
2. completion of M AR 101 and 200;
3. a minimum of 12 regularly graded units of course work at The University of Arizona;
4. a grade-point average of not less than 2.25 overall;

*upper division transfer students, see departmental advisor

Transfer Students

Transfer students who otherwise would qualify except that they do not meet the requirements of having taken a minimum of 12 regularly graded units at the University of Arizona will be given provisional permission to enroll in upper-division courses until they have completed this minimum. Thereafter, they must meet all of the regular provisions of the policy.

See the Department Office, Modern Languages Building 265 for additional information.

100. Orientation to Study in Media Arts (1) I Orientation to undergraduate programs, productive study methods, and use of professional literature and other resource materials in media arts. Open to M AR majors only, who are freshmen, foreign students, or new transfer students to The University of Arizona.

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. 2R, 2S.

106. Mass Media and Society (3) I II Survey of the relationships between mass media and society, effects of mass media on individuals, institutions, culture, social structure.

110. Beginning Film Techniques (3) S 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 laboratory charges.

200. Fundamentals of Theory and Aesthetics in Media Arts (3) I II Survey of the elements which make up video, film, and audio images: light, color, area, depth, movement, and sound in message design and structure.

205. Reporting the News (3) I I (Identical with JOUR 205)

208. Law of the Press (3) I (Identical with JOUR 208)

209. Survey of Film History (3) I II A survey of the history of motion pictures. Films are chosen from a variety of nations and time periods to illustrate the diversity of film styles. 2R, 3L.

221. American Cinema: Directors and Genres (3) I Aesthetic and cultural aspects of westerns, comedies, and mysteries; major films by John Ford, Alfred Hitchcock, Howard Hawks, and Blake Edwards. P, 200, 2R, 2S.

222. Major American Broadcast Genres (3) I II Survey of major radio and television program types, with emphasis on serial and series forms; drama, melodrama, western, crime, drama, comedy, sports 2R, 2S, P, 200.

225. Survey of Broadcasting History (3) I II Survey of American broadcasting, emphasis on programming, economic and industrial history. 2R, 1D.

239. Speaking in the Arts (3) I II (Identical with TAR 239)

241. Beginning Photography (3) [Rpt./2] I II (Identical with ART 241) Fee.

280. Introduction to Electronic Journalism (3) I I II Survey of the history, organization, and practice of electronic journalism.

302. Recording Studio Production (3) I I (Identical with MUS 302)

303. Professional Practices (1) I II S Prepares students to meet the professional expectations of media work. Job search strategies (resume writing and interviewing) and professional concepts are studied. P, 101, 200, 304 or 305, and one Writing-Emphasis Course.

304. Beginning Video Production (4) I I II Introduction to the elements of video production, including professional practices, production elements, and personnel in television stations and video centers. 2R, 3L, P, 101, CR, 200.

305. Introduction to Film Production (4) I I I II Basic principles of 16mm film production and examination of production techniques and practices; laboratory experience with film production equipment and production of several short films. 2R, 2S, 3L, P, CR, 200.

308. Survey of Media Law and Regulation (3) I I II Introduction to the legal and regulatory framework of the electronic media and film: licensing, cross-ownership, public interest, self-regulation, consumer influence, and related topics.


311. Lighting for Media Production (2) I Function and qualities of light; typical application in photography, television, motion pictures, architecture, and interior design. P, 200.

312. Video Art in America (3) I III Investigation of artist-produced video from 1960s to the present. Screenings, critical readings and projects. (Identical with ART 312)

314. Intermediate Video Production (3) I II Production of various types of television programs, including techniques and theory of studio and field operations, use of equipment (studio and EFP) and personnel relationships, with emphasis on the role of the television producer. 2R, 3L. Open to majors and minors only. P, 200, 304, and acceptance of portfolio by Portfolio Committee.

315. Intermediate Film Production (3) I Production of films, with emphasis on sound, editing techniques, and visual design. Students will produce a short film. 2R, 3L, P, 200, 304 and acceptance of portfolio by Portfolio Committee.

316. Radio Production (3) I II Analysis and production of selected radio programs with emphasis on complex radio formats and production techniques. 2R, 3L, P, 304 or 305.

320. Media Arts Criticism (3) I II Analysis of arguments in journalistic and academic criticism and application of critical approaches in written assignments. Writing-Emphasis Course: P, 200 and satisfaction of the upper-division writing proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

333. Roles in Narrative Production (3) I II The major roles used in the production of narrative films and videos, including production management and design, camera, sound, editing. P, advanced standing in media arts, M AR 304 or 305.

336. History of Japanese Film (3) I II Development of Japanese cinema from its origins through its recognition as a major international art film producer during the 1950s and 1960s. Advanced standing waived this course. See instructor. 2R, 2S (Identical with JPN 336)

349. Intermediate Artists' Video (3) I Identical with ART 349

350. Professional Media Interviewing (3) I The interview process and specific interview formats, including survey research, journalistic, and panel formats. Interviewer performance is stressed; practice provided.

362. Writing for Media (3) I I II Principles of media writing. Creation of final scripts for radio, television and film presentations. Writing-Emphasis Course. See "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog. (Identical with JOUR 362)

371. Film/Video Production Financing (3) I I Strategies for production financing for independent film/video projects and ways to position a project in the marketplace. Students will develop a prospectus for their own project. P, 304 or 305.

372. Exhibition Management (3) I I II Programming strategies, exhibition techniques, marketing approaches, and management models for film and video series, guest artist presentations, video installations, conferences, and festivals.

376. Audience Measurement (3) I 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.

380. Writing for News and Documentary (3) I Advanced work in the writing of news and public affairs programs for radio, television,
cable, and other electronic media with emphasis on the public affairs program and documentary formats. P, 205, 304. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

381. Reporting for Broadcast News (3) I Advanced procedures and techniques utilized in news gathering, writing, and production of newscasts with emphasis on events coverage, newsgroup organization. Performance practice is emphasized in laboratory exercises. 2R, 3L, P, 380. (Identical with JOUR 381) Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

414. Advanced Video Production (3) 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.

415. Advanced Narrative Media Production (3) II Advanced practice in film or video production, resulting in a completed narrative. University provides most equipment. Students pay lab and other associated costs. 2R, 2S, P, 314 or 315, 333.

421. Cultural Theory and Criticism of Media (3) I Critical and cultural theories and their application to media arts, including mass culture, empiricism, technoculture, political economy. P, 200, M AR advanced standing. May be convened with 521.

423. Representation of Gender in the Media (3) I Investigation of gender as a social and cultural construct through the critical analysis of media products including television, film, and advertisements. P, 200, 320. (Identical with W S 423) May be convened with 523.

424. Film Theory and Criticism (3) I Advanced studies in current cinematic theory and criticism. Historical examination of major film theories, including formalism, realism, classical Hollywood, structuralism, semiotics, and psychoanalytic theories. May be convened with 524.

426. Sexuality in Media Narratives (3) I Analysis of sexual representation in popular and underground film, music video and avant-garde video art. May be convened with 526.

427. Feminist Media Theory (3) II Includes psychoanalysis, semiotics, materialism, race and class analysis, and feminist media production. P, 200, M AR advanced standing. May be convened with 527.

449. Advanced Artists' Video (3) [Rpt./1] II (Identical with ART 449)

450. Conducting Media Campaigns (3) II Analysis of the development and distribution of information through the media. Press releases, fact sheets, public service announcements, interviews, press conferences, and public hearings are studied. P, 350 or 376.

462. Advanced Writing for Media (3) I Advanced dramatic/narrative screenplay writing. Practice experience in the creative process leading to a complete screen play. P, 362.

470. The Press and Society (3) I II (Identical with JOUR 470)


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 (3) [Rpt./6 units] I II P, 314 or 414 (depending on production assignment) and acceptance of portfolio by Portfolio Committee.
b. Electronic Journalism (4) I II S [Rpt./1] P, 381.
c. News Production (3) [Rpt./1] I II S, 214.
d. Cinema Production (1-6) [Rpt./20 units] S, 500.

500. Graduate Study in Media Arts (1) I Responsibilities of graduate students, forms and procedures, campus resources, research tools, writing standards, and Media Arts content areas in approaches.

521. Cultural Theory and Criticism of Media (3) I For description of course topics, see 421. Graduate-level requirements include an additional paper and additional reading. May be convened with 421.

523. Representation of Gender in the Media (3) II For a description of course topics, see 423. Graduate-level requirements include an additional paper and an in-depth research paper on gender and media. May be convened with 423.

524. Film Theory and Criticism (3) I For a description of course topics, see 424. Graduate-level requirements include additional readings and an in-depth research paper on issues in film theory. May be convened with 424.

526. Sexuality in Media Narratives (3) I For a description of course topics, see 426. Graduate-level requirements include additional reading and writing assignments and different examinations. May be convened with 426.

527. Feminist Media Theory (3) II For description of course topics, see 427. Graduate-level requirements include an additional paper and additional reading. May be convened with 427.

528. Current Issues in Media Theory (3) I Advanced study of major concepts, issues, and movements in contemporary film theory: psychoanalysis, semiotics, Marxism, deconstruction, postmodernism.

532. Media Political Economy (3) II Theories and analytic techniques of political economy. May be convened with 426.

535. Hollywood: Films and Industry (3) I Social-industrial history of American film from "primitive" through Hollywood cinema to the present; role of film industry and social context in development of narration and style. 576. Broadcast and Cable Programming (3) I For a description of course topics, see 476. Graduate-level requirements include an in-depth research paper on an issue related to contemporary media programming. May be convened with 476.

639. Methods of Media History (3) II Analysis of methods used in film and broadcast histories; theories of media history; empirical evidence and interpretation; approaches to placing a media text within its industrial and social context.

696.* Seminars
a. Theory and Criticism (3) [Rpt./6 units] I II
b. Media Arts History (3) [Rpt./6] I II
c. Readings in Media Arts (3) [Rpt./9] I II

*Students may earn a maximum of 9 units in M AR 696, of which a maximum of 6 units may be earned in 696a or 696b.

Medical Technology (See Health-Related Professions)

Medicine (MED/ANES/FCM/IMED/NEUR/OBG/OPH/PATH/PED/PSYI/RONC/RADI/SURG)

Arizona Health Sciences Center
Room 2208
(602) 626-6518

Interdepartmental (MED)

495. Colloquium
y. Introduction to the Neurosciences I (2) 1993-94 P, Consult department before enrolling. (Identical with ANAT 495y, NEUR 495y, PHCL 495y, and PSIO 495y) May be convened with 595y.
z. Introduction to the Neurosciences II (2) 1993-94 P, 495y or consult department before enrolling. (Identical with ANAT 495z, NEUR 495z, PHCL 495z, PSIO 495z and PSYI 495z) May be convened with 595z.

501. Preparation for Clinical Medicine (12) I II P, formal admission to the Ph.D./M.D. program and permission of the course director.

505. Social and Behavioral Science (6) I II P, formal admission to the Ph.D./M.D. program and permission of the course director.

595. Colloquium
y. Introduction to the Neurosciences I (2) 1993-94 P, Consult department before enrolling. (Identical with ANAT 595y, NEUR 595y, PHCL 595y, and PSIO 595y) May be convened with 495y.
z. Introduction to the Neurosciences II (2) 1993-94 P, 595y or consult department before enrolling. (Identical with ANAT 595z, NEUR 595z, PHCL 595z, PSIO 595z and PSYI 595z) May be convened with 495z.
801. Preparation for Clinical Medicine (12) I II

805. Social and Behavioral Science (6) I II

830. Supplementary Registration (1-9)

896. Seminar
a. "Introduction to Forensic Pathology (1-3). II P. 801 or permission of instructor.
b. Physical and Biological Basis of Nuclear Medicine (2) II
h. Human Sexuality (2) II
  j. Medical Jurisprudence (2) II
k. Cardiovascular Pathophysiology (2) II
l. **Research Methods for Clinical and Epidemiological Studies (2) II
s. Salt, Water and Kidney Disorders (2) II
t. Pathophysiology of Respiratory Diseases (2)

* Available as both 696 and 896.
** Available as both 596 and 896.

Anatomy
See Anatomy elsewhere in this catalog.

Anesthesiology (ANES)

Professors Burnell R. Brown, Jr., Head, A. Jay Gandolfi, Charles W. Otto, I. Glenn Sipes (Pharmacology and Toxicology)

Associate Professors Randall C. Cork, Stuart R. Hameroff, Stuart F. Quan (Internal Medicine)

Assistant Professor Edward J. Frink

Clinical Professor Jerry M. Calkins

Clinical Associate Professor Joseph J. Kryc

Research Assistant Professors Stephen B. Cardon (Internal Medicine), Thomas H. Kramer (Pharmacology)


Senior Clinical Lecturers Peter A. Raudzens, Elizabeth Wilkinson

Clinical Lecturers R. Dennis Bastron, Alan E. Zehngut

Assistant Clinical Lecturers James P. An- giulo, Matthew Atlas, Stephen A. Grabenbauer, Dennis P. Healy, Alice Kowalson, Kathleen M. Schrader, Margaret O. Verry

800. Research (1-6) [Rpt. 1/]

810. Clerkship
a. Anesthesiology (4-6)

815. Subspecialty
a. BNI Neuroanesthesiology (4)
b. Obstetric Anesthesia (4)
c. Critical Care Medicine (4-6) (Identical with IMED 815p)

891. Preceptorship
a. Anesthesiology and Subspecialties (1-18)

Biochemistry
See Biochemistry elsewhere in this catalog.

Cancer Biology
See Cancer Biology elsewhere in this catalog.

Family and Community Medicine (FCM)

Professors Herbert K. Abrams (Emeritus), John T. Boyer (Internal Medicine), Eric P. Gall (Internal Medicine), Thomas E. Moon, Andrew W. Nichols, Ronald E. Pust, James R. Shaw (Emeritus), Paul Skinner, William A. Stini (Anthropology), Ronald E. Thompson (Emeritus), Anthony F. Vuturo, Barry D. Weiss

Associate Professors Evan W. Kligman, Head, Peter J. Attarian, Jennie Joe, Daniel O. Levinson, Cheryl K. Ritenbaugh, Arthur B. Sanders (Surgery), Catherine M. Shisslak

Assistant Professors Tamsen Bassford, Stuart R. Hameroff, Stuart F. Quan (Internal Medicine), Thomas H. Kramer (Pharmacology), Eric P. Gall (Internal Medicine), Thomas H. Kramer (Pharmacology)

Research Assistant Professors George H. Cardon (Internal Medicine), Thomas H. Kramer (Pharmacology)

Clinical Associate Professor Joseph J. Kryc

Research Assistant Professors Stephen B. Cardon (Internal Medicine), Thomas H. Kramer (Pharmacology)


Senior Clinical Lecturers Peter A. Raudzens, Elizabeth Wilkinson

Clinical Lecturers R. Dennis Bastron, Alan E. Zehngut

Assistant Clinical Lecturers James P. Angiulo, Matthew Atlas, Stephen A. Grabenbauer, Dennis P. Healy, Alice Kowalson, Kathleen M. Schrader, Margaret O. Verry

800. Research (1-6) [Rpt. 1/]

810. Clerkship
a. Anesthesiology (4-6)
Subinternship
a. Family Medicine (4-6) II S

Subspecialty
b. The Dying Patient (1-6) [Rpt./1]
d. Problems in Community Oriented Primary Care (5)
e. Personal Change in Lifestyle Related Behavior (3-6) Consult department before enrolling.
f. Geriatrics (4-6) [Rpt./6 units] P, third year rotation in FCM and IMED (Identical with IMED 815h, which is home)

Clinical Epidemiology and Prevention (3) I P, none; statistics helpful. (Identical with RONC 815h)
i. Cancer Prevention and Control (3-15) II (Identical with RONC 815h)

Preceptorship
a. Primary Care (6-12)
b. Family Medicine (3-12) P, 4th year medical students. Consult department before enrolling.
c. Epidemiology at CDC (3) I II P, open to majors in medicine, public health, and nursing. Consult department before enrolling.
d. Rural Care (4-12)
e. Prison Health Care (3-6) Consult department before enrolling.
f. International Health (6-12)
g. AHEC/Border Health (3-12) Consult department before enrolling.
h. Family Medicine Special Studies (4-6) P, completion of basic sciences

Mayo Group Practice (6) P, 4th year medical students

Seminar
a. *International Health in the Developing World (3) S Open to health majors only.
b. Approaches to Managing Behavior Problems of Children and Adolescents (2)
c. Leadership Development (2)
d. Principles and Practice of Home Health (2) I II Consult department before enrolling.
e. The Doctor-Patient Relationship (2)
f. Crisis and Conflict: Health Services in Latin America-Brazil (2)
g. *Nutrition in Disease (2) [Rpt./1] P, BIOL 801, PSIO 601/801.
h. *Practice of Community-Oriented Medicine in Rural Areas (2)
i. *International Nutrition (2-3) II
j. Prepaid Health Care (1) [Rpt./1]
k. *Introduction to Public Health (3) I II
l. *AIDS, Cancer, Nutrition Immunity (1) II
m. *Tropical Disease Problems (2)
u. *Current Issues in Health Services (2)
w. *Diet and Disease Prevention (2)

Available as both 596 and 896.

Internal Medicine (IMED)


Clinical Professors Robert O. Brandenburg, Pedro Luis Escobar

Research Professors Marilyn J. Halonen (Pharmacology), Thomas E. Moon (Family and Community Medicine)


Research Associate Professors Robert T. Dorr (Pharmacology), Yi-Mei Peng, Duane L. Sherrill

Clinical Assistant Professors Catherine Azar, Thomas M. Bajo, Jerry Bangert (Pathology), Marlene Bluestein, Anthony E. Camilli, Stephan B. Cardon, Anthony Caruso, Michael Darragh, Pamela Davis, Clifford D. DeBenedet (Pediatries), Mindy J. Fain, Gregory J. Gahm, Lee J. Hixson, Richard F. Hoffman, Lisa Kaufmann, Peter C. Kelly, Mary E. Klink, Marcia G. Ko, Nathan Lauber, Richard M. Mandel, Michael J. Marcic, Margaret M. Miller, Manual Modiano, Patrick S. Pasulka, Paul E. Stander, Mark S. Siskind, Sally B.L. Thompson, Gayle A. Traver (Nursing), Christopher Vero, Albert Warner, Barbara H. Warren (Family and Community Medicine), Kevin Welch, Carol A. Wolfe

Clinical Instructors Anne Hercher, Scott W. Nowlin

Research Instructor Steven B. Knoper


Research Lecturer Susan E. Wilson-Sanders


Clinical Biology (3) II 1994-95 (Identical with CBIO 555)

Seminar
a. Pathophysiology and Immunology of the Clinical Manifestations of Coccidioidomycosis (2) II

Research (3-30) [Rpt./30 units] (See College of Medicine Electives Manual)

Clinical Clerkship (12)
810. Clerkship
a. Ambulatory Care (6) [Rpt./12 units] I II S P, completion of third year medical school.
b. Ambulatory Diagnosis and Therapeutics (6)
c. Geriatrics: The Continuum of Care (4) [Rpt./1] P, IMED 803.
d. Ambulatory Geriatrics (3-12) P, IMED 803.

811. Subinternship
a. Internal Medicine (6-12)
b. Coronary Care Unit — Acting Internship (4)
i. Medical Intensive Care Unit (4)
m. General Medicine — Acting Internship (4)

815. Subspecialty
a. Clinical Cardiology (4-8)
b. Clinical Dermatology (3)
c. Endocrinology (4-12)
d. Clinical Gastroenterology (4)
e. Hematology-Oncology (6)
f. Geriatrics (4-6) [Rpt./6 units] P, third year rotation in FCM and IMED (Identical with FCM 815)
g. Infectious Diseases (4-12)
h. Pulmonary Diseases (4)
j. Pulmonary Laboratory and Consultation Service (3-6)
k. Nephrology, Renal Diseases (3-6)
l. Clinical Allergy (1-6) (Identical with PED 815)
m. Medical Subspecialties (3-6) [Rpt.]
. Physical Medicine and Rehabilitation (4-6) [Rpt./1] CDT P, 3rd or 4th year medical school.
p. Critical Care Medicine (3-6) (Identical with ANES 815)
q. Cardiology Consultation (4)
r. Rheumatology (4-6) P, IMED 803.
s. Clinical Endocrinology, Metabolism and Hypertension (3-6) I II P, completion of required third year Internal Medicine clerkship.
t. Clinical Evaluation and Treatment of Sleep Disorders (3-6) (Identical with NEU 815v, PED 815v, and PSYI 815v)–. Consultation in Internal Medicine (3) P, 803.

891. Preceptorship
a. General Medicine and/or Subspecialties (3-12) [Rpt./2]
d. Cardiology (3-8) P, fourth year medical students.
e. Hematology/Oncology (3-8) P, 803.

896. Seminar
a. Pathophysiology and Immunology of the Clinical Manifestations of Coccidioidomycosis (2) II

Microbiology and Immunology
See Microbiology and Immunology elsewhere in this catalog.

Molecular and Cellular Biology
See Molecular and Cellular Biology elsewhere in this catalog.

Neurology (NEUR)
Professors Alan B. Rubens, Head, Carol Barnes (Psychology), Peggy C. Ferry (Pediatrics), Mary I. Johnson (Pediatrics), William A. Sibley (Pediatrics), Associate Professors Colin R. Bannard, William M. Feinberg, Erwin B. Montgomery, Jr., Gary Wenk (Psychology), Assistant Professors Geoffrey L. Ahern, David M. Labiner, Nathaniel T. McMullen (Anatomy), Mark Menne meier (Psychiatry), Naomi E. Rance (Pathology), Steven Z. Rapcsak, Dinesh Talwar (Pediatrics)
Clinical Professors Harvey W. Buchsbaum, Jose Laguna
Clinical Associate Professors Enrique L. Labadie, Kalarickal J. Oommen, Johan Van Dalen (Ophthalmology)
Research Associate Professor Elliott J. Mufson (Anatomy)
Clinical Assistant Professors Ronnie Bergen, David Griesemer (Pediatrics), Jeannette K. Wendt
Adjunct Lecturer Jay B. Angeline (Anatomy)
Assistant Research Scientist Pelagie Beeson

495. Colloquium
y. Introduction to the Neurosciences I (2)
1993-94 P, Consult department before enrolling (Identical with MED 495y, which is home) May be convened with 595z.
z. Introduction to the Neurosciences II (2) 1993-94 P, 495y or consult department before enrolling (Identical with MED 495z, which is home) May be convened with 595z.

595. Colloquium
y. Introduction to the Neurosciences I (2) 1993-94 P, Consult department before enrolling (Identical with MED 595z, which is home) May be convened with 595y.
z. Introduction to the Neurosciences II (2) 1993-94 P, 595y or consult department before enrolling (Identical with MED 595z, which is home) May be convened with 595z.

605. Human Neuroscience (6) I II (Identical with ANAT 605)

695. Colloquium
a. Motor Control (2) [Rpt./8 units] I II (Identical with EXSS 695a, which is home)

800. Research (3-12) [Rpt./1] (See College of Medicine Electives Manual)

803. Clinical Clerkship (3-6)

810. Clerkship
a. Neurology Consult Service (4)

815. Subspecialty
c. Cerebrovascular Disease (4-6) P, 803.
d. Neurological and Neuromuscular Disorders (3-6) Yr. P, 803; consult department before enrolling.
e. Clinical Evaluation and Treatment of Sleep Disorders (3-6) (Identical with MED 815v)

891. Preceptorship
a. Neurology (4-6) [Rpt./2]

Obstetrics and Gynecology (OBG)
Professors M. Wayne Heine, Head, John R. Davis (Pathology), Kenneth Hatch, Jack Pearson, Kathryn L. Reed, John Seeds, Earl A. Surwit
Associate Professors Ponjola Coney, Diane S. Fordney (Psychiatry), Catherine Racowsky
Assistant Professor David G. Chaffin
Clinical Professors John V. Kelly, John H. Mattox, Tawfik Rizkallah
Clinical Associate Professor William C. Scott
Clinical Assistant Professors Armando Arroyo, Joel M. Childers, Allan Hart sough, Cynthia J. McCurdy, Hugh S. Miller, Herbert E. Pollock, Thomas F. Purdon, Judith E. Riley, Sterling J. Ryerson
Research Assistant Professor David S. Karabinus
Clinical Instructors Charles M. McCurdy, Robert N. Samuelson
Clinical Lecturer Caroline F. Anderson

800. Research (3-6) P, 803.

803. Clinical Clerkship (6)

810. Clerkship
a. Preparation for Practice (4-6) P, 803.
b. Preparation for Private Practice (3-6) P, 803.

811. Subinternship

815. Subspecialty
d. Gynecology-Endocrinology (3-6) P, 803.
e. Obstetrical Ultrasound (4-6) P, 803.

891. Preceptorship

Ophthalmology (OPH)
Professor Barton L. Hodes
Associate Professor Robert W. Snyder, Head
Assistant Professors Theresa R. Kramer, Joseph M. Miller, Millicent C. Palmer
Clinical Professor Robert M. Dryden
Clinical Associate Professor Leonard Joffe
Clinical Assistant Professors Richard W. Allinson, Denis Carroll, George S. Novalis
Assistant Clinical Lecturers Sam E. Sato, Reid Schindler, Edmond H. Thall

800. Research (6-18) II

815. Subspecialty
a. Ophthalmology (3-6)

891. Preceptorship

Pathology (PATH)
Associate Professors James M. Byers III, Ronald B. Schifman, Catherine M. Spier
Assistant Professor Naomi E. Rance
Research Professor Claire M. Payne
Clinical Associate Professor Karen K. Steinbronn
Clinical Assistant Professors Maria L. Aguierre, Jerry L. Banger, Achyut K. Bhattacharya, John D. Howard, William F. Kern, III, S. Anne Leavitt, Bruce O. Parks

489. Introduction to Forensic Science: Pathology, Anthropology, Toxicology and Law (2) I II Opportunity for the criminal investigator and attorney with an interest in forensic pathology to better understand the results of trauma, toxic substances and environmental catastrophes. Taught off campus only. May be convened with 489.

501. General and Systemic Pathology (10) I II P, formal admission to the Ph.D./M.D. program and permission to the course director.

509. Introduction to Forensic Science: Pathology, Anthropology, Toxicology and Law (2) I II For a description of course topics, see 489. Graduate-level requirements include additional assignments as required by the instructor. Taught off campus only. May be convened with 489.

612. Biological Electron Microscopy (4) I (Identical with MCB 612)

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.] I, P, 801.
d. Anatomic/clinical Pathology (4-6) P, completion of basic sciences.

891. Preceptorship
a. Pathology (1-18) [Rpt.] II
b. BNI Neuropathology (4-6) P, completion of basic sciences.

Pediatrics (PED)
Professors Lynn M. Taussig, Head, Leslie L. Barton, Anna I. Binkiewicz, Burris R. Duncan, Robert P. Erickson, Peggy C. Ferry, Stanley J. Goldberg, Ronald Hansen (Internal Medicine), Mary I. Johnson, Otakar Koldovsky, Richard J. Lemen, Elmer S. Lightner, Anthony F. Philippus, Alayne Yates (Psychiatry)
Associate Professors F. Paul Alepa (Internal Medicine), Richard L. Donnerstein, Carlos A. Flores, H. Eugene Hoyne, John J. Hutter, Jr., Wayne J. Morgan, Michael J. Schumacher, Elsa J. Seff, Dan W. Thomas
Assistant Professors Steven H. Erdman, Pamela J. Kling, Daniela Lax, Fernando D. Martinez, Marc Ovadia, Evelyn D. Rider, Dinesh Talwar, Andreas A. Theodorou, Benjamin S. Wilfond, Jean Wilson (Anatomy), Peter D. Yorgin
Clinical Professor Anna I. Binkiewicz, Mary E. Rimza
Clinical Associate Professors Kirk A. Aleck, Robert A. Berg, Suzanne B. Cassidy, John L. Ey, M. Eleanor Grimm, William N. Marshall, Jr., Devyani S. Raval, Ziad M. Shehab
Clinical Assistant Professors Michael B. Aldous, Kathryn A. Bowen, Clifford DeBenedetti, David A. Griesemer, Louanne Hudgens, Courtney R. Johnson, Paul M. Kaufmann, Catherine J. Locke, William A. Madden, Catherine J. Payson (Anesthesiology), Joy B. Peskin, Kyoo H. Rhee, Eve Shapiro, Carol A. Swanson, Rolando Zamora
Research Assistant Professors Mark L. Witten, Anne L. Wright
Clinical Instructor Victoria E. Lasala
Senior Clinical Lecturer George D. DeCommer
Clinical Lecturers Victor A. Elsberry (Pharmacy), Maureen J. Hutter (Psychiatry)
Assistant Clinical Lecturers Miriam Fults, Teresa Longoria, Mimi Peterson, Tamera Schille

800. Research (1-18) (See College of Medicine Electives Manual)

803. Clinical Clerkship (6)

810. Clerkship
b. Inpatient Pediatrics (6)

811. Subinternship
a. Ambulatory Pediatrics (1-18)

815. Subspecialty
a. Advanced Neonatology (4-6)
b. Pediatric Infectious Diseases (3-6)
d. Cardiac Ultrasound Echo and Doppler (4-6)
e. Pediatric Cardiology (4-6)
f. Pediatric Neurology (4-6)
g. Pediatric Hematology/Oncology (4-6)
h. Poison Center (4-6) P, PED 803.
i. Pediatric Pulmonary (4-6) II P, 803.
j. Clinical Allergy (1-6) (Identical with IMED 815L which is home)
l. Pediatric Endocrinology (4-6)
m. Pediatric Clinical Research in a Cross-Cultural Setting (4-12) P, 803 or IMED 804.

891. Preceptorship
d. Pediatric Endocrinology (4-6)
e. BNI Pediatric Neurology (4) P, 803.

Pharmacology
See Pharmacology elsewhere in this catalog. Toxicology courses are listed under Pharmacology and Toxicology.

Physiology
See Physiology elsewhere in this catalog.

Psychiatry (PSYI)
Professors Alan J. Gelenberg, Head, Judith V. Becker, Allan Beigel, Richard R. Bootzin (Psychology), Henry W. Brosin, Alfred W. Kastenm (Psychology), Alan I. Levenson, John C. Racy, Bruce D. Sales (Psychology), Jose M. Santiago, Gary E. Schwartz (Psychology), Henry I. Yamamura (Biochemistry), Alayne Yates
Associate Professors Harold S. Arkowitz (Psychology), Pedro L. Delgado, Diane S. Fordney (Obstetrics and Gynecology), Philip D. Kanof, Richard D. Lane, Eric M. Reiman
Assistant Professors Peter J. Attarian (Family and Community Medicine), Iris R. Bell, Shirley N. Fahey, John S. Jachna, Mark S. Mennemeier, Howard D. Toff
Clinical Associate Professors John Misiaszek, Voya E. Ognyanov, Rebecca L. Potter, Betty Jo Tricou
Clinical Assistant Professors Mario Cruz, Judith C. Dean, Murray M. DeArmond, Timothy L. Harvey, Anne M. Herring, Michael S. Kuntzler, Richard W. Lloyd, Catherine J. Locke (Pediatrics), Russell D. Martin, Bernard M. Morenz, III, Gail L. Schwartz, David L. Stoker

495. Colloquium
z. Introduction to the Neurosciences II (2) 1993-94 P, MED 495yr or consult department before enrolling. (Identical with MED 495sz, which is home) May be convened with 595sz.
Radiation Oncology (RONC)

Professors J. Robert Cassady, Head, G. Timothy Bowden, Thomas C. Cetas, Eugene W. Gerner, Robert B. Roemer

Associate Professors Anne E. Cress, Kullervo H. Hynynen, David S. Shimm, Baldassarre D. Stea

Assistant Professor Jesse Martinez

Research Associate Professor Helen L. Gensler

Clinical Assistant Professors Chee Wai Cheng, Marilyn Croghan, Helen Fosmire, Wendell R. Lutz, Bruce Lulu, Terence Roberts

Research Associate Professors Mary McGovern, Linda Meade-Tollin

Senior Research Scientist William Holmes

Assistant Research Scientist Eugene Gross

Radiation Biology (3) II Basic principles of radiation effects in mammalian cell and tissue systems, with emphasis on biochemical aspects, such as DNA damage and DNA repair, and cellular responses, such as cell kinetics defects and radiation repair and recovery; radiation and chemical (especially radiomimetic drugs) carcinogenesis. P, introductory biology and chemistry.

Eukaryotic DNA Replication (3) [Rpt./1] 1993-94 (Identical with CBIO 505)

Subspecialty

h. Cancer Epidemiology and Prevention (3) I P; none; statistics helpful. (Identical with EPI 513h, which is home)

i. Cancer Prevention and Control (3-15) II (Identical with EPI 515h, which is home)

Molecular Mechanisms of Carcinogenesis (3) I 1994-95 (Identical with CBIO 551)

Cancer Biology (3) II 1994-95 (Identical with CBIO 555)

595. Colloquium

d. Special Topics in Cell Biology (2) [Rpt./6 units] II (Identical with CBIO 595d, which is home)

596. Seminar

h. Cancer Biology Series (1) I (Identical with CBIO 596h, which is home)

800. Research

815. Subspecialty

a. Introduction to Radiation Oncology (1-6)

b. Cancer Epidemiology and Prevention (3) I P; none; statistics helpful. (Identical with EPI 815h, which is home)

i. Cancer Prevention and Control (3-15) II (Identical with EPI 815h, which is home)

Molecular Mechanisms of Carcinogenesis (3) II 1993-94 (Identical with CBIO 851)

891. Preceptorship

h. Cancer Biology Series (1) I (Identical with CBIO 891h, which is home)

Radiotherapy (RADI)

Professors M. Paul Capp, Head, Harrison H. Barrett (Optical Sciences), Theodore Bowen (Physics), William Dallas, Tim B. Hunter (Chief, Diagnostic Radiology), Theron W. Ovitt, Dennis D. Patton, Michael J. Pitt, Gerald D. Pond, Joachim F. Seeger, William L. Wolfe, Jr. (Optical Sciences), James M. Woolfenden

Associate Professors Raymond F. Carmony, Robert J. Gillies (Biochemistry), Arthur F. Gmitro, Evan C. Unger, Walter H. Williams

Assistant Professors Laurie L. Fajardo, Mark T. Yoshino

Clinical Professors George R. Barnes, Jr., James R. Standen

Clinical Assistant Professors Per Granstrom, Rebecca L. Hulet, Rebecca Hunt, Pamela J. Lund, Welland O. Short, Steven Smith

Instructor T. Kent Walsh

Senior Clinical Lecturers Hugh D. Allen, Harry R. Claypool (Anatomy), Harry W. Fischer, Jack N. Hall

Clinical Lecturers Linda L. Attarain, Richard Boyle, Evan Fram, James Richardson, William Wilcox

Research Professors Hans Roehrig, Charles A. Sondhaus

Research Associate Professors H. Bradford Barber, Fayeaz M. Swaleim

Research Assistant Professors Elizabeth Krupinski, Dekang Shen

Research Lecturers Ammar Darkanzali, Brent W. Mockbee

Research Specialists Thomas A. Fritz, Rodriguez Guillen

Surgery (SURG)


Assistant Professors Bruce L. Dalkin, Michael J. Esser, Allan J. Hamilton, Casey L. Huston, Leigh A. Neumayer, Jon K. Nisbet, Luis J. Rosado-Lopez, Francisco G. Valencia, James A. Warnke, Martin E. Weinand, Craig S. Williams, Fred C. Williams

Instructor Richard C. Dart


Research Professors Cleamond D. Eskelson, A. Norman Guthkelch


Research Associate Professors Janis M. Burt (Physiology), Donald W. DeYoung, Ronald L. Misiorski, John A. Szivek

Clinical Assistant Professors Achyut Bhattacharyya, Riemke M. Brakema, William J. Brodzki, Richard H. Carmona, Catherine Cosentino, Heeten Desai, Mary Jo Ghory, John A. Guisto
The Department of Surgery provides a broad general exposure to surgery during a six week basic clinical clerkship and a three week specialty clerkship. The specialty clerkship requirement can also be met by registering for Surgery 807 in Year IV. The basic clerkship stresses preoperative evaluation in emergency, patient, and ambulatory settings, proper operating room conduct and postoperative management. An awareness of the nature and management of surgical disease is developed by case-oriented small group sessions, rounds and weekly conferences. The surgery Specialty Clerkship reinforces these basic skills by application to specialty areas such as urology, orthopedics, neurosurgery, cardiothoracic surgery and otolaryngology.

Elective courses in general and specialty surgery and various aspects of surgical biology are offered. Increased clinical responsibility is assured on hospital services by assigning the elective student to the patient care team. Special courses designed around specific clinical activities and research programs in the Department of Surgery and other departments are available on an individual basis.

The graduate program in surgical sciences includes hospital training in general and specialty surgery with a strong emphasis upon the five-year graduate program. It emphasizes training of the clinical surgeon but encourages elective surgical study for future community, academic or research surgery.

670. Principles of Perfusion Techniques I (3) I
(Ideal with PHCL 670)

671. Perfusion Technology Laboratory (1) I
(Ideal with PHCL 671)
Medieval Studies

Social Sciences Building, Room 121
(602) 621-1586

Graduate Interdisciplinary Program in Medieval Studies

Committee:
Professors Jonathan Beck (French and Italian), John Boe (Music), Roger Dahlen (English), Sigmund Eisner (English), Richard Kinkade (Spanish and Portuguese), Dana Nelson (Spanish and Portuguese), Heiko A. Oberman (History)

Associate Professors Alan E. Bernstein, Chair (History), Carl Berkhout (English), Albrecht Classen (German), Richard C. Jensen (Classics), Peter Medine (English), H. Reynolds Stone (Spanish and Portuguese)

Assistant Professors Cary Nederman (Political Science), Cynthia White (Classics), Jane Williams (Art)

The Graduate Program in 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.

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, Celestino Fernandez (Sociology), Jose D. Garcia (Physics), Linan A. Gyurko (Spanish and Portuguese), Miguel M. Mendez (Spanish and Portuguese), Michael C. Meyer (History), Eliana S. Rivero (Spanish and Portuguese), Charles M. Tatum (Spanish and Portuguese), Carlos Velez-Ibanez (Anthropology), Thomas Weaver (Anthropology)

Associate Professors John A. Garcia (Political Science), Juan R. Garcia (History), Roseanne Gonzalez (English), William Velez (Mathematics)

Assistant Professors Frances Aparicio (Spanish and Portuguese), Hector Delgado (Sociology), Roberto Fernandez (Sociology), Susan Gonzalez-Baker (Public Administration and Policy), Alfonso Morales (Sociology), Ana Perches (Spanish and Portuguese), Antonio Rios-Bustamante (Spanish and Portuguese), Joaquin Ruiz (Geosciences), Kathleen C. Schwartzman (Sociology)

The minor: A supportive minor in Mexican American studies to augment other academic areas or majors is encouraged. The minor requires 21 units, including 160a-160b and 6 units chosen from 161, 233, 332, and 403, or 485. At least 15 units must be in upper-division courses. Group III requirement must be fulfilled in Spanish.

The major: 30 units in MAS, including 180a-180b and nine units chosen from 161, 233, 332, and 403, or 485. At least 15 units must be in upper-division courses. Group III requirement must be fulfilled in Spanish.

The College of Education. (Identical with LRC 406)

407. Bilingualism in the Southwest (3) I II (Identical with ANTH 407) May be convened with 507.

410. Foundations of Bilingual Education (3) I II (Identical with LRC 410)

423. Anthropology of Mexico (3) II (Identical with ANTH 423)

431. Children's Literature in Spanish (3) I (Identical with SPAN 441)

444. Mexican and Mexican-American Prose Fiction (3) I 1994-95 (Identical with SPAN 444)

446. Mexican and Mexican-American Theatre (3) I 1993-94 (Identical with SPAN 446)

447. Contemporary Mexican Literature (3) II S (Identical with SPAN 447)

448. Government and Politics of Mexico (3) I (Identical with POL 448)

449. Mexican and Mexican-American Film (3) II 1993-94 (Identical with SPAN 449)

453a-453b. Mesoamerican Archaeology (3) I II (Identical with ANTH 453a-453b)

456. Race and Ethnic Relations (3) I II (Identical with SOC 456)

473. Spanish for the Native Speaker of Spanish Classroom Teacher (3) II (Identical with SPAN 473) May be convened with 573.

485. Mexican Women's History (3) I CDT Historical survey and sociological analysis of past and present experiences of Mexican women in the United States (Identical with W S 485) Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see “Writing-Emphasis Courses” in the Academic Policies and Graduation Requirements section of this catalog).

487. Bilingualism in the Southwest (3) I II (Identical with ANTH 507) May be convened with 407.

550. Development of Mexican and Mexican-American Literature (3) (Identical with SPAN 550)

573. Spanish for the Native Speaker of Spanish Classroom Teacher (3) II (Identical with SPAN 573) May be convened with 473.

574. Linguistic Perspectives on Mexican-American Spanish and Bilingualism (3) I II (Identical with;106 SPAN 574) May be convened with 474.

695. Colloquium n. Bilingualism in the United States (3) [Rpt./3] S

Microbiology and Immunology (MBIM)

College of Medicine
Life Sciences North Room 644
(602) 626-6061

Professors John J. Marchalonis, Head, Harris Bernstein, Evan M. Hersh (Medicine), Junetsu Ito, Marguerite
Microbiology (MIC)

Undergraduate Program
Pharmacy-Microbiology Building
Room 201
(620) 621-6903

Professors Charles R. Sterling, Program Director (Veterinary Science), Don Bourque (Biochemistry), Ed Cupp (Veterinary Science), Charles P. Gerba (Soil and Water Science), Robert L. Gilbertson (Plant Pathology), William Grimes (Biochemistry), Lynn A. Joens (Veterinary Science), C. John Maré (Veterinary Science), Neil Mendelson (Molecular and Cellular Biology), David Mount (Molecular and Cellular Biology), Merrit R. Nelson (Plant Pathology), George B. Olson (Emeritus), Ian L. Parker (Soil and Water Resources), Norval A. Sinclair (Veterinary Science), J. Glenn Songer (Veterinary Science), Michael E. Stanghellini (Plant Pathology), Hans D. van Etten (Plant Pathology)

Associate Professors Emmanuel Akporiya (Microbiology and Immunology), Robert Arnold (Civil Engineering), Martha Hawes (Plant Pathology), Martinez J. Hewlett (Molecular and Cellular Biology), Robert J. Janssen (Emeritus), Christina Kennedy (Plant Pathology), Donald V. Lightner (Veterinary Science), Iraj J. Misaghi (Plant Pathology), Douglas Park (Nutrition and Food Science), Ralph Price (Nutrition and Food Science), Dennis T. Ray (Plant Science), James T. Sinski, (Emeritus)

Assistant Professors Raina M. Miller (Soil and Water Science), Marc Orbach (Plant Pathology), L.S. Pierson (Plant Pathology), Michael Riggs (Veterinary Science), Zhongguo Xiong (Plant Pathology), L.S. Pierson (Plant Science), James T. Sinski, (Emeritus), Christina Kennedy (Plant Science), Merritt R. Nelson (Plant Pathology)

Lecturers Lee M. Kelley (Emeritus) (Plant Pathology)
Adjunct Associate Professor Mary Olsen (Plant Pathology)

Research Associate Professor Janet M. Decker (Veterinary Science)

Research Assistant Professors Morteza Abbassadegan (Soil and Water Science), Judith K. Brown (Plant Sciences)

The program in Microbiology is based in the College of Agriculture but offers both the Bachelor of Science (through the Faculty of Science) and the Bachelor of Science in Agriculture (through the College of Agriculture). Participating faculty are from the Departments of Plant Pathology, Soil and Water Science, Plant Sciences, Molecular and Cellular Biology, Veterinary Science, Biochemistry, Microbiology and Immunology, and Civil Engineering. An undergraduate program coordinator assists in establishing advising assignments and policy administration. Student advising is by faculty in the various departments. Contact the program secretary in Room 202, Pharmacy-Microbiology (621-6903) for assignment of an advisor.

Students seeking the Bachelor of Science degree must complete the general education requirements prescribed by the Faculty of Science, in addition to the following:

**The major**: 35 units, including 181, 182, 317, 419, 421a, 421b, 428, and 495a.

CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b, and 323/323 or 325/326.

PHYS 102a-102b, or 104a-104b, and 180a-180b.

BIOL 460 or 462a-462b, MATH through calculus (123, 124, or 125a), and STAT 263 are also required.

Students seeking the Bachelor of Science in Agriculture degree must complete the general education requirements of the College of Agriculture, in addition to the following:

**The major**: 35 units, including 181, 182, 317, 419, 421a, 421b, 428, and 495a.

CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b, and 323/323 or 325/326.

PHYS 102a-102b, or 104a-104b, and 180a-180b.

BIOL 460 or 462a-462b, MATH through calculus (123, 124, or 125a), and STAT 263 are also required. Students are also required to complete 12 units in an Agriculture-based department. If taken from an approved list (available from the program office or an advisor), these units may count toward the major requirement of 35 units.

**The minor**: Students seeking either degree within the program have the option of a structured minor in chemistry.

The department participates in the honors program.

181. Introductory Biology I (4) (Identical with MCB 181)

182. Introductory Biology II (4) (Identical with MCB 182)

195. Colloquium
a. Great Experiments in Microbiology (1) I II (Identical with BIOC 195a and MCB 195a)

b. Biotechnology (1) I II (Identical with BIOC 195b)

c. Society and Science (1) I II (Identical with BIOC 195c, which is home)

205. Microbiology (5) I II Introduction to general, applied, and pathogenic microbiology and immunology. Not available for major credit. 4R, 4L.

317. General Microbiology and Microbial Physiology (3) I Microbial cell structure and function; physiology and metabolism, growth; characterization of major microbial groups. P, CR, CHEM 241b, 243b.

**Honors Proseminar** (3) I II

403R. Biology of Animal Parasites (3) I (Identical with VSC 403R) May be convened with MBIM 503R.

403L. Parasitology Laboratory (1) I (Identical with VSC 403L) May be convened with MBIM 503L.

404. Molecular Parasitology (3) II GRD (Identical with VSC 404) May be convened with MBIM 504.

410. Cell Biology (3) II (Identical with MCB 410)

411. Molecular Biology (3) II (Identical with MCB 411) May be convened with MBIM 511.


421a-421b. Microbiological Techniques (3-3) Experiments to facilitate the development of laboratory skills in basic and applied microbiology and biotechnology with emphasis in physiology and metabolism, genetics, immunology and pathogenesis. 1R, 6L. P, 317. (Identical with MCB 421a-421b, PL P 421a-421b, S W 421a-421b, V SC 421a-421b).

423. Mechanisms of Disease (4) II (Identical with VSC 423) May be convened with MBIM 523.


426. Environmental Microbiology Laboratory (2) I (Identical with S W 426) May be convened with MBIM 526.

427R. General Mycology (3) I General mycology, with emphasis on the microfungi. P, 205. May be convened with MBIM 527R.

427L. General Mycology Laboratory (2) I General mycology laboratory, with emphasis on the microfungi. P, 427R or CR. May be convened with MBIM 527L.

428. Microbial Genetics (3) II (Identical with PL P 428)

429. Introductory Virology (3) I Essential features of viruses, and their relationships to the diseases of humans, other animals, plants and microorganisms. P, 205, CHEM 241b, 243b. (Identical with VSC 429) May be convened with MBIM 529.

430. Introduction to Biophysics (2) I (Identical with PHYS 430) May be convened with MBIM 530.

438. Ecology of Infectious Disease (3) II (Identical with VSC 438) May be convened with MBIM 538.

440. Biodegradation of Pollutants in Soil and Groundwater (3) II (Identical with S W 440) May be convened with MBIM 540.
443. Research Animal Methods (3) I (Identical with V SC 443) May be convened with MBIM 543.

450R. Medical Mycology (2) II The isolation and identification of fungi of medical importance. P, 205. (Identical with V SC 450R) May be convened with MBIM 550R.

450L. Medical Mycology Laboratory (2) II Laboratory experiments dealing with isolation and identification of fungi of medical importance. P, 450L or CR. (Identical with V SC 450L) May be convened with MBIM 550L.

470. Food Microbiology and Sanitation (3) II 1994-95 (Identical with NFS 470)

471. Food Microbiology and Sanitation Laboratory (2) II 1994-95 (Identical with NFS 471)

473. Recombinant DNA Methods and Applications (4) II (Identical with MCB 473)

495. Colloquium
  a. Senior (1) [Rpt./1] I II Writing Emphasis Course. P, satisfaction of the upper-division writing proficiency requirement (see "Writing Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

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**Middle Eastern Studies**

Franklin Building, Room 204
(602) 621-5450
(602) 621-9257 (fax)

Center for Middle Eastern Studies

Professors Ludwig W. Adamec (Near Eastern Studies), Thomas F. Mitzel (Near Eastern Studies /Judaic Studies), Brenda G. Joseph (Near Eastern Studies and the Committee on Judaic Studies). Special appointments on leave: Professors Richard Wilkinson (Humanities), Jean E. Goetinck (French and Italian), Shoshauna Green (Judaic Studies), Richard Wilkinson (Humanities) Adjunct Professor Lou Silberman (Judaic Studies)

Adjunct Associate Professor Amir I. Ajami (Near Eastern Studies)

Adjunct Assistant Professors Anne H. Betteridge (Middle Eastern Studies), Pamela Gaber (Near Eastern Studies), Amy W. Newhall (SIROW)

The Center for Middle Eastern Studies coordinates a concentration in Middle Eastern studies for students majoring in a variety of other disciplines, including anthropology, architecture, agriculture, architecture, economics, French, journalism, Judaic studies, medicine, Near Eastern studies, and political science. Areas of particular strength include Afghanistan, Iran, Iraq, the Fertile Crescent, and Egypt. Faculty members are available to counsel students planning their programs.

For students interested in majoring in Middle Eastern languages, programs are available through the Department of Near Eastern Studies and the Committee on Judaic Studies.

The center participates in the honors program.

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**Military Science, Naval Science and Military Aerospace Studies (MLS/NS/MLA)**

Military science (Army), naval science (Navy and Marine Corps) and aerospace studies (Air Force) are open to male and female students seeking a commission. ROTC courses can be counted as elective credit toward graduation in most academic majors. Lower-division courses carry no service commitment. Veterans may receive credit for the first two years of the four-year ROTC program. Textbooks and uniforms are provided by the departments. See the catalog section on School of Military Science, Naval Science and Aerospace Studies under General Divisions of the University for contact the department.

**Military Science (MLS)**

South Hall, Room 101
(602) 621-1609
Professor Michael P. Mezz, Head
Assistant Professor John Russo

Instructors John Benson, David Bryant, Rene Oliviari, William Tackenberg

100. Introduction to Leadership (3) I Organization of the Army; principles and techniques of applied leadership; customs, traditions and military courtesy; basic marksmanship; first aid, land navigation; small-unit tactics; practicum. 2R, 1L. Course is open to all registered students.

101. Leadership Principles (3) II Organization of the Army; principles and techniques of applied leadership; customs, traditions and military courtesy; basic marksmanship; first aid, land navigation; small-unit tactics; practicum. 2R, 1L. Course is open to all registered students.

110. Physical Fitness Training (1) [Rpt./2 units] I II Activity course based on the Army physical fitness training program. 3L.

200. Army Composition/Functions and Leadership Development I (3) Military staff organization and operation; procedures and conduct of military planning; principles of war through historical examples; leadership development for today and tomorrow in small units and organizations; practicum. 2R, 1L. Open to all registered students.

201. Army Composition/Functions and Leadership Development II (3) Continues the development of leadership training for the individual in small unit levels; orientation to Soviet Military power; a practical experiences in land navigation, first aid and rifle marksmanship. 2R, 1L. Open to all registered students.

210. Tactics (2) [Rpt./4 units] I II GRD Development of tactical planning skills and small unit operations.

300. Small Unit Leadership I (3) Topographical map interpretation; fundamentals of small-unit operations; communication media, motivation and behavior in the military environment; military planning and execution; practicum. 3R, 1L. Consult department before enrolling.

301. Small Unit Leadership II (3) Topographical map interpretation; fundamentals of small-unit operations; communication media, motivation and behavior in the military environment; military planning and execution; practicum. 3R, 1L. Consult department before enrolling.

310. Army ROTC Advanced Camp (4) Six-week summer camp at Ft. Lewis, Washington, required for commissioning as an officer in U.S. Army. Open only to Advanced Course Army ROTC cadets.

400. Officership I (3) Development of skills required to function as a manager; motivation and behavior in a military environment; highlights personal integrity, honor and professional ethics; military legal system; unit management; practicum. 3R, 1L. Consult department before enrolling.

401. Officership II (3) Development of skills required to function as a manager; motivation and behavior in a military environment; highlights personal integrity, honor and professional ethics; military legal system; unit management; practicum. 3R, 1L. Consult department before enrolling.
Naval Science (NS)
South Hall, Room 109
(602) 621-1281
Professor R. F. Walters, Head
Associate Professor V. W. Converse
Assistant Professors Larry Alexander, Jim Kelio, Ellen Martin, Tim Minneh, Tom Southard
Instructors Tim Acosta, Victor Bagley
100a-100b. Naval Laboratory I (1-1) I II Various topics such as drill and ceremonies, physical fitness, ship handling, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.
101. Introduction to Naval Science (3) I Introduction to the naval profession and to concepts of seapower, with emphasis on mission, organization, and warfare components of the Navy and Marine Corps; naval and customs, military justice, shipboard damage control and safety.
102. Ship Systems I: Engineering (3) II Ship characteristics and types including ship design, hydrodynamic forces, stability, compartmentation, propulsion, electrical and auxiliary systems, interior communications, ship control, and damage control; basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion.
200a-200b. Naval Laboratory II (1-1) I II Various topics such as drill and ceremonies, physical fitness, ship handling, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.
202. Seapower and Maritime Affairs (3) II U.S. Naval history from the American Revolution to the present. Discussion of the theories of Mahan, political issues of merchant marine commerce, and a comparison of U.S. and Soviet naval strategies.
300a-300b. Naval Laboratory III (1-1) I II Various topics such as drill and ceremonies, physical fitness, ship handling, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.
301. Navigation and Naval Operations (3) I Theory, principles, and procedures of navigation. Students learn piloting navigation including the use of charts, visual and electronic aids, the theory and operation of magnetic and gyro compasses, and celestial navigation.
310. Evolution of Warfare (3) I The development of warfare to present, focusing on theories, strategies, tactics, and technological developments. Student acquires sense of strategy and impact of precedent on military actions.
400a-400b. Naval Laboratory IV (1-1) [Rpt./1] I II Various topics such as drill and ceremonies, physical fitness, ship handling, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.
401. Leadership and Management I (2) I Organizational behavior and management in the context of the naval organization. A survey of management functions of planning, organizing, and controlling, and introduction to individual and group behavior in organizations; motivation and leadership.
402. Leadership Management II (2) II Naval officer responsibilities in naval administration: counseling methods, military justice administration, naval human resources management, directives and correspondence, naval personnel administration, material management and maintenance. P, N S 401 or MAP 305.
410. Amphibious Warfare (3) I Historical survey of the development of amphibious doctrine and amphibious operations, with emphasis on the evolution of amphibious warfare in the 20th century; present day potential and limitations on amphibious operations, including the rapid deployment force concept.

Military Aerospace Studies (MLA)
South Hall, Room 104
(602) 621-3521
Professor Edward D. Harrow, Jr.
Assistant Professors James E. Hartman, Timothy J. Mills, Mickey D. Teague
100a-100b. Air Force Today (2-2) First Year GMC Survey of the doctrine, mission, and organization of the U.S. Air Force and the development of modern and contemporary U.S. air forces. 1R, 1L. 100a is not prerequisite to 100b.
200a-200b. History of Aviation* (2-2) Second Year GMC Survey of the development of aviation from the advent of the air age to the present, with emphasis on military aviation and its relationship with political and economic aspects of historical world situations. 1R, 1L. 200a is not prerequisite to 200b.
300a-300b. Third Year POC**, Leadership and Management (3-3) Theory and application of leadership and management, with emphasis on human relations, motivation, communication for managers, organizational behavior and Total Quality Management (TQM) principles and processes. 3R, 1L. Consult department before enrolling.
400a-400b. Fourth Year POC**, American Defense Policy (3-3) Critical analysis of various aspects of the military in American society and its application and effects on the world political and economic environment. 3R, 1L. Consult department before enrolling.

Mining and Geological Engineering (GEN/MNE/C/MNE)
Mines Building, Room 229
(602) 621-6063
Professors J. W. Dotson (Emeritus), DeVerle P. Harris, Y.C. Kim, Richard Newcomb, William C. Peters (Emeritus), Michael Rieber
Associate Professors Ben K. Sternberg, Head, Charles E. Glass, Satya Harpalani, Pinnaduwa Kulatilake
Assistant Professors John Kemeny, Douglas Labrecque, Paul J. A. Lever, Mary Poulton

Geological Engineering (GEN)
Geological engineering involves the application of engineering principles to the design and specification of earth structures and the exploration and development of natural resources. The department offers the Bachelor of Science in Geological Engineering, and Master of Science and Doctor of Philosophy degrees with a major in geological and geophysical engineering. Undergraduate degree requirements are listed in the College of Engineering and Mines section of this catalog.

120. Mineral Resources, Geotechnology and the Environment (3) I (Identical with MN E 120)
330. Introduction to Remote Sensing (3) I (Identical with GEOG 330)
402. Probability and Statistical Concepts in Geologic Media (4) I Univariate probabilistic and statistical methods: data reduction, basic probability concepts, discrete and continuous probability distributions, sampling distributions, confidence intervals, hypothesis testing, goodness-of-fit tests; applications in geologic media. Introduction to several statistical packages. 3R, 3L. 3ES, 1ED. P, MATH 223. (Identical with MN E 402) May be convened with 502. Kulatilake
407. Photogeology (3) I Use of aerial photographs in geologic mapping. 1R, 6L. 1SES, 1SED. P, GEO 321. (Identical with GEO 407) May be convened with 507. Glass
415. Rock Excavation (3) II (Identical with MN E 415) May be convened with 515.
416. Field Studies in Geophysics (3) I II S Seismic, magnetic, electrical, and gravity exploration techniques. Field trips. Special fee may be required. 3ED. P. 448 or 548. (Identical with GEO 416) May be convened with 516. Sternberg
424. Fundamentals of Geotechnics (3) II Properties of natural geologic deposits; principles of hemispherical projections and rock joint surveys; engineering solutions to problems of soil and rock slope stability, foundation stability and earth retaining structures. 1R, 3L, 3ED. May be convened with 425. Glass

425. Geotechnical Investigations (3) II Investigation and analysis of geologic factors in the design and construction of engineering projects. 1R, 6L, 3ED. May be convened with 523. Glass

426. Health and Safety in Mining (1) I (Identical with MN E 426) May be convened with 526.

427. Geomechanics (3-4) I (Identical with MN E 427) May be convened with 527.

445. Fundamentals of Geostatistics (3) [Rpt./6 units] II (Identical with MN E 445) May be convened with 545.

448. Geophysical Exploration and Engineering (3) I Principles of gravity, magnetic, seismic and electrical exploration; acquisition and interpretation of data to define geologic structure and evaluate resources. 3R, 2ES, 1ED. P, MATH 223. (Identical with GEOS 448) May be convened with 548. Sternberg/Johnson

449. Mineral Exploration (3) I 1993-94 Analysis of guides and techniques leading to location and delineation of mineral deposits. 1ES, 2ED, P, GEO 209. (Identical with GEOS 449 and MN E 449) May be convened with 549. Poulton

470. Computer Methods in Geologic Engineering (3) II Use of computers to solve problems in geologic engineering, including data bases, computer contouring, map filtering and enhancement, and-multivariate analysis of geologic data. 3ED, P, introductory courses in computer programming, math, and earth science. May be convened with 570. Poulton/Sternberg


505. Applied Multispectral Imagery (3) II Application of image processing to mineral exploration, engineering geology, groundwater location, and pollution monitoring. P, 407. (Identical with GEOS 505) Glass

507. Photogeology (3) I For a description of course topics, see 407. Graduate-level requirements include completion of an advanced project involving photo interpretation and field mapping. P, GEOS 321. (Identical with GEOS 507) May be convened with 407. Glass

515. Rock Excavation (3) II (Identical with MN E 515) May be convened with 415.

516. Field Studies in Geophysics (3) II S For a description of course topics, see 416. Graduate-level requirements include addi-
Mining Engineering (MNE)

Mining engineering involves the planning, design, development and operation of underground and surface mines and other subsurface facilities.

The department offers the Bachelor of Science in Mining Engineering, and Master of Science and Doctor of Philosophy degrees with a major in mining engineering.

Undergraduate degree requirements are listed in the College of Engineering and Mines section of this catalog.

120. Mineral Resources, Geotechnology and the Environment (3) I II The history and recent advances in locating and extracting earth's mineral resources; the principles of developing and managing earth's resources and hazards; environmental concerns such as acid rain and hazardous waste. 2R, 3L. (Identical with ENGR 120 and G EN 120). Kemeny/Poulton

220. Mining Methods (3) I II Introduction to the techniques, unit operations, and systems involved in underground and surface mining of minerals and coal. Field trips. 2R, 3L. EES. 1ED. P, MN E 120. Harpalani

401. Analysis of Mine Operations (3) I Use of operations research principles and techniques to analyze various problems in mine operations. 2ES. 1ED. May be convened with 501/ Harpalani


406. Fundamentals of Mine Ventilation (3) I Determination of quality and quantity of respirable air in mining operations. Thermodynamics of mine ventilation and design of ventilation systems. 2R, 3L. 1ES. 2ED. P, AME 331a. May be convened with 506. Harpalani

410. Mine Surveying (1) I II Mine surveying problems and practices; closed traverse of underground mine; shaft plumbing, stope and raise surveying. 1ES. P, 2ES. C E 251. Lever

411. Mineral Processing (3) I Physical and chemical unit operations used to separate and recover the economic minerals and metals from their ores. The modern scientific and engineering background for the operations are presented as well as economic aspects. Includes field trips to major mining operations in Tucson area. 2ES. 1ED. (Identical with MEE 411) May be convened with 511.

415. Rock excavation (3) I Methods of excavation of rock in surface and underground mines and construction, ranging from the empiricism of conventional blasting practice to the application of the fundamental mechanics of rock fracture. 2R, 3L. 1ES. 2ED. Field trips. P, C E 217. (Identical with G EN 415) May be convened with 515. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog). Lever

418. Mine Investment Analysis (3) I II Economic factors, including taxation, mining depletion allowance, and finance in the mining industry; includes fundamentals of engineering economics, capital budgeting, and risk analysis. 1ES. 2ED. P, 430. (Identical with MNEC 418) May be convened with 518. Harris

426. Health and Safety in Mining (1) I Fundamental concepts in the recognition, evaluation and control of health and safety hazards encountered in mining operations; includes a review of engineering responses to the responsibilities to control accidents, a review of federal regulations and standards affecting the industrial workplace, and instruction regarding the interaction of industrial hygiene, safety, fire protection and workers' compensation to control losses resulting from industrial accidents. 1ES. (Identical with G EN 426) May be convened with 526. Lever

427. Geomechanics (3-4) I Mechanical behavior of rock and rock masses; response to load changes: deformations, failure, discontinuity slip; in situ stress state; rock testing; geomechanical classifications; engineering applications: slopes, pillars, tunnels, dam foundations; reinforcement design. 3R, 3L. 2ES. 2ED. P, C E 217. GEOS 321. (Identical with G EN 427) May be convened with 527. Kemeny

430. Mine Examination and Valuation (3) I Principles and procedures in mineral property valuation, geostatistical ore reserve estimation, engineering, economy, investment analysis; use of a microcomputer. 1ES. 2ED. P, 402, 220. May be convened with 530. Kim

433. Elements of Coal Mining (3) I Coal geology, properties and use. Surface and underground methods and equipment: strip mining; continuous, conventional, longwall mining; ground control; ventilation; haulage; electrical power; drainage. Preparation and reclamation. 2ES. P, 220, 406, ECE 207. May be convened with 533.

435. Mine Design (3) I Computer-aided design of a modern mine; feasibility study, pit limit design, mining sequence development and short-term mine planning. 2R, 3L. 1ES. P or CR, 430, 440. May be convened with 535. Kim

436. Subsurface Environmental Engineering (3) I Analysis of sources of heat, humidity, gas emissions, and salt in mineral and other subsurface facilities. Design of engineering systems to control these pollutants. 2ES. 1ED. P, 406 or consult with department before enrolling. May be convened with 536. Harpalani

440. Materials Handling (3) I Surface and subsurface material handling methods. Performance analysis and selection of the following haulage equipment: trucks, shovels, draglines, shuttle cars, locomotives, hoists, conveyors, hydraulic and pneumatic transport systems. Computer applications. 2R, 3L. 1ES. 2ED. Field trips. P, C E 214. May be convened with 540. Lever


449. Mineral Exploration (3) (Identical with GEN 449) May be convened with 549.

450. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.

497. Workshop
a. Unit Operations (1-3) III S P, 220. May be convened with 597a. Lever

500. Economics of Mineral Resource Development and Production (4) I (Identical with MNEC 500)

501. Analysis of Mine Operations (3) I For a description of course topics, see 404. Graduate-level requirements include a project using MIS software. May be convened with 401. Harpalani


503. Analysis of Mining Decisions (3) I Use of geostatistics, system simulation languages and computers to analyze various mining decisions related to reserve estimation and mine planning. P, 401, 402, 430, Kim

506. Fundamentals of Mine Ventilation (3) II For a description of course topics, see 406. Graduate-level requirements include a simulation project on design of an airflow system for an underground mine. May be convened with 406. Harpalani

511. Mineral Processing (3) I For a description of course topics, see 411. Graduate-level requirements include an advanced research project. (Identical with MSE 511) May be convened with 411.

515. Rock Excavation (3) II For a description of course topics, see 415. Graduate-level requirements include a research project. Field trips. P, C E 217. (Identical with GEN 515) May be convened with 415.

518. Mine Investment Analysis (3) II For a description of course topics, see 418. Graduate-level requirements include an indepth research paper on a single aspect of mineral investment to be approved by the instructor. P, 430. (Identical with MNEC 518) May be convened with 418. Harris

526. Health and Safety in Mining (1-1) I For a description of course topics, see 426. Graduate-level requirements include a term paper. (Identical with GEN 526) May be convened with 426.

527. Geomechanics (3-4) I For a description of course topics, see 427. Graduate-level requirements include either a research project or a research paper at the discretion of the instructor. P, C E 217, GEOS 321. (Identical with GEN 527) May be convened with 427. Kemeny

530. Mine Examination and Valuation (3) I For a description of course topics, see 430. Graduate-level requirements include either a research project or a research paper at the discretion of the instructor. P, C E 217, GEOS 321. (Identical with GEN 527) May be convened with 430. Kemeny

533. Elements of Coal Mining (3) For a description of course topics, see 433. Graduate-level requirements include a research project. May be convened with 433.

535. Mine Design (3) II For a description of course topics, see 435. Graduate-level requirements include either a research project or a research paper at the discretion of the instructor. P, C E 217, GEOS 321. (Identical with GEN 527) May be convened with 435. Kim

536. Subsurface Environmental Engineering (3) I For a description of course topics, see 436. Graduate-level requirements include a simulation project on the problem of heat and humidity in a subsurface facility. P, 406 or consult department before enrolling. May be convened with 436. Harpalani

537. Developments in Rock Mechanics (2-3) I For a description of course topics, see 447. Graduate-level requirements include an independent design/analysis project. All-day field trip. P, 427 or 527. (Identical with GEN 545) May be convened with 447.

540. Materials Handling (3) I For a description of course topics, see 440. Graduate-level requirements include a research project. Field trips. P, C E 214. May be convened with 440.

545. Fundamentals of Geostatistics (3) Rpt./6 units II For a description of course topics, see 445. Graduate-level requirements include an additional class project. P, integral and differential calculus. (Identical with GEN 545) May be convened with 445.

547. Underground Construction Geomechanics (2-3) II For a description of course topics, see 447. Graduate-level requirements include an independent design/analysis project. All-day field trip. P, 427 or 527. May be convened with 447.

549. Mineral Exploration (3) (Identical with GEN 549) May be convened with 449.

557. Fundamentals of Geomechanics (4) II Mechanical behavior of geological materials: stress and strain analysis; friction; elasticity, strength and failure; discontinuity slip. Laboratory testing. Applications to rock engineering problems. 3R. SL. P, 427 or C E 340, GEOS 321. (Identical with GEN 557)

580. The Mechanics of Fracture in Rock and Other Brittle Materials (3) Fracture mechanics theory applied to the deformation and failure of rock; numerical techniques; micromechanical damage models; flow through fractures; the mechanics of faulting and earthquake rupture. P, advanced course in engineering mechanics or geomechanics (GEN 427) (Identical with GEN 580) Kemeny


597. Workshop
a. Unit Operations (1-3) III S P, 220. May be convened with 497a.

622. Advanced Kriging Techniques (3) II Theory and application of advanced kriging techniques to mining and earth science related problems: universals, lognormal, indicator, co and probability kriging. P, 402, 430, 501 or MATH 579. Kim

629. Rock Slope Analyses and Design (3) Geologic and engineering considerations in design of optimum rock slope angles; constitutive models for intact rock and joints; theoretical stability analysis, monitoring and control of existing slopes. Field trip. P, 427. (Identical with GEN 629) Kulatilake

698. Seminar
a. Research (1-3) [Rpt.] II (Identical with GEN 698a)
Biology teaching major: Students interested in teaching secondary school biology, which includes molecular and cellular biology, should see the list of required courses under Department of Ecology and Evolutionary Biology.

The department has a structured split minor involving chemistry, physics, and mathematics.

The department participates in the honors program. Core courses all have additional honors credit.

181. Introductory Biology I (4) I Introduction to the cell and its properties, basic genetics, the immune system, recombinant DNA technology with illustrations from bacteria, plants, animals, and humans. High school biology/chemistry recommended. 3R, 3L. (Identical with BIOC 181, ECOL 181, MIC 181)

182. Introductory Biology II (4) I (Identical with ECOL 182)

195. Colloquium
a. Great Experiments in Microbiology (1) I II (Identical with MIC 195a)
b. Biotechnology (1) I II (Identical with BIOC 195a)
c. Society and Science (1) I II (Identical with BIOC 195c, which is home)

320. Genetics (4) I (Identical with ECOL 320)

404. Contemporary Biology in Human Affairs (3) II Advanced in biomedical research will be reviewed and their ethical, social and legal implications discussed. P, one course in BIOC or biology; botany not acceptable.


437. Vertebrate Physiology (4) I (Identical with ECOL 437)

443. Insect Neurobiology (3) II (Identical with ENTO 443) May be convened with 543.

455. Developmental Mechanisms (3) I Molecular and cellular mechanisms of development with emphasis on model systems. P, 181 and an advanced course in genetics, molecular or cell biology. (Identical with BIOC 455)

456. Developmental Biology (3) I (Identical with ANAT 456) May be convened with 556.

467. Insect Neurobiology (4) I I II (Identical with ANAT 471) May be convened with 557.

468. Plant Physiology (4) I (Identical with PL S 460) May be convened with 560.


470. The Cell and the Environment (3) I The molecular and cellular responses to the environment. P, MCB 410 and/or Biochemistry.

471. Human Embryology (4) I (Identical with ANAT 471) May be convened with 571.

473. Recombinant DNA Methods and Applications (4) II Relevant techniques for the isolation, purification and cloning of genes in E. coli hosts. Eucaryotic lambda genomic DNA clones will be characterized by restriction mapping, hybridization analysis, and sequence analysis. 2R, 6L. P, BIOC 462a, CR 411. (Identical with BIOC 473, GENE 473, MIC 473, and PL S 473)

501. Molecular and Cellular Biology (4) I P, formal admission to the Ph.D.M.D. program and permission of the course director.

505. Eukaryotic DNA Replication (3) I (Rpt./1) 1994-95 (Identical with CBIO 505)

510. Plant Molecular Biology (3) II 1994-95 (Identical with BIOC 510)

511. Molecular Biology (3) I II For a description of course topics, see 411. Graduate-level requirements include attending an additional lecture hour per week to discuss independent research, and to perform at a level 10% above undergraduate students. MCB majors should not take this course for graduate credit. P, 462a and consult department before enrolling. (Identical with MIC 511 and MBIM 511) May be convened with 411.

513. Somatic Cell and Molecular Genetics Laboratory (3) I For a description of course topics, see 413. Graduate-level requirements include an oral presentation. P, 181. May be convened with 413.

515. Somatic Cell and Molecular Genetics (2) II For a description of course topics, see 415. Graduate-level requirements include reading papers from the current literature. P, 181. (Identical with GENE 515) May be convened with 415.

516. Computer Analysis of Sequences (3) II For description of course topics, see 416. Graduate students will be required to conduct a research project, submit a written report, and give a presentation in class. (Identical with BIOC 516, ECOL 516 and GENE 516). May be convened with 416.

520. Pathways and Signals in Cells (3) II (Identical with BIOC 520)

543. Insect Neurobiology (3) II (Identical with ENTO 543) May be convened with 443.

545. Concepts in Genetic Analysis (3) I Methods of genetic analysis including mutation isolation, genetic and physical mapping, reverse genetics, evolutionary mechanisms, molecular variation and genomic evolution. P, introductory undergraduate genetics course or biology course. (Identical with BIOC 545, ECOL 545, GENE 545)

550. Topics in Pigment Cell Biology (2) I (Identical with ANAT 550)

555. Molecular Mechanisms of Development (3) II Detailed examination of molecular, genetic and cellular approaches to selected problems in developmental biology. P, 456 or consult department before enrolling. (Identical with BIOC 555 and GENE 555)

556. Developmental Biology (3) I (Identical with ANAT 556) May be convened with 456.

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

558. Advanced Subjects in Endocrinology (2) I (Rpt./1) I 1994-95 (Identical with BIOC 558)

560. Plant Physiology (4) I I II (Identical with PL S 560) May be convened with 460.

562. Plant Intermediary Metabolism (3) II 1993-94 (Identical with PL S 562)

564. Plant Growth and Development (3) II 1993-94 (Identical with PL S 564)

566. Physiology Laboratory (3) II (Identical with ECOL 566) May be convened with 466.

567. Endocrinology (3) I II (Identical with ANAT 567R) May be convened with 467.

568. Nucleic Acids (4) I (Identical with BIOC 568)

569. Topics in Gene Regulations (2) II 1994-95 (Identical with BIOC 569)

570. Topics in Pigment Cell Biology (2) I (Identical with ANAT 570)

572. Biological Regulation (4) I (Identical with BIOC 572)

574. Advances in Mammalian Genetics (2) I (Rpt./1) I 1994-95 (Identical with BIOC 574)

577. Principles of Cell Biology (4) II (Identical with ANAT 577)

582. Topics in Neural Development (2) II 1993-94 (Identical with NRSC 582)
763. Laboratory Rotation III (2) I II Research project with graduate faculty for 8 weeks, 15 hours per week. Open to majors only.

801. Molecular and Cellular Biology (4) I Freshman medical students only.

Music (MUS/MUSI)

Music Building, Room 109
(602) 621-1655

Professors Dorothy Payne Director, James R. Anthony (Emeritus), John Bloom (Emeritus), John Boe, Andrew Buchhasser (Emeritus), Edna Church (Emeritus), Gary D. Cook, Larry J. Day, Gordon Epperson (Emeritus), Billie R. Erlings, Thomas Ervin, Richard Faith (Emeritus), John R. Ferrell, Gregg I. Hanson, O. M. Hartsell (Emeritus), Jeffrey Haskell, Steven Hedden, Robert Hull (Emeritus), Henry Royer (Emeritus), Roy A. Johnson, Jean-Louis Kashy, Jack Lee (Emeritus), Robert McBride (Emeritus), Theodore M. McMillan (Emerita), Elizabeth Mosher, Robert Muczynski (Emeritus), Edward W. Murphy, James P. O'Brien, Marguerite Ough (Emerita), Leonard A. Pearlman, Richard E. Peters (Emeritus), Jocelyn Reiter, Charles Roe, Anita Sammarco (Emerita), Anna Mae Sharp (Emerita), Maureen Skones (Emeritus), R. Warren Sutherland, Andor Toth, Nicholas L. Zumbo


Assistant Professors John T. Brobeck, Enrique Feldman, Patrick Neher, Gary B. Wilson

The School of Music, a division of the Faculty of Fine Arts, offers course work leading to the following degrees: Bachelor of Music with majors in jazz studies, music education, performance, and composition; Bachelor of Arts in Music; Master of Music; Doctor of Musical Arts; and Doctor of Philosophy. The School of Music participates with the Committee on Dance in providing course work for the drama-musical theatre major and the Department of Drama for the Bachelor of Fine Arts degree. The school is a member of the National Association of Schools of Music, and the requirements for entrance and graduation as set forth in this catalog are in accordance with the published standards of that association.

Entrance Requirements: Entrance examinations in musicianship and the major performance area are required. All freshmen and transfer music majors (except piano and organ performance majors) must audition for placement in class or group piano instruction. These courses should be taken concurrently with MUS 120a-120b and 220a-220b. Students desiring the B.A. in Music or the B.M. with a major other than performance must meet the requirements for registration in MUS 181 in their major performance area. B.M. students majoring in performance must meet the requirements for registration in MUS 185 in their major performance area. Admission to the B.M. 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 MUS 185 level requires a minimum of five years of private study or ensemble/ solo experience resulting in sufficient advancement that the student shows promise of being at a professional level after completion of four years of undergraduate study. Detailed information regarding entrance and degree requirements is available from the Director of the School of Music.

Residency Requirements: Majors must complete a minimum number of units of University credit, 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 TTE 493b; and composition—23 units in the major.

Ensemble Participation: All students enrolled in performance studies are required to participate in a conducted ensemble (MUS 200, 400, 500) unless excused by the Director of the School of Music. Accompanying or coached ensembles may fulfill this requirement for keyboard majors per the degree requirements.

Special Regulations: Credit for private or group instruction is granted only to students who are eligible to register for regular University credit. Students registered for performance studies may be assigned to private or group instruction and required to attend master classes and recitals as arranged by the instructor. Students may, at the discretion of their major adviser or performance instructor, be required to register for MUS 201 and to appear in and attend performances as arranged by their instructor. Lessons missed by the student will not be rescheduled unless the instructor has been notified by the student 24 hours before the regular time of the lesson. Lessons missed by the instructor will be

76. Topics in Neural Plasticity (2) II 1993-94
Reading and discussion of primary literature on cellular, biochemical, physiological, and structural changes that occur on the adult nervous system. Prerequisite: a course in neurobiology, consult department before enrolling. (Identical with ANAT 583 and NRSC 583)

584. Cellular Neurobiology (2) II 1993-94
(Identical with ANAT 584)

586. Intracellular Messengers (2) I 1993-94
(Identical with NRSC 586)

587. Biology of Neurological Disease (3) II 1993-94
(Identical with NRSC 587)

588. Principles of Cellular and Molecular Neurobiology (4) I (Identical with NRSC 588)

589. Cancer Genetics and Cytogenetics (3) I 1993-94
(Identical with CBIO 589)

590. Colloquium
a. Topics in Molecular Biology (1) I [Rpt. 6] I II Open to majors only.
b. Special Topics in Cell Biology (2) I [Rpt. 3] I II (Identical with CBIO 599d, which is home)

c. Concepts in Cellular Differentiation (2) I (Identical with ANAT 596c)

596. Seminar
c. Topics in Cellular Differentiation (2) I (Identical with ANAT 596c)

597. Workshop
a. Recombinant DNA Techniques (2) I (Identical with CBIO 597a, which is home)

601. Molecular and Cellular Biology (4) I Acquire a basic understanding of modern genetics, molecular biology, and cell biology, and learn how to apply that understanding to human disease. Open to students in the Masters degree program in Genetic Counseling only. (Identical with GENE 601)

612. Biological Electron Microscopy (4) I Provides theoretical background and practical experience in transmission and scanning electron microscopy that are necessary for the efficient and effective application of ultrastructural and cytochemical techniques as research tools. 2R, 6L. P, one college level course in each of physics, chemistry and biology (Identical with ANAT 612, AN S 612, BI0C 612, ENTO 612, MIC 612, PATH 612, PSIO 612, PL P 612, V SC 612)

621. Molecular, Plant, Microbe Interactions (3) II 1994-95 (Identical with PL P 621)

695. Colloquium
a. Current Topics in Plant Biology (1) I [Rpt. 3] I II (Identical with PL P 695a, which is home)
b. Science, Society and Ethics (1) I (Identical with GENE 695e and NRSC 695e)

696. Seminar
a. Developmental Biology (1) I [Rpt. 6] I II To be taken only when 596a repeated course limit has been met.

761. Laboratory Rotation I (2) I Research project with graduate faculty for 8 weeks, 15 hours per week. Open to majors only.

762. Laboratory Rotation II (2) I Research project with graduate faculty for 8 weeks, 15 hours per week. Open to majors only.
rescheduled within the semester. Lessons falling on a legal holiday will not be rescheduled.

Degree Programs: The curricula for all music programs include a common core of studies which is intended to coordinate all aspects of musical training in a program of comprehensive musicianship.

The music minor for B.A., B.F.A., or B.S. degree: A minimum of 20 units, or more as specified by the major area. A music minor advisor in the School of Music should be contacted for further information or assistance with course selection.

The teaching minor for secondary education: 25 units, including MUSI 110a-110b, 120a-120b, 130a-130b, 338m, 370, 371 or 372, 2 units of conducted ensemble, 4 units of MUSI 181 or above.

BACHELOR OF MUSIC

Basic Requirements: All candidates for the B.M. must complete the following basic requirements: (1) general education requirements, as outlined under the Bachelor of Music degree in the Faculty of Fine Arts section of this catalog; (2) MUSI 110a-110b, 120a-120b, 130a-130b, 210a-210b (except for voice and instrumental performance majors), MUSI 220a-220b, 320, 330a-330b, 350a-350b, 351a or 351b, one unit of 352, 370, 371 or 372, 2 units of conducted ensemble, 4 units of MUSI 181 or above.

The MAJOR IN PERFORMANCE in voice, instrumental music, and a senior recital (MUS 425). Minimum entrance level: MUSI 185. Graduation requirement: seven units of MUSI 485 and a senior recital (MUS 425) of one unit; ensemble: one semester of conducted, seven semesters of general music, MUSI 370, 410a-410b, 420a-420b, 424. Minimum total units: 128.

The major: In addition to the general education requirements as outlined under the Bachelor of Music in the Faculty of Fine Arts section of this catalog, the following course work is required: 110a-110b, 120a-120b, 130a-130b, 210a-210b, 220a-220b, 320, 330a-330b, 370, 371, 421, 423, 490, 495b; EDUC 350; ED P 310; LRC 435, 493b; TTE 300, 338m, 435, 493b. Minimum total units: 132.

The MAJOR IN MUSIC EDUCATION (Instrumental): Major instrument: seven semesters of 2 units per semester (minimum entrance level: MUSI 181. Graduation requirement: 2 units of MUSI 285 and a half recital); ensemble: seven semesters of conducted, two semesters of choir, one unit of 285 and a half recital); keyboard: MUS 310a-310b, MUSI 181P; ensemble: seven semesters of conducted; MUS 153, 211a-211b, 250, 350a or 350b, 351a or 351b, one unit of 352, 370, 372, 450, 451; EDUC 350; ED P 310; LRC 435, 493b; TTE 300, 338m, 435, 493b. Minimum total units: 132.

BACHELOR OF ARTS IN MUSIC

This degree program is designed for students interested in music history who may wish to pursue a graduate degree in musicology or for those whose interest in music is essentially avocational.

The major: In addition to the general education requirements, as described under the Bachelor of Arts in the College of Arts and Sciences section of this catalog, the following course work is required: 110a-110b, 120a-120b, 130a-130b, 210a-210b, 220a-220b, 320, 330a-330b, 370, 371, 421, 425, 440 (6 units), 441, 442; additional general academic electives. Minimum total units: 132.

*In all music degrees the term "semester" in the ensemble requirement indicates that the student is required to register for the number of successive semesters of ensemble listed.
100. Basic Musicianship (3) I II CDT Introduction to the rudiments of musical notation, harmony, rhythm, and melody.

101a-101b. Exploring Music through Piano for General Students (3-1) 101a: Introduces and develops basic concepts of music as a creative process in studying piano. Includes music fundamentals, beginning improvisation, playing by ear, chordings to melodies, music reading, and repertoire. 101b: [Rpt./2] Studying piano pieces and music basics. P, 101a or by audition, interview.

102a-102b. Class Guitar for General College Students (1-1) 102a: Introduction to basic guitar playing techniques for the general college student, with emphasis on literature and styles of playing of current interest to students. 102b: Development of guitar skills including sightreading, accompanying, tone production and other classical techniques. 102a and 102b are offered both semesters.

103. Voice Class for General College Students (2) [Rpt.] Practical training in singing, with emphasis on basic skills of breathing, tone and diction; repertoire to include folk, current, and classic songs in English.

105. Operatic Stage Training (1) I [Rpt./2] An introduction to the fundamentals of movement, acting and stage terminology as related to the performance of opera and operetta. Emphasis on practical experience, including in-class study of selected operatic scenes.

107. Survey of Music I (3) I II Introductory course which concentrates on developing perceptual skills through a study of many types of music, with emphasis 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 II Continuation of 107, with emphasis on Western art music, particularly that of the Medieval through the Baroque era, and the music of other cultures. 107 is not prerequisite to 108.

110a-110b. Piano Class I (1-1) Introductory development of basic keyboard musicianship and technique through activities including playing by ear, improvising, harmonizing, transposing. Open to music 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. P, CR, 120a-120b.


130a-130b. Introduction to Music Literature (2-2) CDT Survey of music literature, with emphasis on structure, period, and style. Open to music majors and minors only. P, CR, 120a-120b.

153. Percussion Instruments Class (1) I II Class instruction in all percussion instruments, including materials and procedures for teaching these instruments in the schools.

175. Theatre Dance (1) I II S (Identical with DNC 175)

210a-210b. Piano Class II (1-1) Continuation of 110b, with additional sight-reading, score-reading, and accompanying. Open to MUS majors and minors only. P, 110b.

211a-211b. Diction for Singers (2-2) Training in diction for singers in English, French, German, Italian, Spanish and ecclesiastical Latin.

220a-220b. Musical Skills and Structure II (3-3) CDT Continuation of 120a-120b, dealing with music from the late medieval period through early 20th-century art music in chronological order. 2R, 3L. P. 120b.

250. Introduction to Music Education (3) I Observation of and practical field experience in public schools; video-taped class presentations. Field trips. Open to music majors only.

302. Recording Studio Production (3) I II Recording studio procedures including the recording chain and pre-post and actual recording techniques; P, with permission of the School of Music. (Identical with M AR 302)

310a-310b. Functional Piano for Music Education Majors (1-1) 310a: Development of functional piano skills needed for public-school music teaching, with emphasis on improvising, harmonizing, transposing, and accompanying. 310b: Continuation of 310a with materials of increasing difficulty; open-score part-reading and rehearsal techniques. P, 210b.

320. Form and Structure in 20th-Century Music (3) I Intensive analysis of posttonal music, beginning with serial works of Schoenberg through very recent compositions by major composers. Open to music majors and minors only. P, 220b.

321a-321b. Jazz Improvisation (2-2) CDT 321a: Background for the art of improvising jazz. Audition required. P, 210e. 321b: Continuation of 321a with refinement of the techniques studied in 321a.


362. Creative Arts Methods (3-3) I II S Prepares elementary education majors to teach music and art in the self-contained classroom. Emphasis includes the planning of music and art lessons, and the presentation and evaluation of art projects. 3R, 1L. P, 360 and ARE 306.

370. Introduction to Conducting (2) I Conducting choral as well as instrumental ensembles; includes basic beat patterns, transpositions and clefs, and introduction to score study. P, CR, 220a.

371. Intermediate Instrumental Conducting (2) I II Conducting techniques for instrumental ensembles of varying sizes; instrumental rehearsal techniques, score reading, and score study. P, 370.

372. Intermediate Choral Conducting (2) I Conducting techniques for choral ensembles; training the chorus, choral musicianship, continuing work in score reading, basic choral literature and program planning. P, 370.

396H. Honors Proseminar (3) II 410a-410b. Pedagogy (2-2) Study of methods and repertory suitable for studio teaching. Open to music majors in their major performance area only. May be combined with 510a-510b.

420a-420b. Counterpoint (3-3) Practical study of the counterpoint of the 16th (in 420a) and 18th (in 420b) centuries. P, 220b. May be combined with 520a-520b.

421. Orchestration (3) I CDT Instruments of the orchestra together with practical study of the art of symphonic scoring; original work and transcriptions. P, 220b.

422. Jazz Arranging (2) I II 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 consult department prior to enrolling. P, 200r, 201j, 220b.
424. History and Literature of Guitar (3) II 1994-95 In-depth study of the evolution of the guitar, lute, and vihuela, including repertoire, style periods, and composers. Open to majors only. May be convened with 524.


426a-426b. Piano Literature (3-3) 1994-95 Historical and stylistic study of keyboard literature, instruments and performance practices. 426a: Baroque through the early Romantic periods. 426b: Mid-Romantic through the Contemporary periods. P, MUSI 285-P. 426a is not prerequisite to 426b. May be convened with 526a-526b.


434. Music in World Cultures (3) II S CD T Overview of nonwestern musics in selected world cultures.


441. Electro-Acoustic Music (3) I Comprehensive study of electronic music. Introduction to the electronic music studio, tape composition, acoustics, music synthesis and sound processing, with actual lab applications. May be convened with 541.

442. Electro-Acoustic Studio Resources (3) II Advanced techniques: synthesis, processing, synthesizer programming, sampling, MIDI, computer-assisted techniques, sequencing and notation. May be convened with 542.

450. Teaching Music in the Elementary School (3) 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. Teaching experience in addition to lecture.

451. Methods and Techniques for Secondary Vocal Music Education (3) I Objectives, techniques and materials for teaching the adolescent as a singer/performer/musician in choirs, ensembles and other staged singing groups in the secondary schools. Laboratory experience in addition to lecture.

455. Music and German Literature (3) I 1994-95 (Identical with GER 455) May be convened with 555.

497. Workshop (1) Level I Off Schulwerk (2) S. May be convened with 497a.

510a-510b. Pedagogy (2-2) For a description of course topics, see 410a-410b. Graduate-level requirements include a major research project in pedagogy. May be convened with 410a-410b.

518. Band Arranging (2) II 1994-95 CDT Detailed study of band instrumentation; major works transcribed for concert band. P. 421.

520a-520b. Counterpoint (3-3) For a description of course topics, see 420a-420b.

Graduate-level requirements include an additional project. May be convened with 420a-420b.

521. Introduction to Graduate Music Theory (3) II Introduction to graduate analysis with emphasis on the survey of analytical systems as applied to a number of stylistic periods. Both cognitive and aural procedures will be investigated. This course may not be used to fulfill doctoral requirements in music. Open to majors only.

522a-522b. Art Song Repertoire (2-2) 1994-95 Class performance of representative selections from the repertoire of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.

523a-523b. History of the Opera (3-3) 1993-94 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.

524. History and Literature of Guitar (3) II 1994-95 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.

526a-526b. Piano Literature (3-3) 1994-95 For a description of course topics, see 426a-426b. Graduate-level requirements include a major research paper and a special class presentation. P, MUSI 285-P. 526a is not prerequisite to 526b. May be convened with 426a-426b.

530. Music in the Renaissance (3) II Vocal and instrumental genres from Du Fay through Palestrina. Open to majors only.

531. Music in the Baroque (3) I 1993-94 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 1994-95 The Viennese classical tradition from its origins to Beethoven. Open to majors only.

533. Music of the Twentieth Century (3) I Contemporary idioms in music; study of genres, styles, and techniques from post-Romanticism to the present. Open to majors only.


537. Survey of Early Music (3) II S Intensive survey of music history from Gregorian chant to the late Baroque. This course may not be used to fulfill doctoral requirements in music. Open to majors only.

541. Electro-Acoustic Music (3) I For a description of course topics, see 441. Graduate-level requirements include a major research paper and special class presentation. May be convened with 441.

542. Electro-Acoustic Studio Resources (3) II For a description of course topics, see 442. Graduate-level requirements include a major research paper and special class presentation. May be convened with 442.

550. Advanced Studies in Music Teaching (3) II S Contemporary practices in planning, organizing and evaluating learning experiences in music for K-12 students.

551. Behavioral Research in the Arts (3) I S 1993-94 Research methodologies as they apply to artistic behavior; emphasis on applying the results of existing studies to practice and on conducting original research.

553. Music and German Literature (3) I 1994-95 (Identical with GER 555) May be convened with 455.

560. Aesthetics of Music (3) I Exploration of the problems of musical meanings, including a panoramic examination of what philosophers, anthropologists, and others of critical intelligence have contributed to comprehensive theory.

570. Advanced Conducting (3) [Rpt.] II Styles of choral, band, and orchestral literature, as they pertain to the problems of the conductor; references to the styles of all periods, with emphasis on the contemporary and modern.

597. Workshop (1) Level I Off Schulwerk (2) S. May be convened with 497a.

600. Introduction to Graduate Study in Music (3) I Bibliographical materials; research resources, techniques, and problems directed toward grad. study in music. Required of all doctoral candidates in music. (Identical with LI S 600)


621a-621b. Analysis of Music of the 18th and 19th Centuries (3-3) 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 1994-95 Study of the philosophies, procedures, techniques, and materials used in teaching theory at the college level.


630. The Music of Bach (3) II 1994-95

631. The Music of Mozart (3) S 1993-94

635. Choral Literature and Techniques (3) [Rpt.] I II A research-oriented study of choral literature from all stylistic periods and genres from the Renaissance to the present, together with appropriate conducting techniques. May be convened with 32R, 3L. Open to majors only. P, graduate standing in choral conducting or choral music education. No more than 12 units of this course may be applied to a graduate degree program.
650. Foundations and Principles of Music Education (3) I S 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 S 1994-95 Principles and techniques of curriculum construction applied to the field of music.

652. Management Techniques in Music (3) II 1994-95 The management of music at all levels of education, industry, and performance.

654. Psychology of Music (3) II S 1994-95 Music perception, physiological and psychological responses to music, basic acoustics, music pedagogy, and evaluation/measurement of music behaviors.

672. Teaching Music in Higher Education (3) II 1993-94 Contemporary practices in planning, organizing, and evaluating learning experiences in music for college and university students. Open to music majors only.

696. Seminar 1. Music Education (1-6) [Rpt. 9 units] I II 2. Musicology (1-6) [Rpt. 9 units] I II 3. Music Theory (1-6) [Rpt. 9 units] I II 4. Composition (2) [Rpt. 8 units] I II Open to majors only.

Ensembles

All courses listed below are offered both first and second semesters and may be repeated. Prerequisite for entrance to all ensembles is by audition or by permission of the School of Music.

Large Conducted Ensembles (200, 400, 500) (1)


Coached Ensembles (201, 401, 501) (1) Offering chamber music experience; designed to develop musical independence.

Small Conducted Ensembles (202, 402, 502) (1)


Opera Theatre (205, 405, 605) (1-4) Training in all aspects of operatic production, including major singing roles, minor roles, opera chorus, opera scenes and chamber operas; technical training in set construction, makeup, costumes and lighting. 605 may also include operatic staging techniques. P for 405, 2 units of 205; P for 605, 4 units of 405 or permission of the School of Music.

Composition Studies: Individual and Group Instruction

420. Introduction to Composition (3) I II [Rpt. 1] Introduction to the basics of music composition, stressing fundamental forms and procedures. P, 120b or permission of the School of Music.

340. Composition (3) I II [Rpt. 1] Pursuit of the more sophisticated aspects of music composition in regard to form; handling of original ideas and searching for a broader and more practical view of music composition as a profession. P, 6 units of 240 or permission of the School of Music.

440. Compositional Techniques (3) I II [Rpt. 15 units] Creative techniques in the fields of modern harmony, counterpoint, orchestration, electronic music, or specific projects in commercial-type composition and arranging. P, 6 units of 340 or permission of the School of Music.

640. Advanced Composition (2-6) I II [Rpt.] Individual projects in composition. Open to theory and composition majors only.

Performance Studies: Individual and Group Instruction* (MUSI)

All of the courses listed below are offered both first and second semester. Please see "ENTRANCE REQUIREMENTS" at the beginning of this section for information regarding prerequisites for MUSI 181 and 185.

*See schedule of fees below.

Piano


Piano Accompanying

685-W (1-4)

Voice


Vocal Coaching

685-J (1)

Organ


Conducting

585-Q (1-4), 685-Q, 785-Q (1-4)

String Instruments

String Bass


Violin


Cello


Harp


Guitar


Viola


Harpischord


Wind Instruments

Baritone


Bassoon


Clarinet


Flute


Horn

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 Fee Statement has been secured. Rental instruments, practice rooms and lockers are issued upon presentation of this statement.

- Group lesson or one-half hour private lesson: $40.
- 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 enrolled in group, private instruction or keyboard class. $5 for one hour practice per day. $10 for two hours practice per day. $15 for three hours practice per day.
- Organs, Harpsichords, and Synthesizer: $10 for one hour practice per day. $15 for two hours practice per day. $20 for three hours practice per day.

Near Eastern Studies (NES/ARB/PRS)
Franklin Building, Room 403 (602) 621-9113
Professors William G. Dever, Head; Ludwig A. Adamec, Michael E. Bonine, Adel S. Gamal, J. Michael Mahafz, Hamdi A. Qafisheh Associate Professors Esther Fuchs (Judacu Studies), William J. Wilson Assistant Professors Simin Karimi, Senzil Nawid Lecturer Shoshona Green

The Department of Near Eastern Studies provides undergraduate and graduate programs of study in the history, cultures, languages, and geography of the geopolitical region of the world currently referred to as the Middle East or the Near East in antiquity.

The department offers a major in Near Eastern studies for the Bachelor of Arts, Master of Arts, and Doctor of Philosophy degrees. For graduate admission and degree requirements, consult the Graduate Catalog.

The major for the Bachelor of Arts degree requires a minimum of 35 units plus two years or the equivalent of Arabic, Persian, Hebrew, Akkadian or other appropriate language. All courses are chosen in consultation with and approved by a departmental advisor.

Arabic (ARB)
403. Advanced Arabic I (3) Continuation of 402, with emphasis on oral and written comprehension and expression. P. 102. May be convened with 503.
404. Advanced Arabic II (3) Continuation of 403, with emphasis on oral and written comprehension and expression. P. 403. May be convened with 504.
424a-424b. Conversational Levantine Arabic (3-3) 1994-95 Extensive oral drill, with emphasis on the acquisition of facility in normal conversation and comprehension. P. 101. May be convened with 524a-524b.
425a-425b. Conversational Gulf Arabic (3-3) Extensive oral drill, with emphasis on the acquisition of facility in normal conversation and comprehension. P. 101. May be convened with 525a-525b.
426. Introduction to Arabic Linguistics (3) II History and structure of the Arabic language in its various forms. P. 102. LING 101. (Identical with LING 426) May be convened with 526.
439a-439b. Egyptian Arabic (3-3) Introduction to the Cairene dialect. Phonology, common greetings, basic vocabulary and grammar. P. one year of Standard Arabic. May be convened with 539a-539b.
448. Arabic Literature in English (3) Historical survey of Arabic literature of the Middle East and Mediterranean world, with readings in English translations. May be convened with 548.
495. Colloquium
n Modern Arabic Prose (3) Rpt. P, two years of Arabic. May be convened with 595n.
0 Classical Arabic Prose (3) Rpt. P, two years of Arabic. May be convened with 595o.
z Readings in Classical Arabic Poetry (3) S P, three years of Arabic for non-native speakers of Arabic. May be convened with 595z.
503. Advanced Arabic I (3) For a description of course topics, see 403. Graduate-level requirements include more assignments in Vol. III of the text and additional outside readings. P. 402. May be convened with 403.
504. Advanced Arabic II (3) For a description of course topics, see 404. Graduate-level requirements include more assignments in Vol. III of the text and additional outside readings. P. 403 or 503. May be convened with 404.
524a-524b. Conversational Levantine Arabic (3-3) 1994-95 For a description of course topics, see 424a-424b. Graduate-level requirements include the ability to speak with sufficient structural vocabulary to participate in most formal and informal conversations, requiring a mastery of at least 120 additional vocabulary items. P. 101. May be convened with 424a-424b.
525a-525b. Conversational Gulf Arabic (3-3) For a description of course topics, see 425a-425b. Graduate-level requirements 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. 101. May be convened with 425a-425b.
526. Introduction to Arabic Linguistics (3) II For a description of course topics, see 426. Graduate-level requirements include a research paper on any phonological, mor-
phological, or syntactic structure of any variety of Arabic, P. 102, LING 301. (Identical with LING 526) May be convened with 426.

539a-539b. Egyptian Arabic (3-3) For a description of course topics, see 439a-439b. Graduate-level requirements include a picture description, summary of taped dialogues, and short reports on Egyptian movies. May be convened with 439a-439b.

548. Arabic Literature in English (3) For a description of course topics, see 448. Graduate-level requirements include two papers on two of the major literary periods covered by this course. May be convened with 448.

595. Colloquium
n. Modern Arabic Prose (3) Rpt./P. two years of Arabic. May be convened with 495n.
 o. Classical Arabic Prose (3) Rpt. P. two years of Arabic. May be convened with 495o.
 z. Readings in Classical Arabic Poetry (3) P. three years of Arabic for non-native speakers of Arabic. May be convened with 495z.

**Persian (PRS)**


401. Intermediate Persian I (4) CDT Conversation in the dialect of contemporary Iran; extensive readings in classical and modern literature. P. 102.

402. Intermediate Persian II (4) CDT Conversation in the dialect of contemporary Iran; extensive readings in classical and modern literature. P. 101.

404. Advanced Persian I (4) CDT Readings in Persian, with the objective of preparing the student for independent research. P. 402. May be convened with 504.

405. Advanced Persian II (4) CDT Readings in Persian, with the objective of preparing the student for independent research. P. 404. May be convened with 503.

449. Classical Persian Literature in English (3) II Historical, cultural and literary issues related to the readings will be discussed. May be convened with 549.

450. Contemporary Persian Literature in English (3) II For a description of course topics, see 449. Graduate-level requirements include a term paper and additional book reviews. May be convened with 449.

540. Contemporary Persian Literature in English (3) II For a description of course topics, see 450. Graduate-level requirements include a term paper and additional book reviews. May be convened with 450.

**Near Eastern Studies (NES)**

103a-103b. Elementary Modern Hebrew (5-5) CDT (Identical with JU S 103a-103b)

140. Middle Eastern Humanities (3) Major trends and traditions in the arts, literatures and languages, religions and philosophies of the Middle East. (Identical with RELI 140)

170. Indian Civilizations (3) Survey of traditional and contemporary social, political and thought patterns of India. (Identical with HIST 170)

171. Ancient Civilizations of the Near East (3) Survey of pre-Islamic cultures of Persia, Mesopotamia, Syria-Palestine, Anatolia and Egypt, with emphasis on unifying themes and institutions. (Identical with ANTH 171 and HIST 171)

172. Islamic Civilization: Traditional and Modern Middle East (3) II Survey of the traditional and contemporary social, political, and economic institutions of Islamic civilizations in the Middle East. (Identical with ANTH 172 and HIST 172)

372a-372b. History and Religion of Israel in Ancient Times (3-3) (Identical with JU S 372a-372b)

375. Ethnography of the Middle East (3) II (Identical with ANTH 375)

377. Modern Israel (3) (Identical with JU S 377)

381a-381b. History of Muslim Societies (3-3) (Identical with HIST 381a-381b)

382. Archaeology and the Bible (3) II (Identical with JU S 382)

396H. Honors Proseminar

401. Ancient Mesopotamia (3) I I (Identical with ANTH 401) May be convened with 501.

403a-403b. Intermediate Modern Hebrew (5-5) CDT (Identical with JU S 403a-403b)


434. Islamic Thought (3) II Traditional ideological systems of Islamic countries and their evolutionary transformations. (Identical with RELI 434) May be convened with 534.


441. Arab-Israeli Conflict (3) I I 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 POL 442) May be convened with 542.

457. Prehistoric Mesopotamia (3) I (Identical with ANTH 457) May be convened with 557.

467. Population and Development in the Middle East (3) I Review of theories and research in population, resources and socio-economic development, with emphasis on determinants and consequence of population growth and migration in contemporary Middle East. (Identical with POL 467) May be convened with 567.

468a-468b. Asia and the West (3-3) 1993-94 (Identical with HIST 468a-468b) May be convened with 568a-568b.

469. Geography of the Middle East (3) I (Identical with GEOG 469)

470. Religious History of India (3) I (Identical with HIST 470) May be convened with 570.

472. History of Medieval India (3) I 1993-94 (Identical with HIST 472) May be convened with 572.

473. History of Modern India and Pakistan: 1750-Present (3) II 1993-94 (Identical with HIST 473) May be convened with 573.

477a-477b. History of the Middle East (3-3) History of civilization in the Middle East from the rise of Islam to the 18th century. 477a: Period of Arab dominance. 477b: Period of Turkish dominance. 477a is not prerequisite to 477b. (Identical with HIST 477a-477b) May be convened with 577a-577b. 477a is a Writing-Emphasis Course* for Middle East specialization.

478. Modern History of the Middle East (3) I Near and Middle Eastern history since the late 18th century, with special emphasis on Egypt and areas to the east. (Identical with HIST 478) May be convened with 578. Writing-Emphasis Course* for Middle East specialization.

*Writing-Emphasis Courses. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

481a-481b. Archaeology of Syria-Palestine in the Bronze and Iron Ages (3-3) Survey of the Bronze and Iron Age cultures of Syria-Palestine, ca. 3500-500 B.C., with emphasis on the use of archaeological materials in historical reconstruction. May be convened with 581a-581b.

484a-484b. Akkadian Linguistics (3-3) (Identical with ANTH 484a-484b) May be convened with 584a-584b.

485. Social Organization of India and Pakistan (3) I Survey of family, kin, and caste in the peasant societies of India and Pakistan. (Identical with ANTH 485) May be convened with 585.

486. Political Systems of India and Pakistan (3) II Survey of post-independence political developments in Pakistan and India. (Identical with POL 486) May be convened with 586.

490. Women in Middle Eastern Society (3) I (Identical with ANTH 490) May be convened with 590.

492. History of Sufism (3) I (Identical with ANTH 492) May be convened with 592.
578. 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 578) May be convened with 478.

581a-581b. Archaeology of Syria-Palestine in the Bronze and Iron Ages (3-3) For a description of course topics, see 481a-481b. Graduate-level requirements include a full-length research paper. P, consult department before enrolling. May be convened with 481a-481b.

584a-584b. Akkadian Linguistics (3-3) (Identical with ANTH 584a-584b) May be convened with 484a-484b.

585. Social Organization of India and Pakistan (3) I For a description of course topics, 485. Graduate-level requirements include a research paper based on original source material. (Identical with ANTH 585) May be convened with 485.

586. Political Systems of India and Pakistan (3) II For a description of course topics, see 486. Graduate-level requirements include a research paper based on original source material. (Identical with POL 586) May be convened with 486.

590. Women in Middle Eastern Society (3) I (Identical with ANTH 590) May be convened with 490.

592. History of Sufism (3) II (Identical with HIST 592) May be convened with 492.

595. Colloquium

596. Seminar
b. Special Topics in Near Eastern Studies (3) [Rpt.4] May be convened with 596b. (Identical with POL 596) May be convened with 596b.

597a-577b. History of the Middle East (3-3)
For a description of course topics, see 477a-477b. Graduate-level requirements include a research paper or book report on a subject or book approved by the instructor. 577a is not prerequisite to 577b. (Identical with HIST 577a-577b) May be convened with 477a-477b.
The interdepartmental program in Neuroscience offers a graduate program leading to the Doctor of Philosophy degree with a major in neuroscience, as well as a graduate minor in neuroscience. A Master of Science degree is offered only in rare instances when students who have already passed the M.S. evaluation requirement are unable to continue in the doctoral program. The program 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 Program 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 program fosters research and communication in interdisciplinary neurosciences 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.

195H. Honors Colloquium (1) I Introduction to the multidisciplinary field of neuroscience and to scientific ways of knowing and the methods and standards for discovering new knowledge. Limited to honors freshmen.

403. Laboratory in Mammalian Systems Neurophysiology (1) I (Identical with PSYC 403) May be convened with 503.

443. Insect Neurobiology (3) II (Identical with ENTO 443) May be convened with 543.

461. Introduction to Neurobiology (4) I (Identical with MCB 461)

466. Principles of Mammalian Systems Neurophysiology (2) I (Identical with PSYC 466) May be convened with 566.

495. Colloquium
a. *Antennal Lobe (1) [Rpt./6 units] II S
b. *Developmental Neurobiology (1) [Rpt./6 units] II S
c. Neurophysiology (1) [Rpt./6 units] II S
d. *Brain, Behavior and Computation (1) [Rpt./6 units] II S
e. *Neurobiology (1) [Rpt./6 units] II S
*May be convened with 500-level.

503. Laboratory in Mammalian Systems Neurophysiology (3) I II (Identical with PSYC 503) May be convened with 403.

537. Gerontology: A Multidisciplinary Perspective (3) II (Identical with PSYC 537)

543. Insect Neurobiology (3) II (Identical with ENTO 543) May be convened with 443.

565. Neural Encoding, Memory and Computation in the Mammalian Brain (3) I II (Identical with PSYC 565)

566. Principles of Mammalian Systems Neurophysiology (2) I II (Identical with PSYC 566) May be convened with 466.

582. Topics in Neural Development (2) I II 1993-94 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, MCB 582 and PSIO 582)

583. Topics in Neural Plasticity (2) II 1994-95 (Identical with MCB 583)

584. Cellular Neurobiology (2) II 1993-94 (Identical with ANAT 584)

585. Neural Mechanisms of Behavior (2) II 1994-95 Discussion of the neural mechanisms of behavior; the control of movement, and integrative mechanisms and plasticity. Examples from vertebrates and invertebrates. P, consult program office before enrolling. (Identical with MCB 586 and MCB 586)


589. Principles of Systems Neurobiology (4) II Detailed introduction to the organization, physiology, and function of neural systems, emphasizing sensory systems, motor control, integration, and plasticity. P, consult program office before enrolling. (Identical with ANAT 589, MCB 589, MCB 589, and PSIO 589)

595. Colloquium
a. *Antennal Lobe (1) [Rpt./6 units] II S
b. *Developmental Neurobiology (1) [Rpt./6 units] II S
c. Neurophysiology (1) [Rpt./6 units] II S
d. *Brain, Behavior and Computation (1) [Rpt./6 units] II S
e. *Neurobiology (1) [Rpt./6 units] II S
*May be convened with 400-level.

695. Colloquium
e. Science, Society and Ethics (1) II (Identical with MCB 695e, which is home)

699. Colloquium
e. Science, Society and Ethics (1) II (Identical with MCB 695e, which is home)

700. Methods in Neuroscience (3) I II S [Rpt.] Research rotations in the laboratories of faculty members within the neuroscience program. Consult neuroscience program office before enrolling.

701. Communication in Neuroscience (2) II Preparation of an essay, and instruction in scientific writing. Open to majors only. P, consult neuroscience program office before enrolling.

Nuclear and Energy Engineering (NEE)

Engineering Building, Room 200 (602) 621-2551


Associate Professors: Morris Marr, Acting Head, Rocco Fazzolari

The department offers the Bachelor of Science in Nuclear Engineering, Master of Science, and Doctor of Philosophy degrees with a major in nuclear engineering.

For undergraduate degree requirements, please see the College of Engineering and Mines section of this catalog. For graduate degree requirements, please see the Graduate Catalog.

NOTE TO ALL NUCLEAR ENGINEERING STUDENTS: You will receive credit toward the completion of your major program for the following courses: PHYS 450, "Introductory Nuclear Physics"; PHYS 550. "Introductory Nuclear Physics".

109. History of Technology and Society (3) I Significant developments in human history emphasizing the role of technology as an agent for social change; particular attention to the use of energy resources. (Identical with ENGR 109)

200. Radiation Detection and Isotopes Laboratory (3) I Introduction to the principles and practices of radiation measurement, experimental techniques and data reduction methods. 1.5ES, 1.5ED. P, 201.

201. Instrumentation and Measurements Laboratory (2) I Techniques of instrument use for measurements of pressure, temperature, mass flow and radiation intensity. Data analysis, error, analysis, lab notebook, technical reporting. 1L, 1L. P, MATH 125b; CR PHYS 116.

280. Basic Nuclear Processes (3) I Nuclear structure and stability, radioactive decay and interactions of radiation with matter. 2ES, P, CHEM 103b, 104b, MATH 125b.

380. Elements of Nuclear Reactor Theory (4) I Neutron diffusion and slowing down theory, as applied to bare and reflected reactors; the effects of core inhomogeneity on neutron behavior. 2ES, 1ED. P, 280, SIE 270.

381. Introduction to Nuclear Reactor Engineering (3) II The analysis and design of nu-
clear power stations, with emphasis on central station systems. 0.5ES, 2.5ED. P, 380.

382. Introduction to Fusion (3) II Science and technology of fusion. 0.5ES. P, PHYS 330, MATH 254.

402. Senior Energy Laboratory (3) II Basic measurements of energy quality, quantity, flow, and conversion. Includes active and passive solar as well as other alternative energy sources. 2R, 3L. 2ES, P, 445 or CR. (Identical with A ME 402) Writing-Emphasis Course for energy engineering students. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

406. Nuclear Engineering Laboratory (4) II Experimental techniques for determining various parameters in nuclear systems; experiments using the critical and subcritical reactors. 3R, 3L. P, 380. Writing-Emphasis Course for nuclear engineering students. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). May be convened with 506.

414. Energy System Design (3) II Modern engineering design methods to effectively use thermal energy and power. Covers: economic analysis and modeling of thermal equipment; optimization techniques; steady state and dynamic simulation of energy systems. Comprehensive project. 3ED. CR, A ME 432. May be convened with 514.

440. Energy Utilization and Management (3) I Methods for evaluating the technical and economic aspects of energy conversion and usage directed toward the effective utilization of resources, including economics, HVAC systems, electric power, lighting and industrial processes. 2ES, 1ED. May be convened with 540.

441. Air Conditioning Engineering (3) I (Identical with A ME 441)

442. HVAC System Design (3) II Analysis and design of air conditioning systems for commercial and industrial buildings, including equipment and component selection. Energy-efficient concepts, controls and computer analysis will be emphasized. 1ES, 2ED, P, 441. (Identical with A ME 442) May be convened with 542.

445. Solar Energy Engineering (3) I Energy analyses of active and passive solar collectors; solar cells; energy storage; systems for solar heating and cooling; mechanical and electrical power; perspective. 2ES, 1ED. P, A ME 230. (Identical with A ME 445) May be convened with 545.

446. Photovoltaic Systems Engineering (3) I Presents system performance prediction methods, load estimation, power conditions, evaluations, electrical system design, and qualitative semiconductor device physics. (Identical with ECE 446) 2ES, 1ED. May be convened with 546.

447. Direct Energy Conversion (3) II Engineering requirements for achieving direct conversion of energy to electrical power; the engineering of thermoelectric and thermionic convertors, fuel cells, magnetohydrodynamic, and photovoltaic systems. 1ES, 1ED. P, MATH 254, A ME 230; or PHYS 121. (Identical with A ME 447 and ECE 447) May be convened with 547.

456. Engineering System Simulation (3) II Dynamic modeling and simulation of engineering systems, including energy conversion systems, nuclear and chemical reactors, and control systems, using digital continuous-system simulation languages. 1ES, 1ED. P, A ME 230; MATH 254. May be convened with 556.

463. Energy from Biomass (3) II (Identical with ABE 463) May be convened with 563.


482. Contemporary Nuclear Power Systems (3) I Analysis of present nuclear power plants, with emphasis on design decisions as they affect performance of individual systems; advanced design concepts; proposed standard designs; comparison of different contemporary systems. 0.5ES, 2.5ED. P, 381 or 486. May be convened with 582.

483. Dynamics of Nuclear Systems (3) I Nuclear reactor kinetics, integral transform methods, internal feedback effects, stability and control. 2ES, 0.5ED. P, 380. May be convened with 583.

484. Radiation Effects (3) II Radiation effects on solids and radiation chemistry of gases and liquids, with emphasis on effects encountered in nuclear reactor, detector, and dosimetry systems. 1.5ES, 1ED. P, 380, CR, MSE 331R. May be convened with 584.

485. Radiation Health Physics and Safety (3) I Study of health physics practices and safety responsibilities; analysis of radiation environments and applications of basic shielding methods to provide understanding of accepted working practices. 2ES, 1ED. May be convened with 585.

486. Nuclear Energy and Power (3) I Fundamentals of nuclear energy and radiation; engineering applications; the basic concepts of nuclear reactors and power systems. Designed for nonmajors. 2ES, 1ED. May be convened with 586.

487. Introduction to Radioactive Waste Management (3) I Background in the technology of the management of all types of radioactive wastes from the nuclear fuel cycle, institutional and industrial. 1.5ES, 1.5ED. May be convened with 587.

494. Practicum a. Operation of the University of Arizona TRIGA Reactor (2) II P, 380 or 588.

496. Seminar s. Developments in Nuclear Power (1) I II


506. Nuclear Engineering Laboratory (4) I II For a description of course topics, see 406. Graduate-level requirements include an in-depth research paper. 3R, 3L. P, 380 or 588. May be convened with 406.

507. Radiochemistry and Radiation Detection (3) I Radiation detection and measurement, health physics, isotope applications, activation analysis, and instrumentation. 3R, 3L. P, CHEM 480b or PHYS 330. (Identical with CHEM 507)

514. Energy System Design (3) II For a description of course topics, see 414. Graduate-level requirements include an additional project involving more intensive application of optimization techniques. May be convened with 414.

540. Energy Utilization and Management (3) I For a description of course topics, see 440. Graduate-level requirements include an in-depth research paper. May be convened with 440.

541. Industrial Energy and Power Management (3) 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 CH E 541)

542. HVAC System Design (3) II For a description of course topics, see 442. Graduate-level requirements include a comprehensive design project. (Identical with A ME 542) May be convened with 442.

543. Power Plant Engineering (3) II The application of fluid dynamic heat transfer and mechanical interaction principles to the engineering design of a power plant. P, 582, 588.

545. Solar Energy Engineering (3) II For a description of course topics, see 445. Graduate-level requirements include an in-depth research paper. (Identical with A ME 545) May be convened with 445.

546. Photovoltaic Systems Engineering (3) I For a description of course topics, see 446. Graduate-level requirements include an in-depth design and/or systems analysis project. (Identical with ECE 546) May be convened with 446.

547. Direct Energy Conversion (3) II For a description of course topics, see 447. Graduate-level requirements include an in-depth research paper. P, MATH 254, A ME 230; or PHYS 121. (Identical with A ME 547 and ECE 547) May be convened with 447.

556. Engineering System Simulation (3) II For a description of course topics, see 456. Graduate-level requirements include an in-depth research paper. P, A ME 230 or CH E 306a; MATH 254. May be convened with 456.

563. Energy from Biomass (3) II (Identical with ABE 563) May be convened with 463.

581. Nuclear Fuel Cycles (3) I For a description of course topics, see 481. Graduate-level requirements include an in-depth research paper. P, 280, A ME 230. May be convened with 481.

582. Contemporary Nuclear Power Systems (3) I For a description of course topics, see 482. Graduate-level requirements include an in-depth research paper. P, 381 or 486. May be convened with 482.
583. Dynamics of Nuclear Systems (3) I For a description of course topics, see 483. Graduate-level requirements include an in-depth research paper. P, 380 or 588. May be convened with 483.

584. Radiation Effects (3) II For a description of course topics, see 484. Graduate-level requirements include an in-depth research paper. P, 380; CR, MSE 331R. May be convened with 484.

586. Nuclear Energy and Power (3) I For a description of course topics, see 486. Graduate-level requirements include an in-depth research paper. Designed for nonmajors. May be convened with 486.

587. Introduction to Radioactive Waste Management (3) I For a description of course topics, see 487. Graduate-level requirements include an in-depth research paper. May be convened with 487.


590. Seminar s. Advanced Nuclear Power Activities (1) [Rpt./3] II

645. Advanced Solar Engineering (3) II Research and development studies related to solar applications: engineering design, analysis, and economics. Course includes invited lectures, literature research, and an original paper. P, 545. (Identical with CH E 645)

660. Fuel Cycles for Nuclear Reactors (3) II 1993-94 The design and analysis of fuel cycles for nuclear reactors; the processes and requirements of fuel cycle element design and the limitations of fuel element performance to rector design; economic factors in fuel cycles. P, 588.

661a-681b Analytical Methods of Transport Theory (3-3) 1994-95 Application of the Boltzmann equation to neutron and photon transport problems; exact solutions, the method of singular eigenfunctions, spherical harmonic expansions, the moments method, integral transport theory, invariant embedding, variational techniques, applications to slowing-down problems. P, 689, MATH 422a-422b.

682. Nuclear Safety (3) II Possible incidents involving nuclear materials in critical reactors, chemical processing systems, fuel shipment operations or subcritical arrays, including assessments of the magnitudes and consequences of nuclear incidents; determination of criteria for evaluating nuclear system safety, including plant siting and operational procedures. P, 380.


692. Technology of Radioactive Waste Storage and Disposal (3) II Detailed technology of nuclear waste streams, their processing and waste collection, segregation, reduction methods and storage and disposal alternatives for high-level and low-level waste. P, 487 or 587.

696. Reactor Theory II (3) II Fundamental theory of heterogeneous reactors, integral transport, blackness theory, perturbation theory, and applications; temperature coefficient, changes in reactivity due to fission product accumulation, fuel consumption, and conversion. P, 588.

Nursing (NURS)

Nursing Building, Room 103
(602) 626-6161

Professors Suzanne Van Ort, Interim Dean, Agnes M. Aamodt (Emerita), Eleanor E. Bauwens (Emerita), Pearl P. Coulter (Emerita), JoAnn Gittenberger, Ada Sue Hinz, Margaret A. Kay (Emerita), Alice J. Longman, Beverly A. McErd (Emerita), L. Claire Parsons, Linda R. Phillips, Arlene M. Putt (Emerita), Gladys E. Sorensen (Emerita)

Associate Professors Amy Badger, Carrie Jo Braden, Evelyn M. D'Walt (Emerita), Sandra Ferckitch, Ross Gerber, Mary E. Hazzard (Emerita), Elaine B. Jones, Lillian Lynch (Emerita), Betty J. McCracken (Emerita), Virginia Miller (Emerita), Ida M. Moore, Anne Noyes, Jessica V. Pergrin (Emerita), Lois E. Proser (Emerita), Pamela Reed, Jacqueline J. Sherman, Gayle A. Traver, Joyce Verran, Mary J. Welty (Emerita), Mary O. Wolanin (Emerita), Anne Woodthill

Assistant Professors Mary Alexander, Leanna Crosby, Joan E. Haase, Margaret A. Knight, Donna M. Pardo, Lee Sennott-Miller, Christine M. Sheehy

Senior Lecturer Patricia A. King

Lecturers Janice Allen, Judith L. Ayoub, Jacqueline Barth, Carol Bluth, Martha D. Cobb, Lucy M. Colbert, Gale E. Manke, Marylyn McEwen, Marlys Moekly, Mary C. Vincenz

Adjunct Lecturers Joyce Bowdish, Linda Evans

Clinical Instructors Kate Brennan, Carol Feingold, Diana S. Gomez, Michele M. Siskind, Elizabeth C. Tracy, Ilene Westfall

Adjunct Clinical Instructor Anna Guerra

The degrees offered are the Bachelor of Science in Nursing, Master of Science, and Doctor of Philosophy with a major 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 baccalaureate nursing students are required to provide their own transportation to the clinical areas where they are assigned for patient-care experience. Baccalaureate 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 university 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 needs and social structures. Required of nursing majors. Open to nonmajors; consult with college before enrolling. Writing-Emphasis Course*

263. Nursing Process and Health Assessment (4) I II Application of scientific knowledge for assessment of basic and developmental needs; use of nursing process to promote health, prevent illness and provide continuing care. Open to majors only. 2R, 6L, P, 251, CR, 279.

279. Nurse as Consumer and User of Research (3) I II Development of analytical skills related to use of research findings; introduction to research process. Open to majors only. P, 251, CR, 263. Writing-Emphasis Course*

281. Nursing Issues and Research (2) S Overview of nursing as a profession within the health care delivery system. Introduction to research process, role of nurse as consumer and user of research. Open to accelerated-pathway nursing majors only.

285. Professional Nursing Skills (5) S The first course in clinical nursing focuses on basic skills, nursing process, and health assessment. Theoretical concepts of health wellness, communication, functional health patterns, culture, physical assessment and basic nursing skills will be taught by lecture, demonstration, seminar and clinical practice. Open to accelerated-pathway nursing majors only.


352. 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 in assisting individuals, families and groups in meeting their health care needs. 2R, 6L. P, 253, 279, CR, 350, 372.

378. Nursing Care in Death and Dying (3) I Designed to provide students the opportunity to explore feelings regarding death, to consider needs and perceptions of the patient and the patient's family, and to improve ability to provide nursing care. Open to majors only, or consult college before enrolling. Writing-Emphasis Course

380. Health and Family Assessment (5) I II Health assessment of clients and families. Family structure, family dynamics and developmental tasks across the lifespan. Open to registered nurses students only. P, admission to the College of Nursing.

381. Professional Nursing Role (1) I II Emphasis on socialization into professional nursing role. Open to registered nurses students only. P, admission to the College of Nursing.


396H. Honors Proseminar (3) I

420. Health Assessment of the School Age Child (3) S Health maintenance, health promotion, physical and developmental assessment, screening, management and referral of the school age child. Open to majors only. P, 481, or consult college before enrolling.

421. Nursing Care of the Child with a Handicap or Chronic Illness (5) S Overview of congenital and acquired handicaps or chronic conditions in school age children. Assessment and management in the school setting of these children and their families. Open to majors only. P, 481, or consult college before enrolling. May be convened with 521.

422. School Nursing Practice (3) I Analysis and application of nursing in school systems. Program development and evaluation, health curriculum development, and principles of epidemiology for identification of high risk groups. Open to majors only. P, 481, or consult college before enrolling. May be convened with 522.


475. Nurse as Care Provider with Critically Ill (5) I II Concepts, principles and techniques for providing care to critically ill individuals in diverse settings. Open to majors only. 2R, 9L, P, 383, 384, CR, 472.

480. Principles of Physiology in Health Care (4) S Selected physiologic functions and adaptive changes which occur in health and illness. Cellular physiology, the immune system, neurophysiology, cardiovascular, pulmonary, renal, and endocrine physiology. P, undergraduate physiology. May be convened with 580.

481. Nurse as Care Provider of Communities (5) I II Concepts, principles and techniques of public health science and community health nursing practice with communities. Open to majors only. 2R, 9L, P, 472, 475, CR, 481, 486, 488.

483. Perspectives of Cancer Care for Health Professionals (3) S Current methods of care for individuals with cancer and for their families. CR, 481, 485, CR, 481, 486, 487, 488.


487. Poverty and Health (3) II Study of the relationship between poverty and health. Concepts and theories from anthropology, psychology and sociology will be used to analyze problems associated with poverty. Advanced degree credit available for non-Ph.D. majors only. P, six units of social science. (Identical with ANTH 487 and FCM 487) May be convened with 587. Writing-Emphasis Course

489. Contemporary Professional Issues (2) I II Nursing, health care and societal issues which influence nursing roles and the practice of professional nursing. Open to majors only. P, 472, 475, CR, 481, 485, 486. Writing-Emphasis Course

504. Conceptual Models (3) S Theory and research surrounding conceptual models with emphasis on description of conceptual models.

521. Nursing Care of the Child with a Handicap or Chronic Illness (3) S For a description of course topics, see 421. Graduate-level requirements include a paper and/or a presentation. P, 481, or consult college before enrolling. May be convened with 421.

522. School Nursing Practice (3) I For a description of course topics, see 422. Graduate-level requirements include identifying a select population; conducting a needs assessment; planning, implementing, and evaluating a specific health program. P, 481, or consult college before enrolling. May be convened with 422.

530. Methods in Nursing Research (3) I Critical examination of selected problems and methods in the nursing research process. Consideration is given to both qualitative and quantitative methods.

540. Statistical Packages in Research (3) I Analysis of data for research projects, theses and dissertations using SPSS and SAS. Organization of data for statistical analysis, entering data and creating command files using the editor, writing and debugging programs. Techniques for producing graphical output using SAS/GRAPH. P, one introductory graduate-level course in statistics. (Identical with STAT 548)

580. Principles of Physiology in Health Care (4) S For a description of course topics, see 480. Graduate-level requirements include an in-depth research paper on an aspect of physiology. P, two introductory graduate-level courses in physiology. (Identical with STAT 548) May be convened with 480.

583. Perspectives of Cancer Care for Health Professionals (3) S For a description of course topics, see 483. Graduate-level requirements include an additional paper. P, enrollment in baccalaureate or graduate programs in nursing or pharmacy. (Identical with FHPR 583) May be convened with 483.

587. Poverty and Health (3) II For a description of course 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, six units of social science. (Identical with ANTH 587 and FCM 587) May be convened with 487.

588. Clinical Anthropology (3) I II Application of principles from anthropological theory 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 588 and FCM 588)

589. Health of the Older Adult (3) S Current research of the aging process including physical and mental alterations; emphasis on physiological changes. Consult college before enrolling. (Identical with GER 589)

600. Nursing Theory and Practice (3-3) I II S Maintenance, therapeutic and preventive nursing care of the physically intact patient. Student selects practice in one area of nursing: 600a (I) is selected for (1) child, (2) maternal-newborn, or (3) psychiatric-mental health. 600b (II) is chosen for (1) community health, (2) gerontology, (3) medical-surgical.

601. Pathophysiologic Alterations (3) I Alterations in physiologic mechanisms secondary to alterations in perfusion, oxygenation, hydration, somnolence, temperature, and resistance to infection. P, 580 or 3 hours of graduate-level physiology.

603. Public Health Science (3) I Health promotion and primary prevention in communities and populations, epidemiology and legal/political issues in advanced public health nursing. Nursing and public health theories synthesized. Open to majors only.

604. Developmental Concepts in Nursing (3) I II Examination of concepts of development over the lifespan and their relationship to nursing phenomena. Different models or views of development are explored and applied to nursing theory development, research, and practice. Open to majors only.

605. Issues in Family Relations (3) I II Examination of issues in providing care to families
using theory and research from nursing and related fields. Concepts included will apply to the young, developing, and aging family. Open to majors only.

606. Social, Psychological Problems in Nursing (3) II Focus on concepts of stress and training with emphasis on health-related outcomes. Nursing research on addictions, depression, abuse and violence will be explored. Open to majors only.

607. Cross-Cultural Nursing (3) S Focus on a synthesis of theories from nursing and related fields to explore cultural variations in response to actual or potential problems of health or illness. The methods for caring and treating culturally influenced responses will be examined. Open to majors only.

608. Cognitive Alterations (3) S Client problems related to the processing of sensory information including etiological factors. Research-based nursing interventions for clients with cognitive alterations are examined. Open to majors only.

609. Health Assessment (3) I Focuses on the synthesis of physical and psychosocial data by using current research and theoretical models in geriatric nursing. Emphasizes physiology, physical, cultural and psychosocial assessment. Open to majors only. P, 580.

610. Educational Process (3) I Theoretical and practical application of teaching-learning process in classroom and clinical settings. Principles of teaching, learning, instructional design, testing, and computer-assisted teaching included. 2R, 3L. Open to majors only.

611. Nurse Educator Role (3) I Theoretical and practical application of curriculum development and process. Use of teaching-learning process. Preparation for nurse educator role. Directed practice teaching included. 1R, 6L. Open to majors only. P, 621.

612. Clinical Agency Administration (3) II Practical application of administrative processes to nursing care delivery setting. Focuses on the use of selected skills essential to effective administration. Open to majors only. P, 624.

613. The Administrative Process (3) I Theoretical background for nursing administration in care settings. Emphases are on accountability, budgeting, management skills, constraints and influences as related to nursing administration. Open to majors only.

614. Geriatric Nurse Practitioner Role (3) I Exploration of models of advanced nursing practice role in health care system. Emphasizes factors that influence process of selecting and implementing geriatric nurse practitioner role. Open to majors only. P, 580.

615. Geriatric Nurse Practitioner Role Development (3) II Focus on concepts and skills needed to manage therapeutically the common acute and chronic health problems prevalent in older adults. Emphasizes clinical decision-making in abnormal aging. Open to majors only. P, 625.

616. Mental Health Nursing Clinical Therapeutic Process (3) II Focus on concepts of personality development using psychodynamic and cognitive-behavioral theories oriented to the practice of mental health nursing: employing individual, family and group nursing therapeutic techniques for the amelioration of problem. P, 600a, graduate standing in nursing.

617. Mental Health Nursing Advanced Clinical Practice (3) I Focuses on the application of cognitive and behavioral theory in the mental health clinical setting, emphasizing individual and group modalities. Open to majors only.

618. Research Utilization (3) S Development and use of models and tools for facilitating the use of research in scientific nursing practice within organizational settings. 2R, 3L. P, 530.

619. Evaluation Research (3) I Development and use of models and tools for assessing nursing processes, programs and performances. Approaches to and psychological reactivity of evaluation are explored. Issues and development of market packages with cost considerations are discussed along with program grant preparation.

620. Issues in Rural Health Care (3) I Topics include: community assessment, planning and evaluation; interdisciplinary practice; health care issues for southwestern ethnic minority populations. (Identical with MAP 635, PHEP 635 and PSYC 635)

621. Nursing Metathory (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 required. P, 6 units of clinical specialty or clinical selective, 3 units of advanced human physiology, 3 units of social science at an advanced level.

622. Middle Range Theory (3) II Introduction to ways of knowing, focus on middle range theories in nursing and related sciences. Emphasis on critique, elaboration and theory testing strategies. Open to majors only. P, 705.

623. Professional Role Development (1-1-1) I II Assist student socialization into the role of nurse scientist. Ethics of research, development of grant proposals, dissemination of scholarly work through publication and presentation, balancing roles of scholar, educator and clinician. Open to majors only. P, admission to Ph.D. program.

624. Ethics of Research (3-3-3) S I II Individualized course of study incorporating research and clinical knowledge in a selected area of nursing practice in the laboratory and field setting. P, 530, 600a-600b, 633, 705, 730.

Nursing—Nutrition and Food Science

NFS

Shantz Building, Room 309
(602) 621-1187

Professors Bobby L. Reid, Head, James W. Berry (Emeritus), Patsy M. Brannon, Mary Ann Kight, K.Y. Lei, John A. Marchello, William F. McCaughhey (Emeritus), Donald J. McNamara, Eugene Nelson (Emeritus), Franklin D. Rollins (Emeritus), Mitchell G. Vavich (Emeritus), Charles W. Weber

Associate Professors Douglas L. Park, Ralph L. Price, Edward T. Sheehan, Ann M. Tinsley

Assistant Professor Wanda Howell

The Department of Nutrition and Food Science provides instructional programs in all areas of nutrition and food safety. These programs prepare students for careers in various phases of the food industry, governmental regulatory and consumer agencies, health care delivery systems, and for graduate study or professional schools of medicine, dentistry, nursing, physical therapy or veterinary medicine.

The department offers the degree of Bachelor of Science in Agriculture with a major in nutritional sciences.

The Master of Science is offered with majors in food science, dietetics, or nutritional sciences. For admission and degree requirements, please see the Graduate Catalog.

Curricular Requirements:
Undergraduate majors must complete the general education requirements as described in the College of Agriculture section of this catalog. Courses in four of the five required study areas must be selected from a departmentally approved list. Consult a departmental advisor for details.

The major in nutritional sciences: Students are required to complete the following courses for the major—ENGL
101, 102 or 103H; 104H; 308; COMM 100, 102; MATH 117R/S; MIS 11I or PL S 220; EXSS 201, 202; MISC 205; PHYS 102a, 180a; CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b; ECON 201a; AEC 242, NFS 208, 251, 301, 340, 408, 441, 460; STAT 263. Select upper-division electives to achieve total required by the University. 

Dietetics Specialization: (Approved Plan IV ADA) Course requirements in the nutritional sciences major with the specialization in dietetics are N FS 340, 358, 440, 443, 458; ED P 310; HLTH 381; MAP 330 or 305; ANTH 102; PSYC 101 or SOC 101. Specialization in dietetics leads to application for internship credentials from the American Dietetic Association. The department maintains cooperative arrangements with the University Medical Center and other health care and educational facilities. 

Nutrition Specialization: Course requirements in the nutritional sciences major with the specialization in nutrition are PHYS 102b, 180b; MATH 118, 124 or 125a; CHEM 322, 323; 6 units from Individuals, Societies, and Institutions. Students preparing for graduate studies are urged to conduct a research project under N FS 499. Specialization in nutrition provides an excellent background for graduate study in nutrition, biochemistry, or other health-related fields. It is not intended as a terminal degree.

The department offers students the opportunity to minor in nutritional sciences. The minor requires at least 20 units of credit to include 12 units of upper-division courses. Students would be expected to have prerequisites and/or supporting courses that may be required for the courses in the minor. 

The minor in nutritional sciences: 101, 208, 251, 301; 11 units from the following: 238, 310 or 340, 411, 443, 447, 448, 499 (1-3 units). 

Minors available from various colleges are optional. Consult an advisor. 

The department participates in the honors program.

101. Nutrition, Food, and You (3) I II Current concepts and controversies in nutrition and food safety; practical applications. Designed for nonmajors and for majors with no previous work in nutrition. 

102H. Nutrition, Food, and You (1) I Current concepts and controversies in nutrition and food safety. Interpretation and critical analysis of hypotheses, experimentation and risk/benefit in nutrition and food science. This honors course is taken concurrently with the honors section of 101. Students earn one credit for additional seminar time and projects done with faculty outside of class. 

197. Workshop 

a. Fitness, Nutrition and Food Technology: Issues and Answers (1) S Field trips. Offered only through Horizons Unlimited Summer Program. 

208. Nutrition and Metabolism (3) I II Integration of the various effects of nutrition on metabolism and physiologic activities at the cellular, tissue, organ and system level in the human. To prepare a student with a background in chemistry for advanced study in nutrition. P, MCB 181; P, CR, CHEM 241a. 

220. Microcomputing Applications (3) I II (Identical with ABE 220) 

238. Theories of Biological Aging (2) I II Introduction to aging in man and lower animals; nutritional, immunologic, neurologic and genetic effects on the aging process. P, beginning course in biology. (Identical with GER 230) 


280. Science of Meat and Meat Products (3) I II (Identical with AN S 280) 

301. Nutrition and the Life Cycle (3) I II Role of nutrients in human development. Physiological bases for changes in nutrient requirements throughout the life cycle (pregnancy, lactation, infancy, childhood, adolescence and aging). P, 208 (majors); 101 (nonmajors); MCB 181. 

310. Principles of Human Nutrition in Health and Disease (3) I Application of basic nutritional principles in the selection of normal and therapeutic diets; designed for students in the health sciences. P, CHEM 101b, 102b. 

340. Introduction to Diet Therapy (3) I Food composition, principles of interviewing and counseling, cultural aspects of diets, energy requirements, major diseases requiring diet therapy. P, CHEM 103b, 104b. 

358. Institution Food Management (3) I II (Identical with PHPR 448) May be convened with 547. 

443. Community Nutrition (2) I 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. 

447. Perspectives in Geriatrics Laboratory (1) II (Identical with PHPR 447) May be convened with 547. 

448. Perspectives in Geriatrics (2) I II (Identical with PHPR 448) 

545. Sensory Evaluation of Food (3) I II 1993-94 Fundamentals of taste, odor, color, and rheology perception as related to food; design and methodology of small-panel and consumer testing. 2R, 3L. May be convened with 559. 

560. General Biochemistry (5) I II (Identical with BIOC 460) 

563. Food Analysis (3) I II 1993-94 Laboratory procedures for chemical and physicochemical analysis of food products. 1R, 6L. May be convened with 563. 

568. Food Processing (3) I II 1993-94 Refrigeration, freezing, dehydration, heating, fermentation and pickling, irradiation and addition of chemicals, as they apply to food preservation and processing, retention of nutritive value, flavor, appearance and safety. P, CHEM 241b, MIC 205. 

570. Food Microbiology and Sanitation (3) I II 1994-95 Microbiology in processing and handling of foods; relation of microorganisms, insects, and rodents to design and function of processing and handling equipment. P, MIC 312. (Identical with MIC 470) May be convened with 570. 

571. Food Microbiology and Sanitation Laboratory (2) I II 1994-95 Laboratory procedures for assessment of sanitary quality of foods. P, 470 or CR. (Identical with MIC 471) May be convened with 571. 

Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog). 

520. Advanced Nutritional Science (3) I Advancement in nutrition and food science and in the dietetic field through participation in research, presentations, and professional seminars. P, 408. May be convened with 541. 

541. Therapeutic Nutrition (4) I II For a description of course topics, see 441. Graduate-level requirements include an in-depth research paper on a current topic. P, 408. May be convened with 441.
Nutritional Sciences (N USC)
Shantz Building, Room 309
(602) 621-5630
Graduate Interdisciplinary Program in Nutritional Sciences
Committee:
Professors Bobby L. Reid, Chair (Nutrition and Food Science), David S. Alberts (Internal Medicine), Ronald E. Allen (Animal Sciences), Harris Bernstein (Microbiology and Immunology), Patsy M. Brannon (Nutrition and Food Science), David L. Earnest (Internal Medicine), Cleamond D. Eskelson (Surgery), Charles Gerba (Soil and Water Science), J. Tal Huber (Animal Sciences), Mary Ann Kight (Nutrition and Food Science), Otakar Koldovsky (Pediatrics), K.Y. Lei (Nutrition and Food Science), Timothy Lohman (Exercise and Sport Sciences), William F. McCaughey (Nutrition and Food Science), Donald J. McNamara (Nutrition and Food Science), Thomas Moon (Family and Community Medicine), Anthony F. Philipps (Pediatrics), William A. Stini (Anthropology, C. Brent Theurer (Animal Sciences), Marc E. Tischler (Biochemistry), Ronald R. Watson (Family and Community Medicine), Charles W. Weber (Nutrition and Food Science)
Associate Professors Larry C. Clark (Family and Community Medicine), Linda K. Houkkooper (Nutrition and Food Science), Donald V. Lightner (Veterinary Science), Douglas L. Park (Nutrition and Food Science), Ralph L. Price (Nutrition and Food Science), Cheryl K. Ritenbaugh (Family and Community Medicine), Edward T. Sheehan (Nutrition and Food Science), Spencer Swingle (Animal Sciences), Ann M. Tinsley (Nutrition and Food Science)
Assistant Professors Iris R. Bell (Psychiatry), Maria Luz Fernandez (Nutrition and Food Science), Wanda H. Howell (Nutrition and Food Science)
Research Entomologist Justin O. Schmidt (Carl Hayden Bee Research Center)
Associate Research Scientist Siraj I. Mufi (Pharmacology and Toxicology)
The interdisciplinary Committee on Nutritional Sciences administers a campus-wide, interdisciplinary program. It includes faculty members from the colleges of Agriculture, Arts and Sciences, and Medicine. The committee offers graduate work leading to the Doctor of Philosophy degree with a major in nutritional sciences. Options in nutritional biochemistry, food safety, 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 safety, animal nutrition, nutritional biochemistry and human nutrition.

696. Seminar
a. Nutrition (1) [Rpt/6 units] I II (Identical with N USC 696b)

**Nutritional Sciences—Optical Sciences—Optical Sciences 293**

Qualified applicants holding undergraduate degrees in engineering, mathematics, or physics are admitted to undergraduate programs in optical sciences. Current active research areas include electro-optics, image formation, image processing, laser physics, materials, medical optics, non-linear optics, optical bistability, optical design, optical fabrication and testing, optical properties of materials; pattern recognition, quantum optics, remote sensing, spectroscopy, surface physics, and thin-film technology. Interdisciplinary programs in progress involve the departments of Astronomy, Chemistry, Civil Engineering and Engineering Mechanics, Electrical and Computer Engineering, Physics, and Radiology, as well as the Arizona Research Laboratory, the Optical Circuity Cooperative and the Optical Data Storage Center.

The degree of Master of Science and Doctor of Philosophy are offered with a major in optical sciences. For admission and degree requirements, please see the Graduate Catalog.

A related program in which the Optical Sciences Center plays a major role is the undergraduate optical engineering program administered by the Department of Electrical and Computer Engineering in the College of Engineering and Mines. (See the College of Engineering and Mines section of this catalog for specific information and requirements related to this program.)

210. Geometrical Optics (3) I Basic principles of light, refraction, reflection, paraxial optics, pupils and stops, properties of optical glass, visual and other instruments, aberrations, measurement and testing. 2R, 3L. P, MATH 125a. (Identical with ECE 210)

210L. Geometrical Optics Laboratory (1) I, P, CR. (Identical with ECE 210L)

226. Physical Optics (3) II Fundamentals of electromagnetic waves; plane harmonic waves; light as a vector wave, reflection and refraction, interference, diffraction. 2R, 3L. P, PHYS 210. (Identical with ECE 226)

226L. Physical Optics Laboratory (1) II Fundamentals of electromagnetic waves; plane harmonic waves; light as a vector wave, refraction and interference, diffraction. P, CR, 226. (Identical with ECE 226L)

350. Radiometry, Sources and Detectors (3) I Symbols, units and nomenclature; geometrical radiation transfer, radiometric measurements, blackbody radiation, sources, noise, detectors, source and detector interfaces. P, 226. (Identical with ECE 350)


412. Optical Instrumentation (3) I Microscopes, telescopes, cameras, high-speed photography, diffraction gratings, fiber optics, ophthalmic instruments; medical optical instruments, adaptive optics, optical scanners. P, 370. (Identical with ECE 412)

416. Optical Design, Fabrication and Testing (4) II Optical design, optical fabrication and testing, optical materials and coatings, lens mounting and centering. P, 412. (Identical with ECE 416)


440a-440b. Atomic and Molecular Spectroscopy for Experimentalists (3-3) (Identical with PHYS 440a-440b) May be convened with 540a-540b.

470a-470b. Optics Laboratory (3) 470a: Properties of prisms, cardinal points of lenses, microlens objectives, desent sources, fluorescent sources, photomultipliers, CCD's. P, ECE 351a, CR 412. 470b: Kerr and Pockels cells, liquid crystal light valves, measurement of optical fiber characteristics, signal transmission, Fourier transforming properties of lenses, spatial filtering, transmission, reflection, image and rainbow holograms. P, 470a, CR 416. (Identical with ECE 470a-470b)

487. Fiber Optics Laboratory (3) II Fiber characteristics, fiber preparation; single and multimode fibers; sources; coupling; communication systems; multiplexing techniques; fiber-optic sensors. P, ECE 456. (Identical with ECE 487) May be convened with 587.

490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.


502. Optical Engineering I (3) I Rays and wavefronts; Fermat's principle; Snell's law; dispersion; systems of plane mirrors. Gaussian and paraxial imagery; Delano diagram; radiometry; Blackbody radiation; Sources. P, PHYS 116, 121.

503. Quantum Optics and Lasers (3) I Quantum background; interaction of light with matter; two-level atom; lasers; nonlinear optics. P, PHYS 435 (Identical with PHYS 503)

504. Mathematical Methods for Optics (3) I Complex variables. Fourier theory and applications to imaging; coherent and incoherent imaging; other integral transforms; special functions and orthogonal polynomials; integral equations. Green's functions. P, Math 223, PHYS 116 or PHYS 121.


507. Solid-State Optics (3) I Basic concepts in crystals and in optical response; optical properties of phonons and semiconductors; quantum wells; electro-optical properties of bulk semiconductors; optical nonlinearities; solid state devices and laser diodes. P, PHYS 435.

508. Probability and Statistics in Optics (3) II Probability theory; random processes; optical applications; hypothesis testing and estimation; physical applications. P, 501 or 509; 504 or 512.

509. Fundamentals of Physical Optics (4) I Electromagnetic theory; interference; concepts of coherence; multiple-beam interference and multilayer films; general, Fresnel, and Fraunhofer diffraction; diffraction grat-
the laser; superconductivity and Josephson radiation. P, 543. (Identical with PHYS 643)
656a-656b. Atmospheric Radiation and Remote Sensing (3-3) 1994-95 (Identical with ATM 656a-656b)
670. Principles of Data Storage (3) II 1993-94 Optics of polarized light in systems of high numerical aperture; automatic focusing and tracking schemes; interaction of light with magnetic media; readout enhancement through multilayering; physical mechanisms of optical recording in ablative, phase-change, thermomagnetic and dye-polymer media; sources of noise in optical recording; data encoding schemes. P, consent of instructor.
680. Microcomputer Interfacing in the Optics Laboratory (3) I Design and construction of interfaces between microcomputer systems and a variety of devices in the optics laboratory, including switches, motors, optical sensors, displays and terminals. Hardware and assembly language software drivers. 1R, 6L.
696. Seminar
a. Advanced Optical Design (1-3) II P, 517.

Pharmaceutical Sciences (PHSC)
Pharmacy Building, Room 236
(602) 626-2823

Associate Professors Sherry (Hsiao-Hui) Chow, Joseph J. Hoffmann (Arid Lands Resource Sciences), Neil E. MacKenzie (Biochemistry), Barbara N. Timmermann (Arid Lands Resource Sciences)

The Department of Pharmaceutical Sciences includes the academic disciplines of pharmaceutical chemistry, biopharmaceutics/pharmacokinetics, pharmaceutics, and pharmacognosy. Please consult the College of Pharmacy section of this catalog for undergraduate admission and degree requirements.

The Master of Science and Doctor of Philosophy degrees with a major in pharmaceutical sciences are available. Concentration within the major include pharmaceutical chemistry, biopharmaceutics/pharmacokinetics, pharmaceutics and pharmacognosy. For admission and degree requirements, please see the Graduate Catalog.

A student must be enrolled in the College of Pharmacy before taking any pharmaceutical science course required in the professional curriculum, except as approved by the department.

The department participates in the honors program.

302. Physical Pharmacy (4) I Discussion of the physical and chemical factors that relate to the development of pharmaceutical products and drug delivery systems. Emphasis is placed on newly emerging technologies and an industrial perspective. P, PHYS 102b, 180b, CHEM 103b, 104b.
307. Dosage Form Design (2) II Application of physical-chemical principles to pharmaceutical dosage forms, including a discussion of the biopharmaceutical considerations which influence the efficacy of pharmaceutical formulations. P, 302, 306.
400. Pharmaceutical Calculations (2) I (Identical with PHPR 400)
408a-408b. Pharmacokinetics Discussion (1-1) I II Discussion related to the application of pharmacokinetic principles with case-study examples. CR, 407 for 408a, 485 for 408b. (Identical with PHPR 408a-408b) May be convened with 508a-508b.
424. Antibiotics (2) I (Identical with PHPR 424)
437a-437b. Medicinal Chemistry and Pharmacognosy (4-4) Relationships between the chemical structure and physiological activity, incompatibilities and stability of the organic and inorganic compounds obtained from natural and synthetic sources; essentials of pharmacognosy, including biologicals. P, 307, CHEM 241b, 243b. May be convened with 537a-537b.
438. Pharmaceutical Analysis (2) II Modern methods and instrumentation used for qualitative and quantitative determination of drugs and metabolites. P, CHEM 323.
485. Advanced Clinical Pharmacokinetics (3) II (Identical with PHPR 485)
508a-508b. Pharmacokinetics Discussion (1-1) I II For a description of course topics, see 408a-408b. Graduate-level requirements include an in-depth analysis of a pharmacokinetic problem. CR, 407 for 408a, 485 for 408b. (Identical with PHPR 508a-508b) May be convened with 408a-408b.
512. Quantitative Structure-Activity Relationships (3) 1993-94 Approaches to the quantification of pharmaceutical actions of drugs on the basis of chemical structure.
527. Antineoplastic Drugs (2) II Discovery and development of natural and synthetic antineoplastic drugs; preclinical screening and toxicity evaluation; phase I, II, and III clinical studies in humans. P, 437b or CR.
537a-537b. Medicinal Chemistry and Pharmacognosy (4-4) For a description of course topics, see 437a-437b. Graduate-level requirements include extensive use of the current literature and emphasis on drug design principles. P, 307, CHEM 241b, 243b. May be convened with 437a-437b.
596. Seminar
a. Pharmaceutical Chemistry (1) [Rpt./5] I II
b. Pharmaceutical Research (1) I II
b. Pharmacology Research (1 to 2) [Rpt./5] I II Open to majors only.
d. Pharmaceutics (1) [Rpt./5 units] I II
601. Advanced Physical Pharmacy (3) II 1994-95 Applications of physical chemistry to pharmacy. P, physical pharmacy or physical chemistry course.
606. Industrial Manufacturing Pharmacy (3) II Pharmaceutics as applied to various aspects of industrial pharmacy. Field trips.
630a-630b. Advanced Organic Medicinals (3-3) 1994-95 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 Subspecialty
I. Research (3-10) I II 5-15.OL, P, or CR, 10 units of PHPR 810. (Identical with PHPR 815L, which is home.)

Pharmacology (PHCL)
College of Medicine, Room 5103
(602) 626-6400
(Department, College of Medicine)
Professors John D. Palmer, Acting Head, David S. Alberts (Internal Medicine), H. Vasken Aposhian (Molecular and
Pharmacology is a broad discipline involving the investigation of the actions of drugs and chemicals upon living material at all levels of organization. The discipline occupies an important interface between the basic medical sciences and the clinical sciences, drawing strongly upon the former for its contribution to the latter. Research in pharmacology utilizes all appropriate techniques of modern biology from the molecular to the clinical levels. In the health professions, pharmacologic knowledge is applied to the diagnosis, prevention, cure or relief of symptoms of disease, and in the promotion of optimal health. The basic pharmacologic principles are emphasized in both medical and graduate student teaching. This will permit the student to develop techniques of problem solving to keep abreast of advances in pharmacology through his/her professional career.

In conjunction with other departments in the University, the department participates in an interdisciplinary graduate program leading to the Doctor of Philosophy degree in pharmacology and toxicology. The department also offers a program of instruction leading to the Master of Science degree with a major in pharmacology. See the Graduate Interdisciplinary Program in Pharmacology and Toxicology.
The M.S. toxicology program. The con-
fect health status in occupational and
chemical and physical agents that can af-
recognition, evaluation, and control of
environmental exposure to chemicals.
ards resulting from occupational and /or
produce adverse biological effects to
mechanisms by which chemicals
in toxicology ranges from determining
universities. The broad scope of interests
of pharmacology ranges
from the study of intermolecular rea-
tions of chemical constituents of cells
with drugs to the effects of chemicals in
our environment on entire populations.
In conjunction with other departments
in the University, the department partici-
ates in an interdisciplinary graduate
program leading to the Doctor of Phi-
sophy degree with a major in phar-
macology and toxicology. (See Graduate
Interdisciplinary Program in Pharmacology
and Toxicology). For admission and de-
gree requirements, please see the Gradu-
ate Catalog.

Toxicology is the science concerned
with the harmful effects of chemicals
(including drugs) on living systems. The
toxicology program offers a curriculum
leading to the Master of Science degree
with a major in toxicology. The program
prepares students for careers in hospital
laboratories, police crime laboratories,
medical examiners' offices, industrial
hygiene laboratories, and toxicology lab-
atories in industry, government, and
universities. The broad scope of interests
in toxicology ranges from determining
the mechanisms by which chemicals
produce adverse biological effects to
identification, and quantification of haz-
ards resulting from occupational and/or
environmental exposure to chemicals.
For admission and degree requirements,
please see the Graduate Catalog.

Industrial hygiene is the applied
science concerned with the anticipation,
recognition, evaluation, and control of
chemical and physical agents that can af-
fect health status in occupational and
environmental settings. An industrial
hygiene concentration is offered within
the M.S. toxicology program. The con-
centration prepares students for profes-
sional practice in a wide range of both
private and public sector organizations.
For admission and degree requirements,
please see the Graduate Catalog.

The department participates in the
honors program.

Pharmacology (PCOL)

195. Colloquium
a. Foundations of Modern Pharmacology
   (1)
401. Human Gross Anatomy (3) II (Identical
   with ANAT 401)
471a-471b. Fundamentals of Pharmacology
   (4-4) Comprehensive study of the biochemi-
   cal, physiological, and therapeutic effects of
   drugs, including mechanisms of action and
drug toxicity, and drug literature evalua-
   tion. 3R, 3L. P, ANAT 401, BIOC 460, PSIO
   480, 481; PHSC 437a-437b. (Identical with TOX
   471a-471b) May be convened with 571a-571b.
472. Nursing Pharmacology (3) I II Pharmacodynamics, pharmacology, and adverse
   effects of commonly used drugs, with em-
phasis on clinical applications. Not available
for elective credit in the College of Pharmacy
or graduate credit in pharmacology-toxic-
ology doctoral programs. May be convened
with 572.
474. Clinical Toxicology (2) I Prevention,
   characteristics, diagnosis and rational man-
agement of diseases caused by drug overdose,
toxic household products, poisonous plants,
venomous animals, environmental and indus-
trial toxicants. P, 472 or 471b, PHSC 407.
   (Identical with TOX 474) May be convened
with 574.
571a-571b. Fundamentals of Pharmacology
   (4-4) For a description of course topics, see
   471a-471b. Graduate-level requirements in-
clude an in-depth research paper on a current
   topic. P, ANAT 401, BIOC 460, PSIO 480, 481;
   CR, PHPR 477a-477b and PHSC 437a-437b. (Identical with TOX 571a-571b) May be convened
   with 471a-471b.
572. Nursing Pharmacology (3) I II For a de-
   scription of course topics, see 472. Graduate-
level requirements include a term paper on
   nursing pharmacology. May be convened
   with 472.
574. Clinical Toxicology (2) I For a descrip-
   tion of course topics, see 474. Graduate-level
   requirements include an in-depth research
   paper on a current topic in toxicology and/or
   a format presentation on a current subject to
   the class. P, 472 or 471b, PHSC 407. (Identical
   with TOX 574) May be convened with 474.
596. Seminar
   a. Advanced Graduate Research (1-3)
      [Rpt.] I II (Identical with PHCL 596a,
      which is home)
620. Principles of Pharmacology (3) I (Ident-
   i cal with PHCL 620)
653. Neuropsychopharmacology (3-4) II Role of
   various neurotransmitters in the peripheral
   and central nervous systems and the effects of
   drugs on the nervous system, including their
   actions at receptors and their influence on
   synthesis, storage, and release of neuro-

transmitters. P, PHCL 501 or PCOL. 471b,
561a, 596. (Identical with PHCL 653 and TOX
653)
695. Colloquium
   a. Research Conference (1-4) [Rpt.] I II
696. Seminar
   a. Student Research (1) [Rpt.] I II (Identical
      with PHCL 696a, which is home.)
815. Pharmacy Subspecialty
   a. Research (5) I II S 15-30L. P or CR, 10
   units of 810. (Identical with PHPR 815,)
   which is home.)

Toxicology (TOX)

408. Insect Toxicology (3) II 1993-94 (Identical
   with ENTO 408) May be convened with 508.
410. Physical Exposures (3) II (Identical with
   OSH 410) May be convened with 510.
423. Mechanisms of Disease (4) II (Identical
   with PH PR 423) May be convened with 523.
427. Veterinary Pharmacology (4) I (Identical
   with ECOL 427)
462a-462b. Biochemistry (3-3) (Identical with
   BIOC 462a-462b) Honors section available for
   (4) honors credits. May be convened
   with 562a-562b.
466. Physiology Laboratory (3) I (Identical
   with ECOL 466) May be convened with 566.
471a-471b. Fundamentals of Pharmacology
   (4-4) For a description of course topics, see
   471a-471b. May be convened with 571a-571b.
474. Clinical Toxicology (2) I (Identical with
   PCOL. 474) May be convened with 574.
480. Human Physiology (4) II (Identical with
   PSIO 480) May be convened with 580.
481. Physiology Laboratory (1) (Identical with
   PSIO 481)
485. Industrial Ventilation (3) II Design and
   evaluation of industrial ventilation systems.
   Emphasis is on level evaluation of industrial
   contaminants. Five laboratory exercises and
   course design project. 3R, 1L. May be con-
  vened with 585.
486. Fundamentals of Industrial Hygiene (3)
   I (Identical with OSH 486) May be convened
   with 586.
487. Advanced Industrial Hygiene and Safety
   (3) II (Identical with OSH 487) May be con-
  vened with 587.
501. The Pharmacological Basis of Therapeu-
   tics (6) II (Identical with PHCL 501) P, PSIO
   601 and graduate course equivalent to BIOC
   801.
502. Industrial Hygiene Instrumentation and
   Analysis (2-4) I (Identical with OSH 502)
508. Insect Toxicology (3) II 1993-94 (Identical
   with ENTO 508) May be convened with 408.
509. Statistics for Research (4) I II (Identical
   with STAT 509)
510. Physical Exposures (3) II (Identical with
   OSH 510) May be convened with 410.
512. Hazardous Materials (2-4) I (Identical
   with OSH 512)
523. Mechanisms of Disease (4) II (Identical
   with V SC 523) May be convened with 423.
550. Drug Disposition and Metabolism (2) II (Identical with PHCL 550)

551. Molecular Biology of Pharmacological Agents (3) I 1993-94 (Identical with PHCL 551)

554. Industrial Toxicology and Chemical Exposures (2-4) Principles of toxicology related to industry; dose response; mechanisms of toxicity; hazard evaluation principles; toxicology of major classes of industrial compounds. P, 6 units each of biological science and organic chemistry.

560. General Biochemistry (5) I II (Identical with BIOC 560)

562a-562b. Biochemistry (3-3) (Identical with BIOC 562a-562b) May be convened with 462a-462b.

566. Physiology Laboratory (3) II (Identical with ECOL 566) May be convened with 466.

571a-571b. Fundamentals of Pharmacology (4-4) (Identical with PHCL 571a-571b) May be convened with 471a-471b.

574. Clinical Toxicology (2) I (Identical with PHCL 574) May be convened with 474.

576. Environmental Toxicology (3) II Toxicity of natural toxins and of agricultural and industrial chemicals, with emphasis on air and water pollutants; decision-making in environmental issues. P, 6 units of biology and of organic chemistry; CHEM 325, 326. (Identical with ENTO 576 and PHCL 576)

580. Human Physiology (4) II (Identical with PSIO 580) May be convened with 480.

581. Physical Laboratory (3) II (Identical with PSIO 581)

582. Immunology (2) I Broad overview of the immune system, with emphasis on how chemicals affect the immune system (immunomodulation) and the role of the immune system in chemical-induced tissue injury/allergic responses. P, 602a-602b, MIC 419R, MBIM 567. (Identical with MBIM 582 and PHCL 582)

585. Industrial Ventilation (3) II For description of course topics, see 485. Graduate-level requirements include additional in-depth materials and written papers. May be convened with 485.

586. Fundamentals of Industrial Hygiene (3) I (Identical with OSH 586) May be convened with 486.

587. Advanced Industrial Hygiene and Safety (3) II (Identical with OSH 587) May be convened with 487.

596. Seminar a. Advanced Toxicology (1-2) [Rpt./3] I b. Current Concepts in Toxicology (1-2) [Rpt./3] II

601. Analytical Instrumentation and Techniques (2-4) I Lecture and laboratory in the qualitative and quantitative determination of toxic substances in the environment and body fluids. Modern instrumental techniques will be employed whenever appropriate. Lecture may be taken separately by non-majors. 2R, 6L. P, CHEM 325, 326. (Identical with PHCL 601)

602a-602b. Biotoxicology (3-3) 602a: I Lecture. Mechanisms of organ directed toxicities in animals. Chemical carcinogenesis, teratogenesis and mutagenesis. Open to non-majors. P, two semesters of ecology. 602b: II Laboratory. Proper use of animals in toxicology and pharmacology research; focuses on organ specific toxicities. (Identical with PHCL 602a-602b)

610. Topics in Advanced Toxicology (1-3) I II Current developments in toxicology including: chemical carcinogenesis, mutagenesis and teratogenesis; behavioral toxicology; inhalation toxicology; toxicokinetics; metabolism and environmental toxicology. P, 601, 602a-602b.

620. Principles of Pharmacology (3) I (Identical with PHCL 620)

653. Neuropharmacology (3-4) II (Identical with PCOL 653)

696. Seminar a. Student Research (1) [Rpt./4] II (Identical with PHCL 696a, which is home)

**Pharmacology and Toxicology**

**College of Medicine, Room 5103**

(602) 626-7912

**Graduate Interdisciplinary Program in Pharmacology and Toxicology**

**Committee:**

Professors David L. Kreulen, Chair, David S. Alberts (Cancer Center), H. Vasken Apochian (Molecular and Cellular Biology), G. Tim Bowden (Radiation Oncology), Klaus Brendel (Pharmacology), Rubin Bressler (Internal Medicine), Burnell R. Brown (Anesthesiology), Dean E. Carter (Pharmacology and Toxicology), Paul F. Consroe (Pharmacology and Toxicology), Thomas P. Davis (Pharmacology), A. Jay Gandolfi (Anesthesiology), Marilyn Halonen (Pharmacology), James R. Halpert (Pharmacology and Toxicology), David J. Johnson (Internal Medicine), Hugh E. Laird, II (Pharmacology and Toxicology), Eugene Morkin (Heart Center), John D. Palmer (Pharmacology), Frank Porreca (Pharmacology), Garth Powis (Cancer Center), Charles W. Putnam (Surgery), William R. Reeske (Internal Medicine), Findlay E. Russell (Pharmacology and Toxicology), I. Glenn Sipes (Pharmacology and Toxicology), Henry I. Yamamura (Pharmacology)

Associate Professors William S. Dalton (Internal Medicine), Robert D. Dorr (Cancer Center), Timothy C. Fagan (Internal Medicine), Lauren Fisher (Pharmacology), Edward D. French (Pharmacology), Charlene A. McQueen (Pharmacology and Toxicology), John B. Sullivan (Surgery)

Assistant Professors Josephine Y. Lai (Pharmacology), Douglas F. Larson (Surgery), Daniel C. Liebler (Pharmacology and Toxicology), Ronald Lynch (Pharmacology), John W. Regan (Pharmacology and Toxicology)

Research Professor Ronald R. Watson (Family and Community Medicine)

Research Associate Professors Ron Lukas (Pharmacology), Thomas L. Smith (Pharmacology)

Research Assistant Professor Mark L. Witten (Pediatrics)

Research Lecturer John Gilkey (Arizona Research Laboratory)

The Graduate Interdisciplinary Program in Pharmacology and Toxicology offers a graduate program leading to the Doctor of Philosophy degree with a major in pharmacology and toxicology. The program has a faculty of forty-one from the departments of Pharmacology, Pharmacology and Toxicology, Anesthesiology, Cancer Center, Molecular and Cellular Biology, Radiation Oncology, Surgery, Internal Medicine, and the Arizona Research Laboratory. Faculty members have research interests in carcinogenesis/cancer chemotherapy, cardiovascular pharmacology, endocrine pharmacology, environmental toxicology, immunopharmacology, molecular/biochemical pharmacology, molecular toxicology, neuropharmacology, and toxicology. Students in the Ph.D. program may choose a major track in pharmacology or toxicology; several areas of concentration are available in either track. The Ph.D. degree is awarded upon successful completion of a research project that culminates in an original and significant scientific contribution.

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.
The Department of Pharmacy Practice offers courses leading to the Doctor of Pharmacy degree. A Master of Science with a major in pharmacy, with concentrations available in the areas of institutional pharmacy administration and pharmacy administration, is offered through the Graduate College. Graduate study in pharmacy administration and pharmaceutical sciences (pharmaceutics, pharmacokinetics) leading to a Doctor of Philosophy degree with a major in pharmacy or pharmaceutical sciences 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.

195. Colloquium
   a. Perspectives on Health Care: Current Issues and Trends (1)

400. Pharmaceutical Calculations (2) I Pharmaceutical calculations pertinent to the selection, formulation, preparation, dosage, and administration of drugs and their dosage forms. (Identical with PHSC 400)

403. Introduction to Pharmacy Practice (1) I Orientation to career opportunities for pharmacists; medical terminology and abbreviations.

404. Interviewing and Counseling Skills (1) I Basic communication skills and thinking strategies needed for effective medication history interviewing and patient counseling.

405. Patient Counseling and Medical Devices (1) I Practical use of devices commonly employed to administer and monitor selected drug therapies; how to instruct patients and health care providers in selection and use of such devices.

407. Pharmacokinetics (4) I (Identical with PHSC 407) May be convened with 507.

408a-408b. Pharmacokinetics Discussion (1-1)
   I I (Identical with PHSC 408a-408b) May be convened with 508a-508b.

410. Research Options in Pharmacy (1) I Introduction to research in the pharmacy disciplines, career opportunities in pharmacy research; grants, contracts, and patents; confidentiality and ethics.

411. Perspectives in Professional Practice (2) I II Orientation to professional practice issues; pharmacy practice site visitsations. Involves weekly discussions, site visits to various pharmacy practices, and a written paper. Field trip. Open to nonmajors.

412. Nonprescription Drugs (2) I Presentation on nonprescription drugs, remedies sold over-the-counter (O.T.C.), designed to guide the pharmacist in providing professional advice to the self-medicating public. P. 405.

413. Pharmacy Practice (2) II Application of pharmaceutical care principles, pharmacy problem-solving skills, role playing and documentation of pharmaceutical care. P. 412, PHSC 407, and PCOL 476.

414. Pharmacy Practice Lab (1) I Laboratory for PHPR 413

419. Parenteral Preparations (2) I Principles and procedures in the preparation, stability, and administration of parental products. 1R, 3L. P. PHSC 407 or CR.

424. Antibiotics (2) I Principles of antibiotic chemotherapy and the properties of the antibiotics employed in therapeutics. P. MIC 205, PHSC 437b, PCOL 476b. (Identical with PHSC 424)

442. Professional Practice Management (3) I Management of professional situations and the interaction among patients, colleagues, and other health-care providers, with application to institutional, community, and clinical pharmacy practice. P. 442. May be convened with 542.

443. Pharmacy Laws (2) I Legal concepts concerning professionalism, negligence, liability, legal processes and semantics; pertinent federal, state and local statutes and regulations.

445. Medication Use and the U.S. Health Care System (3) I An overview of the U.S. health care system and the consumers, providers, payers, and regulators that comprise it. The role of pharmacy and pharmacists within the health care system will be explored, including an examination of social, behavioral, and economic factors associated with the prescribing, dispensing, and use of medications. May be convened with 545.

447. Perspectives in Geriatrics Laboratory (1) II I P, CR, 448. (Identical with GERO 447 and N FS 447) May be convened with 547.

448. Perspectives in Geriatrics (2) I II Multidisciplinary approach to the health-care needs of the elderly, including medication use, nutrition, health care agencies and roles of individual health care professionals. Open to nonmajors. P. CR, 447 for nonmajors. (Identical with GERO 448 and N FS 448) May be convened with 548.

454. Drug Information and Drug Literature Evaluation (2) I Skills and principles of drug information, biostatistics, and literature evaluation needed to evaluate biomedical literature. P. 403.

461. Methodology in Pharmacy Research and Drug Literature Evaluation (3) I II Application of research design, statistical methods, evaluation techniques, and ethical dimensions to critically evaluate published literature, research reports and proposals. P. STAT 263. May be convened with 561.

475a-475b. Pharmacotherapeutics (6-6-8) 475a: I; 475b: II Common diseases that afflict humans. Their management based on pharmacotherapeutic considerations of epidemiology, etiology, diagnosis, pathophysiology, and prognosis. P. BIOC 460, PSIO 480.

483. Perspectives of Cancer Care for Health Professionals (3) S (Identical with NURS 483) May be convened with 583.

485. Advanced Clinical Pharmacokinetics (3) I II Advanced pharmacokinetic principles emphasizing the application of mathematical relationships to therapeutic drug monitoring in patient care situations. P. PHSC 407, 408a, or consult department before enrolling. (Identical with PHSC 485)

489. Clinical Pharmacotherapy of Mental Disorders (2) I A multidisciplinary approach to clinical psychopharmacology, therapeutics, and diagnosis of mental disorders for health professionals. May be convened with 589.

495. Colloquium
   a. Issues in Pharmacy (2) II

507. Pharmacokinetics (4) I (Identical with PHSC 507) May be convened with 407.

508a-508b. Pharmacokinetics Discussion (1-1)
   I I (Identical with PHSC 508a-508b) May be convened with 408a-408b.

511. Pharmacy Management (3) I History, organization and administration of pharmaceutical services within the institutional environment.

512. Advanced Pharmacy Management (3) I II Application of management principles to problem-solving and decision-making techniques in the provision of pharmaceutical services within the institutional environment. Field trips. Open to majors only. P. 511.

542. Professional Practice Management (3) I II For description of course topics, see 442. Graduate students will write either an additional paper or proposal. May be convened with 442.

545. Medication Use and the U.S. Health Care System (3) I For a description of course topics, see 442. Graduate students will write either an additional paper or proposal. May be convened with 442.

547. Perspectives in Geriatrics Laboratory (1) II I P, CR, 448. (Identical with GERO 447 and N FS 447) May be convened with 547.

548. Perspectives in Geriatrics (2) I II For a description of course topics, see 448. Graduate-level requirements include one in-depth research paper on a single topic relevant to geriatric care. Open to nonmajors. P. CR, 447 for nonmajors. (Identical with GERO 548) May be convened with 448.
561. Methodology in Pharmacy Research and Drug Literature Evaluation (3) I I I For description of course topics, see 461. Graduate students will write either an additional paper or proposal. May be convened with 461.

583. Perspectives of Cancer Care for Health Professionals (3) S (Identical with NURS 583) May be convened with 483.

589. Clinical Pharmacotherapy of Mental Disorders (2) I For a description of course topics, see 489. Graduate-level requirements include a research paper on a single topic of psychopharmacology. May be convened with 489.

596. Seminar
   a. Pharmacy Administration (1) [Rpt./5] I
   b. Pharmacy Administration Research (1) [Rpt./5] II

611. Pharmacy and Its Environment (3) I Cultural, social, behavioral, and organizational foundations of pharmacy, including the development of the present state of practice.

612. Issues in Pharmacy Practice Research (3) II Survey of research methodology for studying administrative, social and behavioral aspects of health care and pharmacy practice; strategy for selecting and modifying existing research tools for particular purposes.

621. Pharmaceutical Marketing (3) I II Socioeconomic factors in the development, production, and distribution of drugs.

635. Issues in Rural Health Care (3) II (Identical with NURS 635)

694. Practicum
   a. Clinical Clerkship (1-15) [Rpt.] I II
   b. Administrative Clerkship (1-15) [Rpt.] I II

695. Colloquium
   a. Research in Gerontology (1) I II (Identical with GERO 695a, which is home)

800. Pharmacy Practice Project (1) II Individual pharmacy practice research not related to a thesis or dissertation. Open only to students enrolled in Doctor of Pharmacy program.

803. Pharmacy Clinical Clerkship (5) I II S P; available only after completion of all required and elective didactic coursework in the first 3 professional years.
   a. Community Pharmacy Practice
   b. Institutional Pharmacy Practice
   c. Ambulatory Pharmacy Practice
   d. Drug Information Practice
   e. Adult Acute Care Pharmacy Practice

Note: 803a-e are six-week courses.

810. Pharmacy Clerkship (5) [Rpt./10 units] I II S P; available only after completion of all required and elective didactic coursework in the first three professional years.
   a. Internal Medicine
   b. Surgery
   c. Pediatrics
   d. Geriatrics/Gerontology
   e. Outpatient Practice
   f. Emergency Services
   g. Acute Care
   h. Clinical Pharmacokinetics
   i. Psychopharmacy/Neurology
   j. Nutrition Support
   k. Specialty Institution

Note: 810a-k are six-week courses.

815. Pharmacy Subspecialty (5) [Rpt./10 units] I II S P; available only after completion of all required and elective didactic coursework in the first 3 professional years.
   a. Hematology/Oncology
   b. Cardiology
   c. Pulmonary
   d. Endocrine
   e. GI/Renal
   f. Ob/Gyn/Neonatal
   g. Infectious Disease
   h. Rheumatology/Immunology
   i. Dermatology
   j. Poison Information/Toxicology
   k. Administrative
   l. Research (Identical with PHSC 815I and PCOL 815J)

Note: 815a-1 are six-week courses.

896. Seminar
   a. Pharmacy Practice (1) II

Philosophy (PHIL)

Social Sciences Building, Room 213 (602) 621-3129

Assistant Professors Richard Healey, Joseph T. Toliver
Assistant Professors Thomas Chistiano, David Owen, Margaret Reimer

Philosophy attempts to answer analytic and speculative questions that perplex reflective people when they examine their basic concepts, goals, and ideals. Some of these questions arise naturally in the course of work in the various sciences and humanities. Hence philosophy has a natural border with all other academic disciplines, and lends itself to joint studies and collaborations.

The Bachelor of Arts, Master of Arts and Doctor of Philosophy degrees are available with a major in philosophy. The department also encourages joint majors in such related fields as psychology, political science, economics, and linguistics, among others. Specialized minors in philosophy are available for students planning careers in law or the health professions. For details, students should consult the philosophy department's undergraduate advisor.

The major: 30 units, including 344 and at least one course from each of the following groups: (1) history of ancient philosophy; (2) history of modern philosophy; (3) ethics and value theory; (4) metaphysics and epistemology; (5) logic and language. For a complete list of courses that satisfy each of these areas, please see the Director of Undergraduate Studies.

The supporting minor should be chosen after consultation with the undergraduate advisor.

The department participates in the honors program, offering honors sections of its introductory courses, periodic honors seminars, and the opportunity to conduct independent honors research.

110. Logic and Critical Thinking (3) I II Designed to improve ability to reason and think critically; emphasis on evaluating and presenting arguments. Includes a basic introduction to logic and scientific reasoning.

111. Introduction to Philosophy (3) I II 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.

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 S Classical, medieval, and modern moral and political thought; theories of human good, natural rights, political obligation, relation of individual and state, class conflict.

122. Philosophical Foundations of Western Civilization: Mind, Matter, and God (3) I II S Classical, medieval and modern metaphysical questions: What am I—mind, body, or both? Is the nature of the world ultimately physical? What is God? How may we know?

123. Philosophical Foundations of Western Civilization: Science and Inquiry (3) I II S Classical, medieval, and modern approaches to science, mathematics and knowledge; philosophical problems raised by discovery and change.

145. Science, Technology and Human Values (3) I Nature of science, technology, pseudoscience, and their relation to philosophy and culture; impact of science and technology on society and its values and religion.

202. Introduction to Symbolic Logic (3) Truth-functional logic and quantification theory; deductive techniques and translation into symbolic notation. (Identical with MATH 202)

213. Contemporary Moral Problems (3) Issues and arguments arising in contemporary moral debates. Topics will vary but are likely to include abortion, mercy killing, the nature of economic justice, racism, sexism, pornography, animal rights, the death penalty, terrorism, the morality of war, and nuclear deterrence.

233. Philosophy of Religion (3) I Nature of religion; existence and nature of God; religion and meaning, values and knowledge. (Identical with RELI 233)

238. Philosophy in Literature (3) I Philosophical analysis of selected literary works.
245. Existential Problems (3) II 1993-94 Exploration of central problems of the human condition, such as meaning of life; death; self-deception; authenticity, integrity and responsibility; guilt and shame; love and sexuality (Identical with RELI 245)

260. Ancient Philosophy (3) I Survey of Greek philosophy, from the pre-Socratic philosophers through Plato and Aristotle to post-Aristotelian philosophers. (Identical with CLAS 260)

262. Modern Philosophy (3) Survey of major 17th and 18th century British and European philosophers, chosen from Descartes, Spinoza, Leibnitz, Locke, Berkeley, Hume, and Kant.


305. Introduction to the Philosophy of Science (3) Basic issues in the logic of science: scientific concepts and their meaning, testing of hypotheses, explanation, measurement, role of mathematics, truth versus convention, limits of science.

321. Medical Ethics (3) Ethical issues that arise in relation to medicine and health care: abortion, euthanasia, the allocation of scarce medical resources, socialized medicine, doctor-patient confidentiality, paternalism, etc.

322. Business Ethics (3) II Selected ethical issues in business, including corporate responsibility, preferential hiring and reverse discrimination, advertising practices, environmental responsibility.

344. Issues and Methods in Analytic Philosophy (3) Designed to improve ability to think analytically, with emphasis on analytic methodology. Studies on the nature of mental states, the analytic/synthetic distinction, personal identity, the concept of knowledge and justified belief, the theory of reference, and the distinction between science and pseudo-science. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

350. Minds, Brains, and Computers (3) [Rpt.] I An introduction to cognitive science; current issues relating to minds as computers, neuroscience, vision and language. (Identical with PSYC 350)

376. Introduction to the Philosophy of Language (3) I 1994-95 A survey of basic issues in the philosophy of language. (Identical with LING 376)

396I. Honors Proseminar (3) II 403. Foundations of Mathematics (3) II 1994-95 (Identical with MATH 403) May be convened with 503.

412. Readings in Greek Philosophy (3) [Rpt.] (Identical with GRK 412) May be convened with 512.

413a-413b. Symbolic Logic (3-3) 413a: Intermediate propositional logic and quantification; natural deduction, axon systems, elementary metatheorems, introduction of modal logic, selected topics in philosophy of logic. 413b: Advanced propositional logic and quantification theory; metatheorems on consistency, independence, and completeness; set theory, number theory, and modal theory; recursive function theory and Gödel's incompleteness theorem. May be convened with 513a-513b.

414. Philosophical Logic (3) Introduction to modal logic; problems of interpretation and application; extensions to such areas as tense logic, epistemic logic, deontic logic. May be convened with 514.


419. Induction and Probability (3) Basic philosophical probabilistic models of induction, confirmation of scientific hypotheses, and meaning of probability concepts. May be convened with 519.

421. Philosophy of the Biological Sciences (3) Laws and models in biology, structure of evolutionary theory, teleological explanations, reductionism, sociobiology. (Identical with ECOL 421) May be convened with 521.

422. Linguistic Semantics and Lexicology (3) II 1994-95 (Identical with LING 422) May be convened with 522.

423a-423b. Philosophy of the Physical Sciences (3-3) 423a: Theories and models. Measurement, experimentation, testing hypotheses. Philosophical problems concerning explanation, causation and laws of nature. 423b: Philosophical problems of space, time and motion. Topics may include the nature of geometrical knowledge, the philosophical impact of relativity theory, absolute versus relative conceptions of space and time. May be convened with 523a-523b.

424. Philosophy of Social Sciences (3) Theories, concepts, and forms of understanding in the social sciences. Possible topics: rational choice and decision at the individual and social levels; democracy; and market mechanisms. P, one course in philosophy. May be convened with 524.

430a-430b. Ethical Theory (3-3) 430a: Meta-ethics—meaning of moral terms, relativism, subjectivism, ethics and science, social contract theory. 430b: Normative ethics—Utilitarianism, egoism, rights, natural law, justice, deontological duties, blameworthiness and excuses. May be convened with 530a-530b.

433. Aesthetics (3) Classical and contemporary theories of art; the esthetic experience, form and content, meaning, problems in interpretation and criticism of works of art. May be convened with 533.

434. Social and Political Philosophy (3) Fundamental concepts of politics, leading social and political theories, such as anarchism, social contract, Marxism. May be convened with 534.

436. Games and Decisions (3) Classical theory of subjective probability, utility, and rational choice, with applications to games theory and social welfare theory. P, MATH 119. May be convened with 536.

438a-438b. Philosophy of Law (3-3) 438a: Nature and validity of law; law and morality, judicial reasoning, law and liberty. 438b: Problems about justice, compensation and contracts and/or responsibility and punishment. (Identical with POL 438a-438b) May be convened with 538a-538b.

440. Metaphysics (3) Topics include free will and determinism; causation, personal identity; necessity and essence; truth, realism and ontological. May be convened with 540.

441. Theory of Knowledge (3) Critical examination of some of the major problems concerning evidence, justification, knowledge, memory, perception and induction. May be convened with 541.

442. Knowledge and Cognition (3) I Issues in philosophy and psychology of knowledge, with emphasis on cognitive mechanisms. Perception, memory, concepts, mental representation, problem-solving, reasoning and rationality. Two philosophy courses. May be convened with 542.

443. Knowledge and Society (3) I II Social and interpersonal processes affecting the acquisition and diffusion of knowledge. Emphasis on philosophical perspectives, with interdisciplinary borrowings. P, one philosophy course. May be convened with 543.

450. Philosophy of Mind (3) Topics include the nature of mental states; the relation between mind and brain; and analysis of perception, emotion, memory and action. May be convened with 550.

451. Philosophy and Psychology (3) Investigation of philosophical issues arising from current work in psychology including perception, reasoning, memory, motivation and action. May be convened with 551.

455. Philosophy and Artificial Intelligence (3) Interdisciplinary problems lying at the interface of philosophy and artificial intelligence. May be convened with 555 (Identical with PSYC 455).

463. Philosophy of Language (3) Survey of basic issues in the philosophy of language such as: speech acts, reference, meaning, logical form. (Identical with LING 463) May be convened with 563.

465. Pragmatics (3) II Study of language use, its relationship to language structure and context; topics such as speech acts, presupposition, implication, performative, conversations (Identical with LING 465) May be convened with 565.

467. Frege and the Rise of Analytic Philosophy (3) The writings of Frege on logic, language, and mathematics and their influence on contemporary philosophical thought. May be convened with 567.

470. Greek Philosophy (3) [Rpt.] I Topics in Greek philosophy. May be selected from the pre-Socratics, Socrates, Plato, Aristotle and post-Aristotelian philosophy. (Identical with CLAS 470) May be convened with 570.
471a-471b. Rationalism and Empiricism (3-3)
471a: Rationalists of the 17th and 18th centuries: Descartes, Spinoza, Leibniz, and Kant.
471b: Empiricists of the 17th and 18th centuries: Locke, Berkeley, Hume. May be convened with 571a-571b.

472a-472b. Ancient Philosophy (3-3) [Rpt.]
472a: A philosophical introduction to the major works of Plato. 472b: A philosophical introduction to the major works of Aristotle. (Identical with CLAS 472a-472b) May be convened with 572a-572b.

473. Natural Language Processing (3) II 1994-95 (Identical with LING 473) May be convened with 573.

503. Foundations of Mathematics (3) II 1994-95 (Identical with MATH 503) May be convened with 403.

512. Readings in Greek Philosophy (3) [Rpt.]
(Identical with GRK 512) May be convened with 412.

513a-513b. Symbolic Logic (3-3) For a description of course topics, see 413a-413b. Graduate-level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 413a-413b.

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 ECOI 521) May be convened with 421.

522. Linguistic Semantics and Lexicology (3) II 1994-95 (Identical with LING 522) May be convened with 422.

523a-523b. Philosophy of the Physical Sciences (3-3) For a description of course topics, see 423a-423b. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. May be convened with 423a-423b.

524. Philosophy of Social Sciences (3) For a description of course topics, see 424. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. P, one course in philosophy. 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 paper on a central theme or topic of the course. May be convened with 430a-430b.

533. Aesthetics (3) For a description of course topics, see 433. Graduate-level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 433.

534. Social and Political Philosophy (3) For a description of course topics, see 434. Graduate-level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 434.

536. Games and Decisions (3) For a description of course topics, see 436. Graduate-level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 436.

538a-538b. Philosophy of Law (3-3) For a description of course topics, see 438a-438b. Graduate-level requirements include an in-depth research project on a central theme or topic of the course. (Identical with POL 538a-538b) May be convened with 438a-438b.

540. Metaphysics (3) 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) I 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) I II 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.

551. Philosophy and Psychology (3) For a description of course topics, see 451. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. May be convened with 451.

555. Philosophy and Artificial Intelligence (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. (Identical with PSYC 555) May be convened with 455.

563. Philosophy of Language (3) For a description of course topics, see 463. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. (Identical with LING 563) May be convened with 463.

564. Formal Semantics (3) I (Identical with LING 564)

565. Pragmatics (3) II For a description of course topics, see 465. Graduate-level require-
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 department concerning areas in which research is being conducted.

The major in physics: 36 units, in addition to the general education requirements for the Bachelor of Science degree described in the College of Arts and Sciences section of this catalog. Required courses are 112a-112b, 433, 480a-480b, and 485. 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: 102a-102b, 212.* Introductory Physics (3-3) CDT Designed for liberal arts and life science majors without calculus background. Survey of the basic fields of physics, with emphasis on applications to other fields and historical development. P, high school algebra, geometry, and trigonometry. Both 102a and 102b are offered each semester. Those wishing to take this course as a lecture-laboratory course should register concurrently for 180a or 180b.

104a-104b.* Introductory Physics with Calculus (4-4) Principles of kinematics, dynamics, wave motion and acoustics, thermodynamics, electricity and magnetism, geometrical and physical optics, optical instruments, atomic and nuclear physics. P, CR MATH 125b.

107. The Physics of Music (4) I CDT Sound production, musical instruments, frequency analysis, physics of hearing, psychological and physiological effects, harmony and scales, hall acoustics, electronic production and recording. 3R, 3L.

110.* Introductory Mechanics (4) I II CDT Vector concepts, kinematics, statics, and dynamics for point masses, particle systems, and rigid bodies; conservation laws of energy, momentum, and angular momentum. 4R, 2L. P, MATH 125a, CR, 125b.

111a-111b.* Introduction to Mechanics, Thermodynamics and Relativity (4-4) I II Kinematics and dynamics of particles and rigid bodies, conservation laws, first and second laws of thermodynamics and special theory of relativity. 4R, 2L. P, or CR, MATH 125a for 111a; MATH 125b for 111b.

112a-112b.* Introduction to Electricity, Magnetism, Optics and Quantum Theory (4-4) I II Laws of electric and magnetic fields, dc and ac circuits, Maxwell’s equations, EM waves, physical and geometrical optics, and quantum theory. 4R, 2L. P, 111b, CR, MATH 223 for 112a.

116.* Introductory Electricity and Magnetism (4) I II CDT Field concepts, electrostatics, magnetostatics, currents, electromagnetic phenomena and electromagnetic waves. 4R, 2L. P, 110, CR, MATH 223.


180a-180b. Introductory Laboratory (1-1) Qualitative experiments in physics, both illustrative and exploratory. Designed to accompany 102a-102b. Sections are established corresponding to each course. 3L. P, CR, 102a-102b. Both 180a and 180b are offered each semester.


341. Theoretical Mechanics II (3) I II CDT Continuation of 340; mechanics of the continuum; introduction to variational principles; Lagrange’s equations. P, 410; MATH 254.

415a-415b. Electricity and Magnetism (3-3) CDT Electromagnetic phenomena; Maxwell’s equations. P, 410 or MATH 422a.

420. Optics (3) I II CDT Electromagnetic waves, rays, interference, diffraction, scattering, applications to imaging systems, Fourier methods, holography, and crystal optics. P, 112b. MATH 223.

425. Thermodynamics (3) I II CDT Basic laws of thermal equilibrium; heat engines; ideal and non-ideal gases; phase transitions; introduction to irreversible processes, kinetic theory, and statistical mechanics. P, 112b. MATH 223.

430. Introduction to Biophysics (2) I CDT Concepts and experimental techniques of molecular biophysics, physical properties of biological macromolecules and cell organelles, optical interactions, macromolecular transitions, molecular mechanism or regulation. P, 102b. CHEM 103a-103b. (Identical with MIC 430) May be convened with 530.

433. Physics Demonstrations (1-3) II CDT Introduction to teaching materials and laboratory demonstrations illustrating principles of classical and modern physics, with emphasis on inexpensive techniques and direct experience. Advanced degree credit available for nonmajors only. P, two semesters of physics. May be convened with 533.

435. Introductory Quantum Theory and Atomic Spectra (3) I I CDT Introductory quantum mechanics; solutions of the Schroedinger equation for hydrogen-like atoms; perturbation theory; atomic structure; spectra of one and many electron systems; Zeeman-Paschen-Bach effects; hyperfine structure. P, 330 or 112b, 410, MATH 254, CR, 475a or MATH 413 recommended.
436. Applications of Introductory Quantum Theory (3) I II CDT Applications of quantum theory to molecules, atomic nuclei, elementary particles and simple solids. P, 435. May be convened with 536.

440a-440b. Atomic and Molecular Spectroscopy for Experimentalists (3-3) CDT Experimental techniques to generate, analyze and detect photons from X-ray to IR; interpretation of spectra from gases, liquids, solids and biological macromolecules; light scattering, polarization. P, 330 or 112b. (Identical with OPTI 440a-440b) May be convened with 540a-540b.

445. Experimental Physics 445a-445b-445c are three five-week lecture courses; none is prerequisite to any other.

a. Experimental Spectroscopy (1) I II 5 Laboratory experiments with spectroscopic sources, spectrometers, instrument functions, detectors, light collection optics, spectral recording and analysis. P, 110, 116, 121, or consult department before enrolling. May be convened with 545a.

b. Experimental Acoustics (1) I II Laboratory experiments with sound sources, oscilloscopes, spectrum analyzers, sound levels, filters, musical instruments, recording, room acoustics. P, 110, 116, 121, or consult department before enrolling. May be convened with 545b.

c. Experimental Microscopy, Light Scattering and Optics of Small Particles (1) I II Laboratory experiments with microscopied and polarized scattered light to characterize small particles and surfaces, optical constants, lasers remote sensing. P, 110, 116, 121, or consult department before enrolling. May be convened with 545c.

450. Introductory Nuclear Physics (3) II CDT Basic concepts of nuclear physics: structure and stability of nucleus; nuclear forces; stable systems; nuclear reactions; decay of unstable systems; nuclear radiation characteristics. P, 330 or 112b, MATH 254. May be convened with 550.

460. Introductory Solid-State Physics (3) I II CDT Properties of solids from molecular, atomic, and electronic theory; electric, magnetic, and thermal properties of metals, insulators, and semiconductors; free electron band theories. P, 330 or 112b. May be convened with 560.

475a-475b. Methods of Mathematical Physics (3-3) CDT Vector and tensor analysis; differential and integral equations; Green's functions; variational techniques; linear operator theory, with emphasis on physical applications. P, 410, MATH 254, CR, 415a-415b. May be convened with 575a-575b.

480a-480b. Methods of Experimental Physics I (1 to 3—1 to 3) Designed to develop experimental skills and to demonstrate important concepts in classical and modern physics. 3L, P, two upper-division courses in phys. or CR. Both 480a and 480b are offered each semester, but students are encouraged not to enroll simultaneously. Writing-Emphasis Course. P, 410, MATH 254, CR, 415a-415b. May be convened with 575a-575b.

481a-481b. Methods of Experimental Physics II (1 to 3—1 to 3) Continuation of 480a-480b, with emphasis on individual work. 3 or 6L, P, 480b; ten units of upper-division physics. Both 481a and 481b are offered each semester, but students are encouraged not to enroll simultaneously.

485. Introduction to Computational Physics (3) I An introduction to numerical techniques physicists actually employ to solve real physics problems. Its focus is on problems whose solutions can best be obtained numerically and on the use of the standard mathematics and graphics packages. Sample physics topics include chaos and nonlinear mechanics, quantum perturbation theory and eigenvalues, particle trajectories, and stellar structure. P, 110, 116, 121 or 111a-111b and 112a-112b.

502. Medical Physics (3) I II CDT For a description of course topics, see 402. Graduate-level requirements include an original report demonstrating the ability to construct mathematical models related to one of the diagnostic or therapeutic modalities discussed in the course. P, 104b or 102b and MATH 124 or equivalent. May be convened with 402.

503. Quantum Optics and Lasers (3) I (Identical with OPTI 503)

511. Analytical Mechanics (3) I Laws of motion as developed by Newton, d'Alembert, Lagrange and Hamilton; dynamics of particles and rigid bodies. P, 410.

513. Topics in Advanced Mechanics (3) II Modern topics in classical mechanics, including canonical perturbation theory, invariant mappings, nonintegrated system stochastic behavior and applications to semi-classical quantum theory. P, 511.


528. Statistical Mechanics (3) II Physical statistics; the connection between the thermodynamic properties of a macroscopic system and the statistics of the fundamental components; Maxwell-Boltzmann, Fermi-Dirac, Einstein-Bose statistics. P, 475b.

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 MBIM 530) May be convened with 430.

531. Biophysical Theory (2) II Physical concepts and theories describing biomolecular structure and function, molecular evolution, limits to structure, symmetry, oligomer and virus structure, organelle structure and function. (Identical with MBIM 531)

533. Physics Demonstrations (1-3) II For a description of course topics, see 433. Graduate-level requirements include additional homework problems. P, 435. May be convened with 433.

540a-540b. Atomic and Molecular Spectroscopy for Experimentalists (3-3) For a description of course topics, see 440a-440b. Graduate-level requirements include additional homework problems. P, 330 or 112b. (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) I II For a description of course topics, see 445a. Graduate-level requirements include an in-depth research report on a topic selected in consultation with the instructor. P, 110, 116, 121, or consult department before enrolling. May be convened with 445a.

b. Experimental Acoustics (1) I II For a description of course topics, see 445b. Graduate-level requirements include an in-depth research report on a topic selected in consultation with the instructor. P, 110, 116, 121, or consult department before enrolling. May be convened with 445b.

c. Experimental Microscopy, Light Scattering and Optics of Small Particles (1) I II For a description of course topics, see 445c. Graduate-level requirements include an in-depth research report on a topic selected in consultation with the instructor. P, 110, 116, 121, or consult department before enrolling. May be convened with 445c.

550. Introductory Nuclear Physics (3) I II For a description of course topics, see 450. Graduate-level requirements include additional special topics, to be determined by the instructor. P, 330 or 112b, MATH 254. May be convened with 450.


556a-556b. Electrodynamics of Conducting Fluids and Plasmas (3-3) (Identical with PTYS 556a-556b)


560. Introductory Solid -State Physics (3) I II CDT For a description of course topics, see 460. Graduate -level requirements include an in -depth paper on a topic in solid -state physics. P, 330 or 112b. May be convened with 460.

561. Physics of the Solid State (3) II Elementary excitations in solids, phonons, electrons and holes, excitons, interaction of light with semiconductors, polaritons, high -excitation phenomena, di -electric formalism of optical response, many -body effects in a Coulomb system. P, 460, 570, or OPTI 507 recommended but not formally required. (Identical with OPTI 561)

570a-570b. Quantum Mechanics (3-3) Principles of quantum mechanics; wave mechanics and matrix mechanics; applications to atomic structure and spectroscopy. P, 475a-475b recommended but not required.

571. Symmetry Groups in Physics (3) I Algebraic results of the theory of groups which find repeated applications in atomic, molecular, nuclear and particle physics. Continuous groups, Lie algebras, discrete groups, irreducible tensors. P, 570a-570b.

575a-575b. Methods of Mathematical Physics (3-3) For a description of course topics, see 475a-475b. Graduate -level requirements include advanced examinations, as determined by the instructor. P, 410, MATH 254, CR, 415a-415b. May be convened with 475a-475b.

577a-577b. Theory of Relativity (3-3) 1994-95 Special theory of relativity and its application to mechanics and electrodynamics; tensor calculus and general relativity; relativistic astrophysics and cosmology. P, 475b.

579a-579b. Advanced Relativistic Quantum Mechanics (3-3) Continuous groups; scattering theory; relativistic wave equations; quantum electrodynamics, Feynman diagrams, dispersion theory, renormalization, strong and weak interactions. P, 515b, 570b.


581. Elementary Particle Physics (3) I Production, interaction, and decay of mesons, baryons and leptons; high energy scattering of elementary particles; particle classification and symmetries; theoretical interpretation. P, 435.

582. High Energy Astrophysics (3) II 1994-95 (Identical with ASTR 582)

585. Stellar Pulsation (1-3) [Rpt./5] I II Stellar pulsation, the solar atmosphere, solar seismology and long -term solar variability related to climate.

586. Techniques in Particle Physics (3) II 1994-95 Classification of elementary particles and their interactions with matter, relativistic kinematics, detectors, data acquisition techniques, statistical techniques, analysis of experiments, cosmic radiation, and accelerators.

589. Topics in Theoretical Astrophysics (3) [Rpt.] I Current topics in theoretical astrophysics in depth, with emphasis on the methodology and techniques of the theorist and the cross -disciplinary nature of astrophysics theory. Example subjects are nuclear astrophysics, hydrodynamics, transient phenomena, planetary interiors and atmospheres, neutron stars, jets, and the evolution of star clusters. (Identical with ASTR 589 and PTYS 589)


b. The Physics of Thin Films (3) II P, 460

c. Topics in Colliding Beam Physics (1) [Rpt.9 units] I P, 570a-570b.

643. Quantum Optics (3) II (Identical with OPTI 643)

665. Graduate Physics Laboratory (3) [Rpt./2] I II Introduction to modern research methods and experiments. Problems in low -temperature physics; solid-state, atomic, and nuclear spectroscopy; computer -based data acquisition and analysis; solar -energy physics; and others.

695. Colloquium a. Current Problems in Physics (1) [Rpt./4 units] I II

b. Problems in Computational Science (3) [Rpt./1] I II (Identical with MATH 697, which is home)

Workshop a. Problems in Computational Science (3) [Rpt./1] I II (Identical with MATH 697a, which is home)

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**Physics - Physiology - Physiology**

**Physiological Sciences**

1010 North Martin

Tucson, AZ 85721

(602) 326-0077

**Graduate Interdisciplinary Program in Physiological Sciences**

Committee:

Professors Roger M. Enoka, Chair (Exercise and Sport Sciences), Ronald E. Allen (Animal Sciences), William H. Dantzler (Physiology), Darrel E. Goll (Animal Sciences), Robert W. Gore (Physiology), Joseph F. Gross (Emeritus), Raphael P. Gruener (Physiology), David J. Hartshorne (Animal Sciences), John G. Hildebrand (Division of Neurobiology, Arizona Research Laboratories), Paul C. Johnson (Physiology), Murray A. Katz (Internal Medicine), Otakar Koldovsky (Pediatrics), David L. Kreulen (Pharmacology), Richard J. Lemen (Pediatrics), Timothy G. Lohman (Exercise and Sport Sciences), Robert S. McCuskey (Anatomy), Eugene Morkin (Internal Medicine), William R. Roese (Internal Medicine), Timothy W. Secomb (Physiology), Douglas G. Stuart (Physiology), Charles M. Tipton (Exercise and Sport Sciences), Marc E. Tischler (Biochemistry), Stuart K. Williams (Surgery), Stephen H. Wright (Physiology)

Associate Professors Edmond A. Arbas (Division of Neurobiology, Arizona Research Laboratories), Janis M. Burt (Physiology), Laurel A. Fisher (Pharmacology), Robert J. Gillies (Biochemistry), Patricia B. Hoyer (Physiology), Richard B. Levine (Division of Neurobiology, Arizona Research Laboratories), Paul F. McDonagh (Surgery), Wayne J. Morgan (Pediatrics), Catherine Racowsky (Obstetrics/Gynecology), David J.A. Vleck (Ecology and Evolutionary Biology), Mark E. Wise (Animal Sciences)

Assistant Professors Parker B. Antin (Animal Sciences), Ralph F. Fregosi (Exercise and Sport Sciences), Erik J. Henriksen (Exercise and Sport Sciences), Gail F. Koshland (Physiology), Kevin C. Kregel (Exercise and Sport Science), Howard Y. Lien (Internal Medicine), Ronald M. Lynch (Physiology), Ana M. Pajor (Physiology), John W. Regan (Pharmacology and Toxicology), Andrea J. Yool (Physiology)

Research Assistant Professor Richard C. Schaeffer (Physiology)

The interdepartmental Committee on Physiological Sciences offers graduate work leading to the Doctor of Philosophy 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. 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 transport mechanisms; circulation and respiration, including microcirculation; comparative physiology; endocrinology; exercise physiology; gastrointestinal physiology; muscle physiology; neural mechanisms, including control and neuroendocrinology; 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 William H. Dantzler, Head, Eldon J. Braun, Roger M. Enoka (Ex-
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 offering a program of instruction leading to the Doctor of Philosophy degree with a major in physiological sciences through the Graduate Interdisciplinary Program in 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. are 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, molecular and cellular endocrinology, peripheral vascular physiology, respiratory physiology, gastrointestinal 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 CH E 418 and ECE 418).

419. Physiology Laboratory (2) I Laboratory experiments in physiology intended to provide experience with organ systems and measurement techniques. Designed for engineering students enrolled in the clinical engineering and biomedical engineering options. 6L. Open to nonmajors only. P, 418 or CR. (Identical with CH E 419 and ECE 419).

466. Physiology Laboratory (3) II (Identical with ECOL 466) May be conveled with 566.

468. Comparative Physiology (3) II (Identical with ECOL 468) May be conveled with 568.

480. Human Physiology (4) II Principles of physiology with emphasis on the human; designed primarily for students in pharmacy and health related sciences. Consult department before enrolling. P, CHEM 243b, MATH 123, PHYS 102b, CR, 481. (Identical with TOX 480) May be conveled with 580.

481. Physiology Laboratory (1) II Experiments intended to reinforce principles of physiological phenomena; designed primarily for students in pharmacy and health related sciences. Consult department before enrolling. P, CHEM 243b, MATH 123, PHYS 102b, CR, 481. (Identical with TOX 481) May be conveled with 581.

495. Colloquium
y. Introduction to the Neurosciences I (2) 1993-94 (Identical with MED 495y, which is home) May be conveled with 595y.
z. Introduction to the Neurosciences II (2) 1993-94 (Identical with MED 495z, which is home) May be conveled with 595z.

503. Cellular Physiology (4) I Fundamental responses of living organisms to environmental changes, by examining mechanisms which operate at the cellular level. Topics include organelle structure and function, transmembrane homeostasis and transport phenomena, excitability, intercellular and intracellular communication, cellular mobility, and nerve-muscle-synapse function. P, CHEM 103b, 104b, 241b, 243b; PHYS 102b; MATH 125a-125b; BIOC 460.

566. Physiology Laboratory (3) II (Identical with ECOL 566) May be conveled with 466.

568. Comparative Physiology (3) II (Identical with ECOL 568) May be conveled with 468.

580. Human Physiology (4) II For a description of course topics, see 480. Graduate-level requirements include demonstration of in-depth understanding of human physiology through several written assignments. P, CHEM 243b; MATH 123, PHYS 102b, CR, 580. (Identical with TOX 580) May be conveled with 480.

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, 580. (Identical with TOX 581) May be conveled with 481.

582. Topics in Neural Development (2) II (Identical with NRSC 582).


590. Principles of Systems Neurobiology (4) II (Identical with NRSC 590).

595. Colloquium
a. Mathematical Techniques in Physiology (2) [Rpt./12 units] I II P, MATH 125a-125b, STAT 160.
b. Muscle Physiology (2) [Rpt./12 units] I II P, 503.
c. Endocrinology (2) [Rpt./12 units] I II P, 504.
d. Renal Physiology (2) [Rpt./12 units] I II P, 601/602.
e. Molecular and Cellular Excitability (2) [Rpt./12 units] I II P, 603/604.
f. Peripheral Vascular Physiology (2) [Rpt./12 units] I II P, 601/602.
g. Membranes and Transport (2) [Rpt./12 units] I II P, 602/603.
h. Systems Neurophysiology (2) [Rpt./12 units] I II P, 601/602.
i. Introduction to Personal Computers in Physiology (2) [Rpt./12 units] I II

596. Scientific Writing (2) I, II (Identical with ECOL 596).

601. Systems Physiology (7) II Comprehensive coverage of systemic physiology with emphasis in the underlying principles of function. Permission required to enroll; consult instructor before registering.

605. Human Neuroscience (6) I II (Identical with ANAT 605).

610. Research Methods in Physiology (1-3) [Rpt./10 units] I II 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 ESSS 695a).

696. Seminar
a. Physiology Series (1) [Rpt./3 units] I II Open to majors only.

697. Workshop
a. Physiology Tutorial (3) [Rpt./4 units] I II P, 503, 601. Consult department before enroll-
Planetary Sciences (PTYS)
Space Sciences Building, Room 325
(602) 621-6963

Assistant Professors Timothy D. Swindle
Participating Scientists from the Lunar and Planetary Laboratory:
Senior Research Scientists Lyle A. Broadfoot, Larry A. Lebofsky, Bill R. Sandel Associate Research Scientists Jay B. Holberg, Lon L. Hood
Assistant Research Scientists Robert McMillan, Ann Vickery, Roger Yelle

The Department of Planetary Sciences offers a multidisciplinary program leading to the Master of Science and Doctor of Philosophy degrees with a major in planetary science.

Earth science teaching major: Students interested in teaching secondary school earth science, which includes planetary sciences, should see the listed required courses under Department of Geosciences.

Undergraduate students may obtain a minor in Planetary Sciences. The PTYS minor must include PTYS 403, 411, and six other upper-division units in Planetary Science. The remaining units are chosen by the student and major advisor subject to final approval by the Planetary Sciences Curriculum Committee.

For admission and degree requirements, please see the Graduate Catalog.

105. The Universe and Humanity: Origin and Destiny (3) I II Formation and evolution of the universe, the solar system, and life; events which led to our existence; the future for life in the solar system; life elsewhere. Designed for nonscientists. (Identical with ASTR 105)

106. Survey of the Solar System (4) I II Interdisciplinary synthesis of planetary and space science; the sun, planets, satellites, interplanetary gas, comets, small bodies, space missions. Designed for nonscientists. 3R, 3L.

107. Planet Earth: Evolution of a Habitable World (3) I II History of the Earth as a planet including the origin of the solar system; formation of life; comparative evolution of Earth, Mars, Venus and Titan; global climate change past and present. Designed for nonscientists. P, MATH 117/R.

403. Introduction to the Solar System (3) 1993-94 Survey of planetary physics, planetary motions, planetary interiors, geophysics, planetary atmospheres, asteroids, comets, origin of the solar system. P, PHYS 112a or PHYS 121. (Identical with ASTR 403 and GEOS 403) May be convened with 503.

411. Introduction to Planetary Geology (4) 1994-95 Geologic processes and landforms on satellites and the terrestrial planets, their modification under various planetary environments, and methods of analysis. 3R, 3L.

418. Modern Astronomical Instrumentation and Techniques (3) 1993-94 (Identical with ASTR 418) May be convened with 518.

419. Global Tectonic Processes (3) II (Identical with GEOS 419) May be convened with 519.

41a-441b. Dynamic Meteorology (3-3) (Identical with ATMOS 41a-441b) May be convened with 514a-541b.

503. Introduction to the Solar System (3) 1993-94 For a description of course topics, see 403. Graduate-level requirements include an in-depth research paper on a selected topic and an oral class presentation. This course does not count toward the major requirements in planetary sciences. P, PHYS 112a or PHYS 121. (Identical with ASTR 503 and GEOS 503) May be convened with 503.


510. Principles of Cosmochemistry (3) I 1994-95 Chemical compositions of solar system objects; equilibrium and nonequilibrium chemical processes applied to planets; cosmochronology. (Identical with GEOS 510)

518. Modern Astronomical Instrumentation and Techniques (3) I 1993-94 (Identical with ASTR 518) May be convened with 418.

519. Global Tectonic Processes (3) II (Identical with GEOS 519) May be convened with 419.

520. Meteorites (3) I 1994-95 Classification: chemical, mineralogical and isotopic composition; cosmic abundances; ages, interaction with solar and cosmic radiation; relation to comets and asteroids. P, 510. (Identical with GEOS 520)

523. Statistical Mechanical Problems in the Space Sciences (3) I 1994-95 Foundations of statistical mechanics; fluctuations, noise and irreversible thermodynamics, applications of the statistical mechanics of solid bodies and planetary environments. P, 505a-505b-505c. (Identical with ASTR 523)

530. Chemical Evolution of the Earth (3) I (Identical with GEOS 530)

541a-541b. Dynamic Meteorology (3-3) (Identical with ATMOS 541a-541b) May be convened with 414a-414b.

544. Physics of High Atmospheres (3) I 1993-94 Physical properties of upper atmospheres, including gaseous composition, temperature and density, ozonosphere, and ionospheres, with emphasis on chemical transformations and eddy transport. (Identical with ATMOS 544)

545. Stellar Atmospheres (3) I 1993-94 (Identical with ASTR 545)


545. Evolution of Planetary Surfaces (3) II 1994-95 The geologic processes and evolution of terrestrial planet and satellite surfaces including the Galilean and Saturnian and Uranian satellites. Course includes one or two field trips to Meteor Crater or other locales. (Identical with GEOS 545)

555. Remote Sensing of Planetary Surfaces (3) II 1993-94 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, and case studies in planetary remote sensing. (Identical with ASTR 555 and GEOS 555)


surfaces. Occultation technique for studying rings, surfaces, and atmospheres.

567. Inverse Problems in Geophysics (3) I 1994-95 (Identical with GEOS 567)

571. Terrestrial Planets (3) I 1993-94 Geophysical and geochemical techniques used to deduce composition and evolution of terrestrial planets. Topics include the Earth, Moon, Mars, Venus, and meteorites. (Identical with GEOS 571)

582. High Energy Astrophysics (3) II 1993-94 (Identical with ASTR 582)

583. Thermodynamics in Geosciences (3) I (Identical with GEOS 583)

589. Topics in Theoretical Astrophysics (3) [Rpt.] I (Identical with PHYS 589)

594. Practicum
a. Planetary Geology Field Studies (1) [Rpt.] III II Field trip

596. Seminar
a. Frontiers of Cosmochemistry (3) [Rpt./4] II 1994-95 P. 510, GEOS 457

Planning (PLNG)

Graduate Interdisciplinary Program in Planning

Committee:

Professors Kenneth N. Clark, Chair (Architecture), Robert B. Bechtel (Psychology), Michael Bonine (Geography), Nathan Buras (Hydrology and Water Resources), Hanna J. Cortner (Renewable Natural Resources), Kennith E. Foster (Arid Lands), Lay J. Gibson (Geography), Robert C. Giebner (Architecture), R. Frank Gregg (Emeritus), William Havens (Landscape Architecture), Robert Hersberger (Architecture), Helen M. Ingram (Political Science), David A. King (Renewable Natural Resources), W. Kirby Lockard (Emeritus), Lawrence D. Mann (Geography), Fred S. Matter (Architecture), Gordon F. Mulligan (Geography), Phil R. Ogden (Range Management), Richard W. Reeves (Geography), Sandra Rosenbloom (Architecture), Thomas F. Saarinen (Geography), Arthur L. Silvers (Public Administration and Policy), Soroosh Sorooshian (Hydrology and Water Resources), Ervin H. Zube (Renewable Natural Resources)

Associate Professors D. Robert Altschul (Geography), Harry Der Boghiosian (Architecture), Michael D. Bradley (Hydrology and Water Resources), Nader V. Chalfoun (Architecture), Dennis C. Doxtater (Architecture), H. Randall Gimblett (Renewable Natural Resources) Charles E. Glass (Mining and Geological Engineering), Alfredo R. Huete (Soil and Water Science), Stuart E. Marsh (Arid Lands Resource Sciences), David A. Plane (Geography), Charles M. Foster (Architecture), Donald C. Wilcox (Renewable Natural Resources), Robert H. Wortman (Civil Engineering), Assistant Professor D. Phillip Guertin (Watershed Management)

The interdisciplinary program in Planning directs a graduate professional program leading to the Master of Science degree with a major in Planning.

The major consists of 54 units: 36 units of core course work and 18 units in a chosen area of concentration. Core courses include 500, 544, 557, 584, 605, 611, 657, 693, 696, and Law 660. Areas of concentration include: arid lands (addressing development in arid environments), community design (focusing on physical dimensions of urban design), environmental planning (addressing behavioral aspects of environmental issues), regional planning (emphasizing mainstream urban and regional land-use development), renewable natural resources (allowing both resource management and landscape design options), transportation planning (addressing travel forecasting and facilities design), and water resources (allowing both analytical and policy options).

The program requires completion of a projects course. A comprehensive written examination or professional report must be completed as part of the 54 units of course work. Internship experience is required and students are expected to field applications in other course work as well. The program is specifically designed to expose students to the interdisciplinary nature of most planning problems. The course work provides a mixture of theoretical and practical perspectives on diverse planning issues.

Interested persons should contact the program chairs for further information.

110. Regional Land Use (3) II (Identical with GEOG 110)

301. Introduction to Regional Planning (3) II (Identical with GEOG 301)

379. Urban Growth and Development (3) I II (Identical with GEOG 379)

444. Site Planning (3) II (Identical with ARCH 444) May be convened with 544.

453. Location Analysis (3) I (Identical with GEOG 453) May be convened with 553.

456. The American City (3) I (Identical with GEOG 456)

457. Statistical Techniques in Geography, Regional Development and Planning (3) I (Identical with GEOG 457) May be convened with 557.

459. Land Use and Growth Controls (3) II (Identical with GEOG 459) May be convened with 559.

461. Population and Resources (3) II (Identical with GEOG 461)

468. Urban Transportation Planning (3) II CDT (Identical with CE 468) May be convened with 568.

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

473. Geology and the Urban Environment (3) II (Identical with GEOG 473) May be convened with 573.

476. The Land Development Process (3) I II (Identical with GEOG 476) May be convened with 576.

481. Computer Cartography (3) II (Identical with GEOG 481) May be convened with 581.

483. Geographic Applications of Remote Sensing (3) II (Identical with GEOG 483) May be convened with 583.

484. Planning the Built Environment (2) I (Identical with ARCH 484) May be convened with 584.

497. Workshop
i. Community Design for Non-Designers (3) I (Identical with ARCH 497i, which is home) May be convened with 597i.

500. Ecosystemology for Urban Planning (3) I (Identical with HWR 500)

504. Public and Policy Economics (3) (Identical with PA 504)

510. Development of Regional Planning (3) I (Identical with GEOG 510)

514. Analytic Methods in Planning and Management (3) II (Identical with PA 514)

523. Health and Public Policy (3) II (Identical with PA 523)

527. Aging and Public Policy (3) I (Identical with PA 527)

544. Site Planning (3) II (Identical with ARCH 544) May be convened with 444.

550. Metropolitan and Regional Planning (3) I (Identical with GEOG 550)

553. Location Analysis (3) I (Identical with GEOG 553) May be convened with 453.

556. Urban Systems Analysis (3) II (Identical with GEOG 556)

557. Statistical Techniques in Geography, Regional Development and Planning (3) I (Identical with GEOG 557) May be convened with 457.

559. Land Use and Growth Controls (3) II (Identical with GEOG 559) May be convened with 459.

561. Resource Management (3) II (Identical with GEOG 561)

563. Perception of Environment (3) I II (Identical with GEOG 563)

565. Project Planning and Modeling (3) II (Identical with CE 565)

567. Geographical Analysis of Population (3) I (Identical with GEOG 567)

568. Urban Transportation Planning (3) II CDT (Identical with CE 568) May be convened with 468.
Plant Pathology (PLP)

Forbes Building, Room 104

(602) 621-1828


Associate Professors H. Earl Bloss (Emeritus), Martha C. Hawes, Christina K. Kennedy, Assistant Professors Marc Orbach, landmark S. Pierson III, Zhongguo Xiong

Adjunct Professors George Cummins, John S. Niederhauser

Research Associate Professor Mary Olsen

Research Assistant Professor Elizabeth Pierson

Associate Extension Specialist/Research Scientist Michael E. Matheron

Associate Research Scientist, Mary Olsen

(Environmental Research Lab)

The department offers programs leading to the Master of Science and Doctor of Philosophy degrees with a major in plant pathology. Subject areas within the department include mycology, nematology, virology, and microbiology.

For graduate admission and degree requirements, consult the Graduate Catalog.

596. Seminar

a. Current Research (1-3) [Rpt./8] I II


602. Signal Exchange in Plant Root-Microbe Interactions (3) II 1993-94 Examination of the theoretical understanding of factors that influence both pathogenic and beneficial microbial associations with plant roots. Physical, biochemical, and molecular aspects of plants and their associated microorganisms presented through a combination of lectures and discussions of current literature in the field. P, BIOC 560, PL P 305 or consent of instructor.


612. Biological Electron Microscopy (4) I (Identical with MCB 612)

621. Molecular Plant-Microbe Interactions (3) II 1994-95 Molecular properties that control development of host, parasite, and symbiotic relationships. Contemporary molecular hypotheses are related to genetic and biochemical data available on disease resistance and pathogenesis. P, BIOC 460, (Identical with BIOC 621 and MCB 621)

695. Practicum

a. Clinical Plant Pathology (1-3) [Rpt./2] I II P, 451


695. Colloquium

a. Current Topics in Plant Biology (1) I II

b. Advanced Plant Pathology (4) I Topics include major concepts in classical and molecular genetics of plant-pathogen interactions, physiology, biochemistry, and molecular biology of plant pathogenesis; principles of plant epidemiology and theories and practices of plant disease control. P, 305 or equivalent.

The Department of Plant Sciences provides education to prepare a student for a wide range of opportunities in plant-related sciences and agriculture. The Bachelor of Science in Agriculture is available to undergraduate students with a major in plant sciences.

The department also offers the Master of Science and Doctor of Philosophy degrees with a major in plant science. For graduate admission and degree requirements, consult the Graduate Catalog.

Undergraduate students must complete course work in five of the six study areas, as listed under the general education requirements in the College of Agriculture section of this catalog.

**Plant sciences majors:** The following courses are required: CHEM 103a-103b, 104a-104b, 241a, 243a and either 241b/243b or BIOC 460; MATH 124; MCB 181; PHYS 180a and either 102a or 103a; PL S 100, 101, 312, 450, 495a, SW 200, 201 and a course in crop/plant physiology. Each major is required to develop an area of emphasis within the department by completing an additional minimum of 12 upper-division units chosen from departmental or closely related courses and selected in consultation with a major advisor. The areas of interest include ornamental/landscape horticulture, crop science, turfgrass culture, fruit/vegetable/nut production, general plant biology.

The agricultural business curriculum: Students selecting this curriculum may major in plant sciences. Students must complete the requirements for the major as indicated above with the exception that one of the following courses is required: PL S 405; ENTO 151 or 201R; or PL P 305. Additional course requirements for the agricultural business curriculum are ACCT 200; AREC 213, 215, 450, and three courses from the following: ECON 300, 330; ACCT 210; MAP 320; AREC 213, 313, 403, or 404.

The minor in plant sciences: Students may obtain a minor in plant sciences. Twenty units are required from the departmental course offerings with the prerequisites satisfied prior to taking the course. Courses will be selected depending on the area of the student's interest and in consultation with a minor advisor.

**100. Plant Science (3) I II Germination, emergence, growth, and reproduction of important economic plant species; how these plant processes are influenced by the environment.**

**100H. Plant Science (3) I II Germination, emergence, growth, and reproduction of important economic plant species; how these plant processes are influenced by the environment.**

**101. Plant Sciences Laboratory (1) I II Laboratory exercises in plant sciences. 3L, P, 100 or CR.**

**101H. Plant Sciences Laboratory (1) I II Laboratory exercises in plant sciences. 3L, P, 100 or CR.**

**195. Colloquium**

b. Agriculture as a Science (1) II (Identical with ENTO 195b and PL P 195b).

**220. Microcomputing Applications (3) I II (Identical with ABE 220).**

**312. Plant Genetics (4) II Critical examination of the various theories of heredity and their application to plant breeding, including demonstrations illustrating genetic factors in economic plants. 3R, 3L, P, 100, 101, or MCB 182, CHEM 103a, 104a.**

**330. Plant Propagation I: Sexual & Asexual Reproduction (3) I Principles and practices of plant propagation by seed and asexual methods, including use of growth regulators, rooting media and misting systems. Physiological basis of propagation methods will be emphasized. 2R, 3L, P, 100, 101, and either MCB 181 or ECOL 260.**

**355. Plant Materials (4) II (Identical with L AR 335).**

**339. Nursery Systems Management (3) I II 1994-95 Principles and practices of nursery operations: control of environmental factors and cultural practices involved in nursery production of plants. 2R, 3L, P, 100, 101.**

**354. Landscape Horticulture (3) I II 1993-94 Horticulture practices which influence performance of plants in the landscape. Installation, establishment and maintenance of plants in the landscape. 2R, 3L, P, 100, 101, SW 200.**

**355. Turfgrass Science and Culture (3) I II 1994-95 Species, growth and development, use and establishment, and environmental stresses influencing cultural practices. P, 100, 101 or MCB 181, ECOL 260.**

**368. Principles of Grassland Agriculture (3) I II 1994-95 Adaptation, culture, and growth of legumes, grasses, and other forage plants. All-day field trip. P, 100, 101.**

**405. Weed Science (4) I Principles and effects of controlling agronomic and horticultural weeds, with emphasis on chemical control methods; weed identification. 2R, 3L, P, ECOL 260 and SW 200 (ECOL 302 recommended). May be convened with 505.**

**408. Arid Land Crop Ecology (3) I II Physical and biotic environment of crops in relation to crop culture, production, and geographical distribution; relations among the human population, crop productivity, and man's environment. P, ECOL 260, MCB 181, MCB 182. May be convened with 508.**

**415. Principles of Plant Breeding (3) I Application of the principles of genetics, botany and statistics to the improvement of plants. P, 312 or ECOL 320. May be convened with 515.**

**430. Plant Propagation II: Plant Cell and Tissue Culture (3) I Principles and theory of plant tissue culture. Commercial and experimental applications of micropropagation, plant cell/protoplast culture, and plant transformation techniques. 2R, 3L, P, PL S 312 or MCB 181, PL S 330 or consent of instructor. May be convened with 530.**

**450. Developmental Plant Anatomy (4) I Structure, function and development of vascular plants. 3R, 3L, P, 100 or MCB 181. May be convened with 550.**

**460. Plant Physiology (4) I Introduction to water relations, photosynthesis, respiration, growth and development of higher plants. 3R, 3L, P, 100 or MCB 181. (Identical with ECOL 460 and MCB 460) May be convened with 560.**

**463. Plant-Water Relations (3) I II Analytic approach to the study of water movement into and through plants; development of internal water deficits and their significance to physiological processes. P, 460 or ECOL 260. (Identical with WS M 463) May be convened with 563.**

**473. Recombinant DNA Methods and Applications (4) II (Identical with MCB 473).**

**475. Physiology of Crop Production (3) I II Plant processes, modifications, and environmental interactions in relation to growth of crop plants, with emphasis on recent advances and research techniques. P, 460. May be convened with 575.**

**495. Colloquium**

a. Senior Seminar (1) I II Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

**496. Seminar**

d. Plant-Insect Interactions (1) [Rpt/5] I II (Identical with ENTO 496d) May be convened with 596d.

**505. Weed Science (3) I For a description of course topics, see 405. Graduate-level requirements include a research paper on an approved subject. P, ECOL 260, ECOL 302, CHEM 241, SW 200. May be convened with 405.**
508. Arid Land Crop Ecology (3) II For a description of course topics, see 408. Graduate-level requirements include preparation of in-depth research project. P. ECOL 260, MCB 181, MCB 182. May be convened with 408.

509. Information Sources for Agricultural Scientists (1) Information systems and retrieval techniques, with particular reference to concepts, uses and limitations; emphasis on abstracts, indexes, alerting services, journals and government documents. (Identical with LI S 509)


511. Principles of Plant Breeding (3) I For a description of course topics, see 415. Graduate-level requirements include participation in experimental exercises in simulated recurrent selection. P. 312, or ECOL 320. May be convened with 415.

512. Plant Propagation II: Plant Cell and Tissue Culture (3) II For a description of course topics, see 430. Graduate-level requirements include measurement of gene expression. P. 4 units. (Identical with GENE 512)

513. Developmental Plant Anatomy (4) I For a description of course topics, see 450. Graduate-level requirements include preparation of in-depth research project. 3R, 2L. P. 100 or MCB 181. May be convened with 450.

514. Economic Botany of Arid Lands (3) I 1993-94 Examines past, present, and potential future industries based on plant resources in arid lands. Survey of useful products from arid lands, their biosynthesis and physiological function, taxonomic and geographic sources, and their role in local and global economies. P. 460. (Identical with AR L 541)

515. Plant Anatomy (4) I For a description of course topics, see 450. Graduate-level requirements include preparation of in-depth research project. 3R, 2L. P. 100 or MCB 181. May be convened with 450.

516. Plant Physiology (4) I For a description of course topics, see 460. Graduate-level requirements include preparation of an analytical paper on selected areas in plant physiology. P. 100 or MCB 181. CHEM 241a, 243a. (Identical with ECOL 560 and MCB 560) May be convened with 460.

517. Plant Intermediary Metabolism (3) II 1994-95 Selected topics in plant metabolism and photosynthesis. P. 460. (Identical with MCB 562)

518. Plant Water Relations (3) II For a description of course topics, see 463. Graduate-level requirements include preparation of an in-depth research project. P. 460 or ECOL 260. (Identical with WS M 563) May be convened with 463.

519. Plant Growth and Development (3) II 1993-94 Selected topics in growth and development. P. 460. (Identical with MCB 564)

520. Recombinant DNA Methods and Applications (4) II (Identical with MCB 573)

521. Physiology of Crop Production (3) II For description of course topics, see 475. Graduate-level requirements include preparation of in-depth research project. P. 460. May be convened with 475.

522. Seminar d. Plant-Animal Interactions I (3) [Rpt./5] I (Identical with BIOL 522) P. 460. (Identical with Ref S 509)

523. Advanced Genetics (3) II 1994-95 Advanced topics in genetics, selected from strand and tetrad analysis, chromosome structure and organization, recombination at the molecular level and gene conversion, mutation classifications and origins; genetic complementation and its relation to a genetic unit and its function. P. 312 or ECOL 320. (Identical with GENE 627)

524. Theory of Plant Breeding (3) II 1994-95 Critical study of the theoretical basis for plant breeding procedures. P. 415 or 515.

525. Advanced Cytogenetics (4) I 1994-95 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. 4 units. (Identical with GENE 635)

526. Colloquium a. Current Topics in Plant Biology (1) I (Identical with PL P 695a)

527. Seminar a. Plant Science (1) [Rpt./4] II

Political Science (POL)

Social Sciences Building, Room 315
(602) 621-7600

Professors James W. Clarke, Richard C. Cortner, Helen M. Ingram, Conrad F. Joyner (Emeritus), Paul Kelso (Emeritus), Clifford M. Lyle, Edward N. Muller, Jerrold G. Rusk, John E. Schwarz, Michael P. Sullivan, Peter A. Toma (Emeritus), John C. Wahlke (Emeritus), Allen S. Whiting, Edward J. Williams, Clifton E. Wilson (Emeritus)

Associate Professors John A. Garcia, Head, Phillip C. Chapman, Jeanne Nienaber-Clarke, John E. Crow (Emeritus), William J. Dixon, Jerrold D. Green, Donald R. Hall (Emeritus), Thomas M. Holm, Barbara Norrander, Daniel J. O'Neill, Lyn Ragdsdale, Thomas J. Vogler, John F. Willerton

Assistant Professors Paul G. Buchanan, David Gibbs, Deborah R. Mathieu, Cary Nederman, V. Spike Peterson, David Wilkins

Adjunct Professor R. Frank Gregg (Emeritus)

The Department of Political Science offers courses on the philosophies, processes, organizations, methods, and policies of government and related political institutions. These courses focus on government and politics in the United States and foreign countries and also on how governments of different nations relate to one another. Political science instruction is useful for pursuing careers in government, politics, law, business, education, journalism, and the media.

The department offers the degrees of Bachelor of Arts, Master of Arts, and Doctor of Philosophy with a major in political science. A Bachelor of Arts in Education and a Master of Education with a teaching major in political science are also available. For information on graduate degrees, please see the Graduate Catalog.

The major: Thirty units of course work in political science must be taken, including 102 and at least one of the following: 100, 120, 140, 160. At least 18 units of this course work must be upper-division courses (300- and 400-level courses). Individual study cannot be used to satisfy this 18-unit requirement. Students must also take courses from five of the six fields of study listed below.

The minor: Twenty units of course work must be taken, with a concentration in one of the six subfields recognized by the department. No fewer than 12 hours shall be taken in one subfield; 102, 120, 140 or 160 may be included as part of the 12 hours. At least nine units in the minor must be upper division.

The teaching minor: Twenty units of course work in political science must be taken. Of the total twenty units, twelve must be taken in one of the six subfields. In addition, one of the lower-division courses — 100, 120, 130, or 160 — must be within the appropriate subfield.

Teacher certification: The U.S. and Arizona Constitutions requirement for a teacher's certificate may be satisfied by two course options: 102, 130, 102, 214. An additional option is the constitution examination, which carries no university credit.

Fields of study: The department is divided into six substantive areas or fields of study. Some of these fields, with appropriate course listings, are as follows:


Special programs: Majors interested in law, civil service, or foreign service should consult the department's career
advisors regarding an appropriate course of study. Internships are offered in connection with the State Legislature, the Public Defender, the Juvenile Court, administrative agencies of the City of Tucson and Pima County, and the U.S. Congress. Three credits of internship can be counted toward the minimum thirty units for the major. It does not fulfill the upper-division or sub-field requirements for the major. Prelaw students interested in legal problems of American Indians may combine prelaw and American Indian policy courses in the Department of Political Science with the minor in American Indian studies.

The department participates in the honors program.

100. Introduction to Politics (3) I II Issues in contemporary political analysis; human values and political goals; how governments differ and why they change; how nations influence one another. Not open to students with previous credit in 140, 120, or 160.


120. Introduction to International Relations (3) I II Study of the international system, its actors and their capabilities; ends and means of foreign policy; international tension, conflict, and cooperation.


140. Introduction to Comparative Politics (3) I II Survey of the major political systems and analysis of comparative political concepts, with a view to preparation for more advanced study.

160. Introduction to Political Ideas (3) I II Basic issues in political thought, with emphasis on contemporary problems of democracy, liberty, authority, obligation, and ideology.

205. The American Presidency (3) I II Political dynamics of the executive office and its relationship to the competitive branches of government within the American political system.

206. Public Policy and Administration (3) I II Theory and practice of executive agencies, including policy making and other functions, processes, personnel and fiscal management, and administrative law. (Identical with PA 206)

214. Arizona Government (1) Arizona constitution. Offered through correspondence only.

231. Political Parties in an Age of Media and Money (3) I II American two-party system; party organization and activists; party roles in media, money, nominations, elections, and campaigns; party influence in government; the future of parties.

240. Canadian Government and Politics (3) I Canada as a North American alternative: political culture, English-French relations, structures and processes, problems of federalism, environmental policies, Canadian-U.S. relations.

242. Western European Political Systems (3) I II Examination of the ideological framework, political culture, functions and processes of the Western European political systems.

247. Introduction to Latin-American Politics (3) I II Survey of the political forces and social groups important in shaping contemporary Latin America; examination of Indians, slaves, peasants, landlords, labor, the middle sectors, and the military; discussion of theories of instability.

250. Contemporary International Politics (3) I II Analysis of conflicts of national interests; decision making in the present international system; role-playing and simulation experience.

270. Colonization and Native People (3) I II An overview of various colonial models and definitions. Includes individual studies of the relations between the Ainu and Japan, American Indians and the United States, the Sami and Norway, and the Maori and New Zealand. (Identical with AINS 270)

280. Politics and the Vietnam War (3) I II The American experience in Vietnam in terms of generational politics, foreign and military policy-making processes, the sociopolitical aspects of the war, and American political culture.

290. Politics and the Novel (3) I II Discussion and analysis of significant political questions as seen through the eyes of 19th and 20th century novelists, including Camus, Forster, Naipaul, Penn Warren, Didion, Dostoevsky, and Zola. (Identical with ENGL 290)

297. Workshop (3) I II Open to participants in Model U.N. programs only.

309. The Judicial Process (3) I II Structure, function, and processes of the "third branch" of the American government.

315. Political Sociology (3) I II (Identical with SOC 315)

328. Problems in Contemporary Political Theory (3) I II Intensive examination of selected problems and concepts in political theory. P, 160 or PHIL 110, 113, or 121.

330. Minority Groups and American Politics (3) I II Political problems of the poor; analysis of systemic poverty in the U.S. and theories of causation; selected policy problems: education, housing, job training, enforcement of antidiscrimination statutes; future of "power" movements. (Identical with AAS 330 and MAS 330)

332. Politics of the Mexican-American Community (3) I II Political structure and processes of the Mexican-American community, with emphasis on history, schooling, political behavior, and class; future trends; bibliography. (Identical with MAS 332)

334. Politics and American Indians (3) I II Examination of public policy on American Indians and analysis of the political culture of American Indian communities. (Identical with AINS 334)

335. Gender and Politics (3) I II Examination of politics through the lens of gender hierarchy: emphasis on how conceptions of masculinity and femininity shape and are shaped by interacting economic, political and ideological practices. P, W S 100 (Identical with W S 335)

350. Politics and the Health Care System (3) I II Analysis of social, economic, political, ethical, and legal problems in the practice, administration, and allocation of health care services, and discussion of proposals for alternative arrangements.

373. Political Geography (3) I II (Identical with GEOG 373)

377. Modern Israel (3) (Identical with JU S 377)

388. Immigration and Refugee Policy (3) I II Analysis of constitutional, legal, historical, and political consequences of U.S. immigration and refugee policy. Recent trends. Foreign and domestic policy effects of migration. (Identical with LA S 388)

402. American National Government (3) I II Political problems of the poor; analysis of systemic poverty in the U.S. and theories of causation; selected policy problems: education, housing, job training, enforcement of antidiscrimination statutes; future of "power" movements. (Identical with AAS 330 and MAS 330)

403. American National Government (3) I II Political problems of the poor; analysis of systemic poverty in the U.S. and theories of causation; selected policy problems: education, housing, job training, enforcement of antidiscrimination statutes; future of "power" movements. (Identical with AAS 330 and MAS 330)


406. Bureaucracy, Politics, and Policy (3) I II 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. P. 102. May be convened with 506. (Identical with PA 406)

407. Congress and American Politics (3) I II Examination of election politics, 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. P. 102. May be convened with 507.

408. Parliamentary Procedure (3) I II (Identical with COMM 408)

410. Struggle for the Presidency (3) I (Identical with COMM 410) May be convened with 510.

412. Local Government and Administration (3) I II Examination and analysis of local decision-making structures and their policy outputs. P. 102, 130. May be convened with 512.

421. Ancient and Medieval Political Theory (3) I II Development of Western political theory from the Greeks to Machiavelli. P. 102, 160 or PHIL 110, 113, or 121. May be convened with 521.
422. Early Modern Political Theory (3) II Western political theory from Machiavelli to Marx. P, 102, 160 or PHIL 110, 113, or 121. May be convened with 522.

423. Recent Political Thought (3) II Political theory from Marx to the present. P, 102, 160 or PHIL 110, 113, or 121. May be convened with 523. Writing-Emphasis Course*

426. American Political Thought (3) II American political ideas from colonial times to the present. P, 102, 160 or PHIL 110, 113, or 121.

427. Marxism and its Critics (3) II A critical survey of the main currents of Marxism from Marx to the present. P, junior standing. May be convened with 527.

431. Political Culture and the Dynamics of Change in American Society (3) II Examination of the manner 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. P, 102. May be convened with 531.

432. Pressure Groups (3) I Formation, structure, and place of pressure groups in the democratic society; the function of interest groups in the political process; problems of leadership, internal organization, and membership loyalties. P, 102. May be convened with 532. Writing-Emphasis Course*

434. Quantitative Analysis of Political Problems (3) I Introduction to the use of statistics on political data, with emphasis on statistical manipulation; evaluation and interpretation of statistical explanations of political phenomena. P, 102.

435. Public Opinion and Voting Behavior (3) I Attitude and opinion formation and socialization; public opinion in the political process; the relationship between attitudes, opinion, and voting behavior in American politics. P, 102. May be convened with 535.

436. Political Socialization (3) II Description and analysis of how and why people wield, leadership, internal organization, and membership loyalties. P, 102. May be convened with 532. Writing-Emphasis Course*

441. Arab-Israeli Conflict (3) II 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. P, 102. (Identical with NES 441) May be convened with 541.

442. Transformation of Agrarian Societies in the Middle East (3) II (Identical with NES 442) May be convened with 542.

443. Soviet Politics (3) I Revolution and contemporary ideology; state, party, and mass organizations; economic and social planning; civil liberties; models of autocracy and pluralism. P, 102. (Identical with RSS 443) May be convened with 543. Writing-Emphasis Course*

444. East European Political Development (3) II Presentation of strategies for development in Latin America; exploration of the socio-economic, social, and cultural reform. P, 102. 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. P, 140. May be convened with 545. Writing-Emphasis Course*

447. Latin-American Political Development (3) II Presentation of strategies for development in Latin America; examination of case studies from Cuba, Brazil, Chile, Guatemala, and other countries. Open to juniors and seniors only. P, 102. (Identical with LA S 447) May be convened with 547. Writing-Emphasis Course*

448. Government and Politics of Mexico (3) I Description and analysis of Mexico's political economy, its political system, and its foreign policy, with emphasis on Mexican-U.S. relations. P, 102. (Identical with LA S 448 and MAS 448) May be convened with 548.

449. The Politics of Cultural Conflict (3) II Comparative examination of the approaches of different types of political systems to domestic conflict of a racial, religious, linguistic, and/or ethnic nature. P, 102. May be convened with 549.


451. Soviet Foreign Policy (3) I Ends and means of Soviet foreign policy; the decision-making process; Soviet relations with the West and developing nations. P, 102. (Identical with RSS 451) May be convened with 551.

452. Communist Foreign Relations (3) II Interrelations of fourteen Communist-party states, with emphasis on cooperation and conflict in such organizations as the Comecon and the Warsaw Pact. P, 102. May be convened with 552.

453. Revolution, Insurgencies, and Guerrilla Movements (3) I Exploration of the socio-political and economic origins of revolutionary and guerrilla movements, the strategies adopted by insurgent groups, and guerrilla tactics. Open to juniors and seniors only. P, 458/558. May be convened with 553. Writing-Emphasis Course*

454. Theories of International Relations (3) I Introduction to theories of international relations on the levels of man, the nation-state, and the international system, with a logical and empirical evaluation of approaches and theories. P, 102, 120 or 250, 267. May be convened with 554.

455. American Foreign Policy (3) I Analysis of the Cold War; Congressional-Executive clashes over foreign policy control; approaches to policy analysis. P, 102. May be convened with 555.

456. International Law (3) The international state system; legal-political problems, including territory, environment, seas. P, 102, 120, or 250. May be convened with 556. Writing-Emphasis Course*

457. Inter-American Politics (3) I Survey and analysis of the leading political and economic issues at controversy between the United States and Latin America. P, 102. (Identical with LA S 457) May be convened with 557.

458. Civil-Military Relations in the Third World (3) I Examination of the role of the armed forces in the Third World, comparing and contrasting Third World military organization and strategic perspective with those of First and Second World militaries. Juniors and seniors only. May be convened with 558. Writing-Emphasis Course.*

460. Modern Chinese Foreign Relations (3) II 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. P, 120. (Identical with CHN 460) May be convened with 560.

461. Feminist and IR Theories (3) II Issues in epistemology; survey and integration of feminist and IR theories; application of feminist theories to IR. P, WS 100 and POL 120 or 250. (Identical with WS 461) May be convened with 561.

464. International Relations of East Asia (3) II National interests, issues and conflicts, relations, and influence of domestic politics in interstate relations in East Asia. P, 102. (Identical with EAS 464) May be convened with 564.

467. Population and Development in the Middle East (3) I (Identical with NES 467) May be convened with 567.


471. Constitutional Law: Civil Liberties (3) I II Analysis of the constitutional guarantees of civil liberties in the U.S. P, 102. May be convened with 571.

474. Administrative Law (3) I Law governing the organization, powers, and procedures of the executive and administrative establishment, with emphasis on the limitations im-
posed by the American constitutional system. P, 102. May be convened with 574.
475. Concepts in Criminal Law (3) II Focus on questions such as what constitutes a crime; when is killing murder; what makes punishment just; what distinctions exist between justifiable and excusable crimes. P, 102.
476. Women and the Law (3) I Legal status of women in America, including constitutional protections, marriage and family relationships, educational and vocational opportunities, political rights, criminal law. P, 102. (Identical with W S 476) May be convened with 576.
478. American Indians and the Supreme Court (3) I II Examination of the U.S. Supreme Court as a policy-making institution; with analysis of major court opinions affecting tribal sovereignty and individual Indian rights in such areas as tribal status and federal relations, treaty law, Indian land title, jurisdiction. P, 334 (Identical with AINS 478) May be convened with 578.
480. Formation of Public Policy (3) I Needs and demands for public action on policy issues; organization and nature of political support; processes and problems of decision making in the formation of public policy at the national, state, and local levels. P, 102. (Identical with PA 480) Writing-Emphasis Course*
481. Environmental Policy (3) II Role of government in management of energy, natural resources and environment; process and policy alternatives; special attention to the Southwest. P, 102. (Identical with HWR 481 PA 481 and RNR 481) May be convened with 581.
483. Urban Public Policy (3) I II Analysis and discussion of social, economic, and political problems and proposed solutions in changing urban environments. P, 102. May be convened with 583.
486. Political Systems of India and Pakistan (3) II (Identical with NES 486) May be convened with 586.
488. Governing Science and Technology (3) II (Identical with GEOG 488).
498. Public Choice (3) II (Identical with ECON 489) May be convened with 589.
496. Seminar
   a. Russian and Soviet Studies I (3) (Identical with RSS 496a, which is home) *Writing-Emphasis Course. P; satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of the catalog).
505. Government and Economic Well-being (3) I II For a description of course topics, see 405. Graduate-level requirements include additional reading assignments and a more detailed paper. May be convened with 405.
506. Bureaucracy, Politics, and Policy (3) I For a description of course topics, see 406. Graduate-level requirements include an additional research paper. May be convened with 406.
507. Congress and American Politics (3) I II For a description of course topics, see 407. Graduate-level requirements include a much higher level of performance on term paper or research paper, and/or an additional paper of 8-10 pages. May be convened with 407.
510. Struggle for the Presidency (3) I (Identical with COMM 510) May be convened with 410.
512. Local Government and Administration (3) I II For a description of course topics, see 412. Graduate-level requirements include a reading assignment of at least two additional textbooks and writing an essay on each. P, 130. May be convened with 412.
521. Ancient and Medieval Political Theory (3) I For a description of course topics, see 421. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 421.
522. Early Modern Political Theory (3) II For a description of course topics, see 422. Graduate-level requirements include additional research, readings, and paper(s). May be convened with 422.
523. Recent Political Thought (3) I II For a description of course topics, see 423. Graduate-level requirements include an extended bibliography, with notes and commentary on readings submitted at the end of the semester. May be convened with 423.
526. Cross-National Research Methods (3) II (Identical with SOC 526).
527. Marxism and its Critics (3) I II For a description of course topics, see 427. Graduate-level requirements include a research term paper of 15-25 pages with a bibliography, as well as a beginning research bibliography. P, junior standing. May be convened with 427.
531. Political Culture and the Dynamics of Change in American Society (3) I I For a description of course topics, see 431. Graduate-level requirements include additional research and paper. May be convened with 431.
532. Pressure Groups (3) I II For a description of course topics, see 432. Graduate-level requirements include a much higher level of performance of term paper or research paper. Additional readings and essays on those readings may also be required. May be convened with 432.
535. Public Opinion and Voting Behavior (3) I II For a description of course topics, see 435. Graduate-level requirements include additional research, readings, and paper(s). May be convened with 435.
536. Political Socialization (3) I II For a description of course topics, see 436. Graduate-level requirements include an extensive research paper. May be convened with 436.
537. Democracies, Emerging and Evolving (3) I For a description of course topics, see 437. Graduate-level requirements include extensive reading and a research paper. (Identical with LA S 537) May be convened with 437.
538a-538b. Philosophy of Law (3-3) (Identical with PHIL 538a-538b) May be convened with 438a-438b.
541. Arab-Israeli Conflict (3) I II For a description of course topics, see 441. Graduate-level requirements include an additional research paper. May be convened with 441.
542. Transformation of Agrarian Societies in the Middle East (3) II (Identical with NES 542) May be convened with 442.
543. Soviet Politics (3) I For a description of course topics, see 443. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 443.
544. East European Politics (3) I II For a description of course topics, see 444. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 444.
545. Comparative Political Revolution (3) I For a description of course topics, see 445. Graduate-level requirements include extensive reading and a research paper. May be convened with 445.
547. Latin-American Political Development (3) I II For a description of course topics, see 447. Graduate-level requirements include additional course readings. (Identical with LA S 547) May be convened with 447.
548. Government and Politics of Mexico (3) I For a description of course topics, see 448. Graduate-level requirements include a book review and related discussion with the instructor. (Identical with LA S 548) May be convened with 448.
549. The Politics of Cultural Conflict (3) I For a description of course topics, see 449. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 449.
550. Religion and Politics (3) II For a description of course topics, see 450. Graduate-level requirements include additional readings, research, and paper(s). (Identical with LA S 550) May be convened with 450.
551. Soviet Foreign Policy (3) I For a description of course topics, see 451. Graduate-level requirements include extensive reading plus a research paper. May be convened with 451.
552. Communist Foreign Relations (3) I II For a description of course topics, see 452. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 452.
553. Revolution, Insurgencies, and Guerrilla Movements (3) I II For a description of course topics, see 453. Graduate students will be required to submit a research paper during finals week. May be convened with 453.
554. Theories of International Relations (3) I I For a description of course topics, see 454. Graduate-level requirements include additional assignment/paper. May be convened with 454.
555. American Foreign Policy (3) I I I For a description of course topics, see 455.
Graduate-level requirements include additional assignment/paper. May be convened with 455.

556. International Law (3) I For a description of course topics, see 456. Graduate-level requirements include research papers. May be convened with 456.

557. Inter-American Politics (3) I For a description of course topics, see 457. Graduate-level requirements include a book review and related discussion with the instructor. (Identical with LA S 557) May be convened with 457.

558. Civil-Military Relations in the Third World (3) I II For a description of course topics, see 458. Graduate-level requirements include an extensive research paper. May be convened with 458.

560. Modern Chinese Foreign Relations (3) II For a description of course topics, see 460. Graduate-level requirements include an additional research paper. (Identical with CHN 560) May be convened with 460.

561. Feminist and IR Theories (3) II For a description of course topics, see 461. Graduate-level requirements include an additional paper, or more extensive writing on papers. (Identical with WS 561) May be convened with 461.

564. International Relations of East Asia (3) I For a description of course topics, see 464. Graduate-level requirements include an additional research paper. (Identical with EAS 564) May be convened with 464.

565. Population and Development in the Middle East (3) I For a description of course topics, see 465. Graduate-level requirements include an additional paper and readings. May be convened with 465.

576. Women and the Law (3) I For a description of course topics, see 476. Graduate-level requirements include additional research, readings, and paper(s). May be convened with 476.

578. American Indians and the Supreme Court (3) I II S For a description of course topics, see 478. Graduate-level requirements include research papers. (Identical with AINS 578) May be convened with 478.

596. Seminar I International Water Resource Management (1-3) [Rpt./2] I II (Identical with ECON 696w, which is home)

 Portuguese
(See Spanish and Portuguese)

Psychology (PSYC)

Psychology Building, Room 312
(602) 621-7447

Professors Lynn Nadel, Head, Carol Barnes, Neil R. Bartlett (Emeritus), Lee Roy Beach (Management and Policy), Robert B. Bechtel, Judith Becker (Psychiatry), Allan Beigel (Psychiatry), Richard Bootzin, Dipankar Chakravarti (Marketing), William D. Crano (Communication), Terry C. Daniel, George Domino, Kenneth Forster (Cognitive Science), Merrill Garrett (Cognitive Science), Michael Gottfredson (Management and Policy), Barbara Gutek (Management and Policy), Travis Hirschi (Sociology), Sigmund Hsiao, William H. Itelson, Marvin W. Kahn, Alfred Kasznik, John F. Kihlstrom, James E. King, Mary P. Koss (Family and Community Medicine), Robert W. Lansing, Bruce McNaughton, Amnon Rapoport (Management and Policy), Carl A. Ridley (Family and Consumer Resources), David Rowe (Family and Consumer Resources), Bruce D. Sales, Jose Santiago (Psychiatry), Gary Schwartz, Lee Sechrest, Mary C. Wetzel, David B. Wexler (Law), Robert L. Wrenn

Associate Professors Harold S. Arkowitz, Merrie L. Brucks (Marketing), Robert Burns (Management and Policy), Jeff Greenberg, Irene M. Pepperberg (Ecology and Evolutionary Biology), Mary Peterson, Ronald H. Pool, Christopher Puto (Marketing), Rosemary A. Rosser, Catherine Shisslak (Family and Community Medicine), Varda Shoham, Linda Swisher (Speech and Hearing Sciences), Gary Wnek

Assistant Professors Geoffrey Ahern (Neurology), John Allen, Felice Bedford, Iris Bell (Psychiatry), Paul Bloom, Aurelio J. Figueroa, Daniel J. Flannery (Family and Consumer Resources), Elizabeth Glishy, Kerry Green, Elizabeth Krupinski (Radiology), Mark Lane (Psychiatry), Akiva Liberman, Chad Marsolek, Laura McCloskey, Mark Mennemeier (Psychiatry, Neurology), Janet Nicol (Linguistics), Tamra Pearson-d’Estree, Cyma Van Petten, Karen Wynn

The Department of Psychology offers courses designed to provide a scientific understanding of cognition, emotion, and motivation, the biological basis of
mental life and behavior in the nervous and endocrine systems, the organization and development of mind and behavior in the individual, the social basis of mental life and behavior, and the nature and treatment of psychopathology.

Degrees awarded are the Bachelor of Arts, Bachelor of Science, Master of Arts and Doctor of Philosophy with a major in psychology. The master's degree is awarded during doctoral training; there is no Master of Arts program as such.

All psychology majors must satisfy departmental distribution requirements by completing one course (3 units) in each of the following areas: cognition, emotion and motivation (CEM); psychobiology and neuroscience (PN); and individual and social processes (ISP). Alternatively, as described elsewhere in the General Catalog, minors in CEM, PN, and ISP (or 302, or 8 units in biology lab science). The three distribution areas (CEM, PN, and ISP) must be taken by the end of the junior year.

290. Human Development (3) I II S Measurement, quantitative description, and statistical inference as applied to psychological variables. P, MATH 116R/S; PSYC 101 or CR.


290. Research Methods (3) I II S Students will gain experience in a range of psychological research methods. 2R, 3L, P, 101, 230.

296. Proseminar h. Psychology Honors (3) II F, acceptance into honors program.

300. Social Psychology (3) I II S Introduction to major theories and research findings of social psychology; to provide an understanding of the roles of cognitive and motivational processes in social behavior. P, 101 or 8 units of biological laboratory science.

302. Introduction to Biopsychology (3) I I S Survey of the basic principles of nervous system function in relation to perception, learning, memory, emotion, and thinking. Credit is allowed for this course or for 210, but not for both. P, 290, or 8 units of biology lab science.

312. Primate Behavior (3) I II Survey of psychological research on nonhuman primates; includes sensory processes, learning, development, social and abnormal behaviors. P, 290.


314. Introduction to Personality and Social Development (3) I II Introduction to the development of personality, emotion, and social cognition and behavior from conception to adolescence. P, 101.

315. Language Development (3) I Introduction to theory and research on language development, with emphasis on word learning and grammatical development. P, 101 or LING 101 or consult department before enrolling.

316. Personality (3) I II Basic concepts and issues in personality theory and research; approaches to personality description and assessment. P, 101.


350. Minds, Brains and Computers (3) [Rpt.] I (Identical with PHIL 350)


371. Environmental Psychology (3) I Basic concepts in environmental psychology; the relationship between the individual and the large-scale environment. P, 290.

385. Industrial-Organizational Psychology (3) I II S The application of psychology to problems of industrial organizations, including personnel, job satisfaction, leadership, and advertising. P, 290.

401. Biological Bases of Motivation (3) I Biochemical compounds related to life and the role of behavior in life; chemical processes occurring within organisms and how they interact with behavior. P, 101; 230 and 290; 302 or 8 units of biological laboratory science. May be convened with 501.

403. Laboratory in Mammalian Systems Neurophysiology (3) I II Neurophysiology laboratory including stereotoxic surgery, microelectrode recording of neural signals, electo-
trical and chemical stimulation, and principles of analog and digital signal processing. P, 290, 302. (Identical with NRSC 403) Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 503. Writing-Emphasis Course*


410. Advanced Social Psychology (3) I II Social psychology, with emphasis on theory and method. P, 290. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 510. Writing-Emphasis Course*

411. Animal Behavior (3) I Systematic study of animal behavior. Analysis of environmental and genetic determinants of behavior, special behavioral adaptations in animals, and sociobiological concepts. P, 290. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 511. Writing-Emphasis Course*

412. Animal Learning (3) II Animal learning with emphasis on interspecies comparisons. P, 290. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 512. Writing-Emphasis Course*

413. Drugs, Brain and Behavior (3) I II Physiological, neurotoxic and behavioral effects of drugs on individual neurotransmitter systems in the brain. Special emphasis will be given to the historical use and political significance of the major drugs of abuse. P, 101, 230, 290, 302. May be convened with 513. Writing-Emphasis Course*

414. Personality and Social Development (3) I I II Research and theory in developmental psychology with an emphasis on social cognition, social and emotional growth. P, 290, 240 or 314. May be convened with 514. Writing-Emphasis Course*

415. Advanced Topics in Cognitive Development (3) II Introduction to major theories, methods, and research findings associated with the development of cognition and intelligence. P, 230, 290, 240 or 313, or permission of instructor. Students should ideally also have some background in cognitive psychology, e.g., 355. Writing-Emphasis Course*

416. Advanced Personality (3) I II In-depth consideration of topics, issues and research in personality. P, 290, 316. May be convened with 516. Writing-Emphasis Course.

419. Field-Based Human Learning (3) I II Learning principles in terms of behavioral ecology. Naturistic study with video and computer methods of human services and academic settings. P, 101, 370. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 519. Writing-Emphasis Course.*

421. Psychology of Death and Loss (3) I II 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, 290 or graduate standing. May be convened with 521. Writing-Emphasis Course*

422. Advanced Abnormal Psychology (3) I Survey of the causes and treatments of various forms of behavior disorder; basic concepts and critical evaluation of current research and theories. P, 101, 290. May be convened with 522. Writing-Emphasis Course.

425. Thinking, Reasoning, and Problem Solving (3) II Survey of historical and current theories and research on human thinking, reasoning and problem solving. P, 255. May be convened with 525. Writing-Emphasis Course*

427. Field Methods in Environmental Psychology (3) II Behavior in man-made or managed environments, with emphasis on objective methods; designed for students having a professional interest in environmental design or management. P, 371 or graduate standing. (Identical with ARCH 427 and LAR 427) May be convened with 527. Writing-Emphasis Course*

428. Antisemitism (3) (Identical with HIST 428)

429. Advanced Topics in Perception (3) I II Perception of space, theories of object recognition, evolutionary constraints, learning, attention, visual cognition, and theories of perception. P, 230, 290, 329. May be convened with 529. Writing-Emphasis Course*

430. Psychology, Law and Social Policy (3) I Critical review of theory, methods and research in the psychology, law and social policy interface. P, 101; 230 and 290; 306; 6 units of a social science, or graduate standing. May be convened with 530. Writing-Emphasis Course*

431. Ethical Issues in Psychology (3) I II A consideration of issues in the derivation of ethical criteria, selection of the appropriate subset of criteria to guide ethical decision-making, and utilization of the criteria when making a decision in psychological research or practice. P, upper-division standing or honors student. May be convened with 531. Writing-Emphasis Course.

435. Adult Development and Aging (3) I Change and continuity in cognition, personality, and adjustment during adulthood, with emphasis on aging processes and late life. P, 290, or 101 and two courses in gerontology or human development; or graduate standing. (Identical with GERO 435) May be convened with 535. Writing-Emphasis Course*

437. Gerontology: A Multidisciplinary Perspective (3) I II Biological, psychological, and social issues in aging, including brain changes with age, cognitive change with age, and the social impact of increasingly older population demographics. (Identical with GERO 437) May be convened with 537. Writing-Emphasis Course*

446. Environmental Cognition (3) I Rpt. on the understanding of higher brain function. Enrollment is restricted to those concurrently enrolled in the lab. P, NRSC 588; CR, PSYC 403. (Identical with NRSC 466) May be convened with 546. Writing-Emphasis Course*

449. Social Cognition (3) [Rpt./6 units] I II Analysis of social phenomenon from a cognitive perspective; perception, memory, thought and language concerning self, others, and social situations. P, 230, 290, or permission of instructor. May be convened with 549. Writing-Emphasis Course

450. Psychological Assessment and Testing (3) I II Evaluation of assessment processes and of measurements of intelligence, aptitudes, personality, and interests; test theory; social implications. P, 290. May be convened with 550. Writing-Emphasis Course*


453. Lexical and Syntactic Development (3) I II Current theory and data on first language acquisition with special focus on research that relates linguistic theory and learnability theory to empirical studies of children's linguistic abilities. P, senior standing or consult department before enrolling; one lower-division course in cognitive psychology, developmental psychology, or linguistic theory. May be convened with 553. Writing-Emphasis Course*

454. Culture and Mental Health (3) I Mental health in cross-cultural perspective; universal and culture specific disorders, traditional and western psychotherapy, cultural values in treatment methods and in research. P, 290, 418. May be convened with 554. Writing-Emphasis Course*

455. Philosophy and Artificial Intelligence (3) (Identical with PHIL 455) May be convened with 555. Writing-Emphasis Course*

458. Psychopathology (3) I II In-depth study of current theoretical and research formulations in psychological disorders; various approaches to behavior change. P, 290, 322. May be convened with 558. Writing-Emphasis Course*

462. Mental Health Policy (3) I Rpt. on the theory, research and practice in law and mental health interactions and in the delivery of mental health services. P, upper-division standing or honors student. May be convened with 562. Writing-Emphasis Course*

465. Neural Encoding, Memory and Computation in the Mammalian Brain (3) I II Theoretical principles and biological mechanisms by which information is represented, categorized, stored, and recalled in specific central nervous system (CNS) circuits in the course of adaptive behavior. P, one advanced course in neuroscience, biological or cognitive psychology, one advanced course in math or computer science. May be convened with 565. Writing-Emphasis Course*

466. Principles of Mammalian Systems Neurophysiology (2) I II Topics in the neurophysiology of sensation, perception, cognition, and action in mammals illustrating the application of modern research methods to the understanding of higher brain function. Enrollment is restricted to those concurrently enrolled in the lab. P, NRSC 588; CR, PSYC 403. (Identical with NRSC 466) May be convened with 566. Writing-Emphasis Course*
472. Human Memory Systems (3) II Examines the processing systems that underlie human learning, memory and cognition; emphasizing cognitive, neuroscientific and computational approaches to research and theory. P, 290, 355. May be convened with 572. Writing-Emphasis Course.

473. Natural Language Processing (3) II (Identical with LING 473) May be convened with 573. Writing-Emphasis Course.

475. History of Psychology (3) I Growth of psychology as a science; major schools and theories; contributions of famous investigators and major advances; psychology as an art and a science today. P, 290 and 6 upper-division units in psychology. May be convened with 575. Writing-Emphasis Course.

478. Sleep and Sleep Disorders (3) II Topics include sleepwalk rhythms, sleep deprivation; dreams, and the diagnosis and treatment of sleep disorders. P, 290, 302. May be convened with 578. Writing-Emphasis Course.

479. Topics in the Cognitive and Affective Bases of Behavior (3) [Rpt./1] I II Variable content (consult schedule): learning, cognition, perception, psycholinguistics, emotion, others. P, 290 and 6 units of upper-division psychology; or grad. standing. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 579 Writing-Emphasis Course.

484. Psychology and Health (3) [Rpt./1] I II Current research and theory concerning psychological contributions to health maintenance, illness prevention and treatment, and the organization of health services. May be convened with 584. Writing-Emphasis Course.

485. Contemporary Issues in Psychology (3) [Rpt./1] I II Variable content (consult schedule): major topical problems in psychological research, theory, and applications. P, 290 and 6 units of upper-division psychology. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 585. Writing-Emphasis Course.


495. Psychology of Language (3) I-II Variable content (consult schedule): major topical problems in psychological research, theory, and applications. P, 290 and 6 units of upper-division psychology. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 595. Writing-Emphasis Course.

500a-500b. Current Issues in Psychological Theory and Research (3-3) Intensive examination of a range of content areas addressed in contemporary psychological theory and research. Open to psychology graduate students only.

501. Biological Bases of Motivation (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; 230 and 290, or 250; 302 or 8 units of biological lab science. May be convened with 401.

502. Principles of Neuroanatomy (4) II (Identical with ANAT 502)
man development; or graduate standing. (Identical with GERO 535) May be convened with 435.

537. Gerontology: A Multidisciplinary Perspective (3) I II For a description of course topics, see 437. Graduate-level requirements include an in-depth research paper on a single aspect of gerontology. (Identical with GERO 537 and NRSC 537) May be convened with 437.

540. Visual Cognition (3) [Rpt./1] I II Recent advances in the areas of perception and attention, with an emphasis on visual process.

541. Topics in Language and Cognition (3) [Rpt./1] I II Variable content, including language acquisition, the relation between language and spatial cognition, and the evolution of mind. P, graduate majors in linguistics and psychology; others consult with department before enrolling.

542. Psycholinguistics (3) [Rpt./1] I II Recent advances in the area of psycholinguistics, with an emphasis on sentence processing and the contribution of linguistic theory to an understanding of psychological mechanisms.

546. Environmental Cognition (3) [Rpt./1] I II For a description of course topics, see 446. Graduate-level requirements include an in-depth research paper on a single aspect of environmental cognition. May be convened with 446.

549. Social Cognition (3) [Rpt./6 units] I II For a description of course topics, see 449. Graduate-level requirements include a research paper pertinent to the topic of social cognition. May be convened with 449.

550. Psychological Assessment and Testing (3) I II For a description of course topics, see 450. Graduate-level requirements include an in-depth research paper on psychological assessment and testing. May be convened with 450.

553. Lexical and Syntactic Development (3) I II For a description of course topics, see 453. Graduate-level requirements include a written paper on a subject pertinent to topic area. (Identical with LING 553) May be convened with 453.

554. Culture and Mental Health (3) I For a description of course topics, see 454. Graduate-level requirements include an in-depth research paper on culture and mental health. P, 422. May be convened with 454.

555. Philosophy and Artificial Intelligence (3) (Identical with PHIL 555) May be convened with 455.

558. Psychopathology (3) II For a description of course topics, see 458. Graduate-level requirements include an in-depth research paper on psychopathology. May be convened with 458.

562. Mental Health Policy (3) [Rpt./3] I II For a description of course topics, see 462. Graduate-level requirements include an extra term paper which ultimately could be prepared for publication as well as an additional oral class participation. May be convened with 462.

564. Methods for Psychosocial Research (3) I Logic of inquiry and issues of philosophy of science as they apply to psychosocial research. Problems encountered by researchers in personality, family studies, social and clinical psychology, and creative approaches to their data analysis and methodological design resolutions.

565. Neural Encoding, Memory and Computation in the Mammalian Brain (3) I II For a description of course topics, see 465. Graduate-level requirements include Graduate-level requirements include an in-depth research paper on a single aspect of neural encoding. P, one advanced course in neuroscience, biological or cognitive psychology, one advanced course in math or computer science. (Identical with NRSC 565) May be convened with 465.

566. Principles of Mammalian Systems Neurophysiology (2) I II For a description of course topics, see 466. Graduate-level requirements include an in-depth research paper on an advanced topic pertinent to current topics in the neurophysiology of sensation, perception, cognition and action in mammals illustrating the application of modern research methods to the understanding of higher brain function. P, NRSC 558; CR, PSYC 403 (Identical with NRSC 566).

567. Experimental Phonetics: Physiology (3) (Identical with SPH 567)

568. Experimental Phonetics: Acoustics and Perception (3) [Rpt. with SPH 568]

572. Human Memory Systems (3) I II For a description of course topics, see 472. Graduate-level requirements include an in-depth research paper on human memory and cognition. P, 230, 290, or graduate standing. May be convened with 472.

573. Natural Language Processing (3) I II (Identical with LING 573) May be convened with 473.

575. History of Psychology (3) I For a description of course topics, see 475. Graduate-level requirements include an in-depth research paper on an aspect of history of psychology. P, 290 and 6 upper-division units in psychology. May be convened with 475.

576. Sleep and Sleep Disorders (3) I II For a description of course topics, see 476. Graduate-level requirements include a critical review of the research literature of a relevant topic. P, 290, 302. May be convened with 476.

579. Topics in the Cognitive and Affective Bases of Behavior (3) [Rpt./1] I II For a description of course topics, see 479. Graduate-level requirements include an in-depth research paper on an aspect of cognitive and affective bases of behavior. P, 290 and 6 units of upper-division psychology; or graduate standing. May be convened with 479.

580. Clinical Neuropsychology (3) II Cognitive and affective sequelae of human central nervous system disease/damage, with emphasis on clinical evaluation, management and rehabilitation.

582. Advanced Psychopathology (3) [Rpt./1] I II Advanced survey of current theory and research in symptoms, causes and treatment of the major psychological disorders.

584. Psychology and Health (3) [Rpt./1] I II For a description of course topics, see 484. Graduate-level requirements include an additional term paper pertaining to the course topic. May be convened with 484.

585. Contemporary Issues in Psychology (3) [Rpt./1] I II For a description of course topics, see 485. Graduate-level requirements include an in-depth research paper on an aspect of contemporary psychological research. P, 290 and 6 units of upper-division psychology; or graduate standing. May be convened with 485.

588. Computational Linguistics (3) I (Identical with LING 588) May be convened with 488.

596. Seminar a. Social Psychology (3) [Rpt./4] I II b. Developmental Psychology (3) [Rpt./1] I II c. Biopsychology (3) [Rpt./1] I II d. Clinical Psychology (3) [Rpt./4] I II e. Law, Psychology, and Policy (3) [Rpt./4] I II f. Cognitive Psychology (3) [Rpt./1] I II g. Psychology (3) [Rpt./4 units] II h. Advanced Behavior Analysis (3) I II i. Interdisciplinary Environment-Behavior Design (3) [Rpt./1] I II (Identical with ENV 596u, which is home)


621. Clinical Assessment Methods (3) I II Theory and practice in interview techniques and cognitive and personality assessment. Open to majors only.

622. Principles of Behavior Therapy (3) I Systematic review of the major theories of behavior modification, with emphasis on application to clinical problems. Open to graduate psychology majors only.

628. Systems of Psychotherapy (3) [Rpt./2] I II Current research and theory in psychotherapy.

635. Issues in Rural Health Care (3) I (Identical with NURS 635)

694. Practicum a. Clinical Interviewing and Assessment (1-3) [Rpt./1] I II Open to clinical psychology students only.

695. Colloquium a. Motor Control (2) I (Identical with EXSS 695a)

696. Seminar f. Linguistic Investigations and Applications (3) I II (Identical with LING 696f, which is home)
Public Administration and Policy (PA)  
McClelland Hall, Room 405  
(602) 621-7965  
Professors Michael Gottfredson (Management and Policy), Helen Ingram (Political Science), Theodore Koff, John Schwarz (Political Science), Arthur Silvers  
Associate Professors H. Brinton Milward, Director, Lawton Robert Burns (Management and Policy), Ronald Vogel  
Assistant Professors Susan Gonzalez Baker (Mexican American Studies), Chris Demchak, Howard Frant, Michael Polakowski, Edella Schlager  

The School of Public Administration and Policy offers two degrees designed to prepare men and women for a variety of staff and managerial positions in public sector and non-profit organizations, and private organizations dealing with the public sector. The degrees offered are the following:  

The Bachelor of Science in Public Administration with majors in public management, health, and human services administration, and criminal justice administration. For degree requirements, please see the College of Business and Public Administration section of this catalog.  

The Master of Public Administration. For admission and degree requirements, please see the Graduate Catalog.  

The School participates in the Honors Program.  

204. Introduction to the Analysis of Data for Decision Making (3) I II Informal and exploratory approaches to the analysis of empirical data in a managerial context. P, MATH 119  

206. Public Policy and Administration (3) I (Identical with POL 206)  

221. 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.  


321. Health Care Policy and Institutions (3) I Examines public policy issues in health including recent developments in health policy and planning at the national, state and local levels and their impacts on administrative behavior.  

341. Juvenile Delinquency (3) I II (Identical with SOC 341)  

342. Criminology (3) I II (Identical with SOC 342)  

343. The Crime Problem (3) I I Theory and research on the nature, causes and control of crime from an interdisciplinary perspective (Identical with SOC 343)  

344. Legal Aspects of the Criminal Justice Process (3) I II Analysis of selected principles of criminal law, criminal procedure and correctional law. (Identical with SOC 344)  

400. Quantitative Methods for Administrators (3) I 5 Quantitative techniques and their applications. Equations and their graphs, systems of linear equations, matrix algebra, linear programming; fundamental probability, expected value; functions and limits, applications of differential calculus. Open only to graduate students. This course cannot be credited toward the completion of a bachelor's degree.  

405. System and Program Evaluation (3) I Methodology of evaluating the performance of programs and strategies in the context of policy assessment.  

406. Bureaucracy, Politics and Policy (3) I (Identical with POL 406)  


421. Health, Ethics and Public Policy (3) II Major policy issues confronting health care system, including finance, access and ethics.  

422. Introduction to Health Economics (3) II Applies microeconomic theory, industrial organization and public finance to efficiency and equity problems in the acute and chronic health-care sectors and explores solutions to these problems at an introductory level. P, 321.  

423. Introduction to Health Care Policy and the Elderly (3) I Consideration of public policy as it relates to the needs of elderly persons in modern industrial societies. Emphasis on vulnerable groups such as poor and minority elderly.  

435. International Management (3) I (Identical with MAP 435) May be convened with 535  

441. The Criminal Justice System (3) I II Background, philosophy and modes of operation in the American criminal justice system. (Identical with SOC 441)  

445. Law of the Elderly (2) I Examines the law as it affects the elderly in such areas as legislation, finances, housing, death, guardianship, access to services and ethics. Focuses upon the recognition and analysis of legal problems and identification of legal resources (Identical with GERO 457). May be convened with 557.  


480. Formation of Public Policy (3) I (Identical with POL 480)  

481. Environmental Policy (3) I (Identical with POL 481)  

501. Public Organization Theory (3) I II Course focuses on understanding and analyzing interactions, effectiveness and complexities of organization structures.  

503. Politics and the Policy Process (3) I Various theories of how public policy is formulated.  

504. Public and Policy Economics (3) I Applications of econometrics to the analysis of public policy and planning problems. (Identical with GEOG 504 and PLNG 504)  

505. Methods for Policy Analysis and Program Evaluation (3) I Techniques for analyzing the effects of public policies and programs. P, ECON 500 or permission of instructor.  


513. Intergovernmental Relations (3) I Legal, political and social framework of interjurisdictional and interagency relations; trends, emerging issues, and devices for securing coordination and responsibility.  

514. Analytic Methods in Planning and Management (3) I Methods and models for program planning and policy analysis; forecasting, service demand, facility location in capital investment programming, task sequencing, program analysis and evaluation. P, MIS 552, GEOG 557 or permission of instructor (Identical with PLNG 514).  

521. Social Policy (3) I Design, implementation and outcomes of social policy initiatives in the U.S. and abroad. Themes include historical overview of anti-poverty policy in the U.S., competing explanations for conditions of inequality, and examination of policy solutions (Identical with SOC 521).  

522. Analysis of Health Systems (3) I Introduces the student to the scope and nature of public and private health systems in the U.S.; examines roles of government and private enterprise in the development and operation of health institutions.  

523. Health and Public Policy (3) I 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, 522 (Identical with PLNG 523).  

524. Management of Long Term Care Facilities and Programs (3) I Problems and principles of management of facilities and community based programs providing health and social services to the chronically impaired. P, 522.
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. Finally, the major requires at least 9 units each in further study of Western and Eastern religions.

The minor: 20 units, including 120, 130 and 14 additional units in religious studies.

120. Western Religions (3) I II Religions of the Western World: Judaism, Christianity, Islam.

126. Greek Mythology (3) I II (Identical with CLAS 126)

130. Asian Religions (3) I II (Identical with EAS 130)

140. Middle Eastern Humanities (3) I (Identical with SOC 540)

142. Chinese Humanities (3) (Identical with CHN 142)

144. Japanese Humanities (3) I II (Identical with JPN 144)

220. Japanese Religion (3) 1994—95 (Identical with JPN 220)

225. Introduction to Women and Religion (3) I II (Identical with W S 225)

233. Philosophy of Religion (3) I I (Identical with PHIL 233)

234. Existential Problems (3) I II 1993—94 (Identical with PHIL 245)

271. The History of Christianity (3) I II (Identical with HIST 271)


302. Protestant Thought in the 20th Century (3) I II Survey of the various strands of Protestant theology since the turn of the century, with special reference to authors such as B. Rauschenbusch, Barth, Brunner, Tillich, Bultman and Bonhoeffer.

303. Epistles of St. Paul (3) I Examination of the religious and cultural background in the Greco-Roman world during the lifetime of St. Paul; analysis of Paul's thought in Acts and the Epistles.

305. Greek and Roman Religion (3) I II 1993—94 (Identical with CLAS 305)

307. Spirituality in the Arts (3) I I (Identical with HUM 307)

320a-320b. Literature of the Bible (3-3) I II (Identical with ENGL 320a-320b)

322. Sociology of Religion (3) I II (Identical with SOC 322)

331. Taoist Traditions of China (3) I II 1993—94 (Identical with CHN 331)

333. Buddhist Meditation Traditions (3) I II (Identical with EAS 333)

340. Jesus in Contemporary Thought (3) I 1993—94 Survey of present thinking about the meaning of Jesus, including humanistic, Jewish, and various Christian interpretations.

345. Hindu Religious Activities (3) I II (Rpt./6 units) II (Identical with EAS 345)

348. Myth and Archetype (3) I II (Identical with CLAS 348)

370a-370b. History of the Jews (3-3) I II (Identical with HIST 370a-370b)

372a-372b. History and Religion of Israel in Ancient Times (3-3) I II (Identical with JU S 372a-372b)

374. The Holocaust (3) I II 1994—95 (Identical with HIST 374)

382. Archaeology and the Bible (3) I II (Identical with JU S 382)

405a-405b. Medieval Europe (3-3) I II (Identical with HIST 405a-405b)

406. Medieval England (3) I II (Identical with HIST 406)

407a-407b. Intellectual History of Medieval Europe (3-3) I II (Identical with HIST 407a-407b)

408. The Renaissance (3) I II (Identical with HIST 408)

409. The Reformation (3) I II (Identical with HIST 409)

411. Anthropology of Religion (3) I II (Identical with ANTH 411)

416. Tudor-Stuart England (3) I II (Identical with HIST 416)

425. Theoretical Issues in the Study of Women and Religion (3) I II (Identical with WS 425) May be convened with 525.

428. Antisemitism (3) I II (Identical with HIST 428)

430. Prophecy in Ancient Israel (3) I II 1993—94 (Identical with JU S 430) May be convened with 530.

434. Islamic Thought (3) I II (Identical with NES 434)

435. Jewish Mysticism (3) I II (Identical with JU S 435)

450. Religion and Politics (3) I II (Identical with POL 450)

453. Culture and Civilization of North Africa (3) I II 1994—95 (Identical with FREN 453)
Remote Sensing (REM)
1600 N. Country Club Rd., Suite 100, Tucson, AZ 85716
(602) 621-4242

Graduate Interdisciplinary Program in Remote Sensing

Committee:
Professors Philip N. Slater (Optical Sciences), Chair, Victor R. Baker (Geosciences), Robert E. Dickinson (Atmospheric Sciences), Barry D. Ganapol (Nuclear and Energy Engineering), Lloyd W. Gay (Renewable Natural Resources), Benjamin M. Herman (Atmospheric Sciences), John A. Reagan (Electrical and Computer Engineering), Richard W. Reeves (Geography and Regional Development), Soroosh Sorooshian (Hydrology and Water Resources)

Associate Professors Charles E. Glass (Mining and Geological Engineering), Alfredo R. Huete (Soil and Water Science), Charles F. Hutchinson (Arid Lands Resource Sciences), Stuart E. Marsh (Arid Lands Resource Sciences), John W. Olsen (Anthropology), William O. Rasmussen (Agricultural and Biosystems Engineering), Robert A. Schowengerdt (Electrical and Computer Engineering, Arid Lands Resource Sciences), Robert B. Singer (Lunar and Planetary Laboratory, Geosciences)

Assistant Professors L. A. Graham (Remote Natural Resources)

Remote sensing concerns the collection of information related in some way to the Earth's natural resources or environment. Data are primarily collected by satellite and aircraft systems in conjunction with localized ground-based surveys and measurements. The data are processed by digital computer or optical techniques to extract information of value to earth scientists and resource and environment managers at the local, state, and federal levels.

The Program in 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, Arts and Sciences, Business and Public Administration, Engineering and Mines; and in Arid Lands Studies and Optical Sciences. For further information concerning the minor, please see the Graduate Catalog.

490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 For a description of course topics, see 490. Graduate-level requirements include an additional term paper. (Identical with AR L 490, ATMO 490, G EN 490, GEOG 490, GEOS 490, HWR 490, MNE 490, OPTI 490, RNR 490, SW 490) May be convened with 590.

590. Remote Sensing for the Study of Planet Earth (3) II 1993-94 For a description of course topics, see 490. Graduate-level requirements include an additional term paper. (Identical with AR L 590, ATMO 590, G EN 590, GEOG 590, GEOS 590, G EN 590, HWR 590, MNE 590, OPTI 590, RNR 590, SW 590) May be convened with 490.

496. Seminar w. Feminist Approaches to the Bible (3) I (Identical with JUS 496w) May be convened with 496w.

596. Seminar w. Feminist Approaches to the Bible (3) I (Identical with JUS 496w) May be convened with 496w.

Renewable Natural Resources (RNR/LAR/ARM/WSM/WFSC)
Biological Sciences East, Room 325
(602) 621-7255


Assistant Professors Lee A. Graham, Lisa J. Graumlich (Tree-Ring Laboratory), D. Philip Guertin, Vicente L. Lopes, Guy R. McPherson, Thomas W. Swetnam (Tree-Ring Laboratory)

Lecturers Charles D. Ziebell (Emeritus)

Extension Specialists Donna K. Chickerling, George B. Ruyler, John R. Stair

The School of Renewable Natural Resources is concerned with the management and conservation of natural ecosystems of arid and semi-arid environments. Programs of study in the School prepare students for careers in management with environmental science and natural resource agencies and organizations that require a fundamental knowledge about the science, planning and management of natural systems to provide the resources of water, wood, forage, wildlife, fisheries, soil and aesthetic values.

The Bachelor of Science in Renewable Natural Resources is available with majors in range management, watershed management and wildlife and fisheries science. Undergraduate minors are available in these general areas of study. The degree is composed of general education and supporting science courses, a series of interdisciplinary renewable natural resource courses, and courses that develop additional knowledge in subjects specific to each major. The natural resource core curriculum is designed to integrate subjects of importance to all students in renewable natural resource fields, to introduce students to the interdisciplinary nature of resource management, and to develop an understanding of multiple-use management systems. A major in landscape architecture for the Bachelor
of Landscape Architecture and Master of Landscape Architecture are also offered. In addition, a student may obtain the degree of Master of Science or Doctor of Philosophy with a major in range management, watershed management, wildlife and fisheries science, or renewable natural resources studies. For information concerning graduate admission and degree requirements, consult the Graduate Catalog.

**Renewable Natural Resources (RNR)**

135. Conservation of Natural Resources (3) I Conservation and multiple use of renewable natural resources, including forest, watershed, range, wildlife, and recreation; history of forest and range use and its present status.

197. Workshop a. The Natural Environment: Its Uses and Protection (1) 5 Field trips. Offered only through the Horizons Unlimited Summer Program.

200. Foundations in History and Policy (3) I Historical and philosophical developments in natural resources management; social, political, and economic factors affecting natural resource use; the role of natural resource managers in today's society.

202. Natural Resources — Plant Identification (3) I Plant classification, identification and nomenclature, with emphasis on the grass, rose, legume, composite, pine, and other plant families containing important forest and range plants. Use of dichotomous keys and recognition of representative species will be utilized to develop plant identification skills. 1R, 6L.

271. Natural Resources — Computer Applications (3) II Application of microcomputer software for management of renewable natural resources. Includes spreadsheets, database management systems, and statistical programs with emphasis on the introduction to geographic information systems and their applications. 2R, 3L. Open to majors only. P, STAT 160 or 263, prior computer experience.


321. Natural Resources — Measurements (3) I Study of basic land, weather, hydrologic and vegetation measurements, and recreation use and animal census techniques employed in management of natural resources; methods, instrumentation, data analysis, presentation and interpretation of results. 2R, 3L. P, MATH 118, RNR 271.

375. Economics of Land and Water in the American West (3) II (Identical with AREC 375)

384. Natural Resources — Management Practices (4) II Introduction to resource management practices used to achieve societal goals. Includes practices used to produce water, wood, forage, wildlife and other renewable resources; to protect water, soil, wilderness and scenic attractions; and to mitigate the adverse impacts of management and land-use activities on the environment. Field trips. P, basic ecology course, 316 or RA M 382.

406. Conservation Biology (3) II 1994-95 (Identical with ECOL 406) May be convened with 506.

417. Introduction to Geographic Information Systems (3) I Computer techniques for capture, processing, analysis and display of geographic information, with emphasis on applications in land resources management and planning. 2R, 3L. P, basic knowledge of computer operations. (Identical with GEOG 417 and S W 417) May be convened with 517.


438. Fire Ecology (3) II Ecological role and use of prescribed fire in forest and range ecosystems; fire history; concepts and specific fire effects on vegetation, wildlife, soils and watersheds. P, basic ecology course, 316 or RA M 382. May be convened with 538.

476. Natural Resource Economics (3) II (Identical with AREC 476)

478. Global Change (3) II (Identical with GEOG 478) May be convened with 578.

500. Natural Resources — Policy and Administration (3) II Resource policy formation; ethics of resource use; administration and organization for resource management; analysis of present policy and trends. P, 200, AREC 375. May be convened with 580. Writing Emphasis Course*

581. Environmental Policy (3) II (Identical with POL 481) May be convened with 581.

486a-486b. Natural Resources — Management and Economics (3-3) Introduction to decision-making techniques in natural resources management, including planning, GIS, modeling, applied economics, and systems analysis techniques. 2R, 3L. P, AREC 375, RNR 271, 384. May be convened with 586a-586b. 486b is a Writing Emphasis Course*

489a-489b. Advanced Environmental Interpretation (2-2) Advanced training and experience in communication of natural history and environmental principles to the public. Students must be available for some weekend field work. 489a is part of a two-semester sequence. Credit and grade for 489a will be awarded only upon completion of 489b. Field trips. P, 12 units in biology or renewable natural resources. May be convened with 589a-589b.

490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.


w. Advanced Cadastral Survey (1-4) II P, prior training and work experience in cadastral surveying. (Identical with CE 497w) May be convened with 597w.

498. Advanced Geographic Information Systems (3) II For a description of course topics, see 417. Graduate-level requirements include a thorough bibliographic review and a scholarly paper on a current application of geographic information systems in the student's major field. P, basic knowledge of computer operations. (Identical with GEOG 517 and S W 517) May be convened with 417.

518. Advanced Geographic Information Systems (3) II For a description of course topics, see 418. Graduate-level requirements include a more extensive project and report. P, 517. (Identical with GEOG 518) May be convened with 418.

527. Artificial Intelligence in Resource Management (3) I 1994-95 Use of artificial intelligence as it applies to natural resources, including knowledge representation, problem solving, expert systems, feature recognition, neural networks, and genetic algorithms. Examples will be derived from current applications using various techniques to address management problems. P, computer programming skills.

537. Modeling Natural Systems (3) I 1994-95 For a description of course topics, see 437. Graduate students will do an expanded project and report. P, MATH 123, 124 or 125a, RNR 316, computer programming skills. May be convened with 437.

538. Fire Ecology (3) II For a description of course topics, see 438. Graduate-level requirements include a research report on the ecological impacts of fire in a specific vegetation type. P, basic ecology course, 316 or RA M 382. May be convened with 438.

546. Principles of Research (3) II Philosophy of science and the principles of conducting research, including formulation of problems, problem analysis, study plans, and preparation of manuscripts for publication.

555. Advanced Applied Plant Ecology (3) II Discussion of advanced topics in plant ecology, with emphasis on applied ecology of terrestrial ecosystems. P, basic ecology and statistics.

575. Economics of Natural Resource Policy (3) II (Identical with AREC 575)
696. Seminar (3) II (Identical with AREC 576)

578. Global Change (3) II (Identical with GEO 578) May be convened with 478.

580. Natural Resources—Policy and Administration (3) II For a description of course topics, see 480. Graduate-level requirements include an in-depth policy analysis paper. May be convened with 480.

581. Environmental Policy (3) II (Identical with POL 581) May be convened with 481.

586a-586b. Natural Resources—Management and Economics (3-3) For a description of course topics, see 486a-486b. Graduate-level requirements include additional research on a planning project. May be convened with 486a-486b.

589a-589b. Advanced Environmental Interpretation (2-2) For a description of course topics, see 489a-489b. Graduate-level requirements include development and presentation of an original interpretive program. Students must be available for some weekend field work. 589b is part of a two-semester sequence. Credit and grade for 589a will be awarded only upon completion of 589b. Field trips. P. 12 units in biology or renewable natural resources. May be convened with 489a-489b.


595. Colloquium
   b. Public Natural Resource Management (2) I II 1994-95
   c. Human Dimensions in Renewable Natural Resources (3) I 1993-94
   d. Topics in Forest and Range Ecology (2) II 1994-95
   e. Heritage Resources Planning and Management (2) II 1993-94

597. Workshop
   a. Natural Resource Conservation Workshop (1) [Rpt./2] S Field trips.
   b. Desert Ecosystems (1) [Rpt./3] II May be convened with 497b.
   w. Advanced Cadastral Survey (1-4) II P, prior training and work experience in cadastral surveying. (Identical with CE 597w) May be convened with 497w.

694. Practicum
   a. Teaching in Renewable Natural Resource Studies (1-3) [Rpt./4 units] I II
   b. Teaching in Range Management (1-3) [Rpt./4 units] I II
   c. Teaching in Watershed Management (1-3) [Rpt./4 units] I II
   d. Teaching in Wildlife and Fisheries Science (1-3) [Rpt./4 units] I II

696. Seminar
   a. Renewable Natural Resources (1-2) [Rpt.] III
   b. Integrating Advanced Technology in RNR (3) I 1993-94

697. Workshop
   a. Interdisciplinary Problem Solving in Natural Resources I (2) I II P, consult department before enrolling. (Identical with HWR 697a, which is home) Note: 697a is part of a two-semester sequence. Students receive a grade of "K" at the end of the first semester. Credit and grade for 697a will be awarded only upon completion of 697b.
   b. Interdisciplinary Problem Solving in Natural Resources II (2) I II P, 697a. (Identical with HWR 697b, which is home) Note: 697b is part of a two-semester sequence. Credit and grade for 697b will be awarded only upon completion of 697a.

Landscape Resources
William H. Havens, Program Leader

Landscape Architecture (LAR)
The five-year curriculum leading to the Bachelor of Landscape Architecture is composed of two preprofessional and three professional years. The curriculum is designed to prepare the student to meet entry-level requirements for the profession of landscape architecture. While the principles of professional practice are universal, the program encourages strong linkages in renewable natural resources and recognition of the unique qualities of the arid Southwest.

Each applicant must comply with University of Arizona requirements for admission to the professional phase of program. Each applicant to the professional phase of program must submit an Application for Admission to the Professional Major form to the Program Leader by April 15 preceding the intended fall admission. Students are admitted to the professional phase in the fall semester only, after having completed the following courses: CHEM 101a, 102a; ECOL 130; ENGL 101, 102 or 103H, 104H; I AR 101, 103, 104, 201, 202; MATH 117R/S, 118; PL S 100; RNR 200, 271, 321; SW 200, 201.

Applicants will be evaluated by the Landscape Architecture Admissions Committee on the basis of the following criteria: grade-point average, course work, statement of intent, work experience, special interests, and creative endeavors. Admission will be restricted to those applicants with the highest evaluation. It is unlikely that students with cumulative grade-point averages less than 2.7500 will be admitted. All applicants to the professional phase will be notified of acceptance or rejection by May 15. Applicants seeking advanced standing will be placed in the preprofessional phase until they fulfill all requirements for admission to the professional major.

The following courses are required as part of the professional program in landscape architecture: ARH 118, or ARCH 324, 334; COMM 100, 102; ECON 201a; ENGL 308; GEOG 103b; I AR 301, 302, 332, 335, 401, 402, 404, 436, 442, 443, 451, 452, 453, 460, 482; PSYC 101, 371; RNR 202, 384. Students will also take a 12-unit landscape architecture internship in their final year.

101. Introduction to Landscape Architecture (2) I Introduction to the profession of landscape architecture.

103. Basic Design I (3) I Understanding the design process, with emphasis on development of visual language and graphic skills; study of functional, contextual, spatial, social-cultural and environmental factors in influencing design in our physical environment. 2R, 45.

104. Basic Design II (3) II Exploring the creative design process through 2-D and 3-D exercises. Introduction of basic environmental, functional and aesthetic design criteria. 2R, 45, P. 103.


202. Intermediate Design II (4) II Introduction to materials and techniques of graphic communication and their application in landscape design. 2R, 5S, P. 201.

301. Landscape Architectural Design I (4) I Application of the principles of design to landscape architecture problems. 1R, 8S, P. 202.

302. Urban Landscape Design I (4) II Landscape architectural design problems in urban environments. 1R, 8S, P. 301.

332. Introduction to Computer-Aided Design for Landscape Architecture (3) II CDTI introduction to computer-aided design (CAD) utilizing microcomputers. Course includes theory, ethics, management and applications for computer use in landscape architecture. Open only to landscape architecture majors in professional phase of program. 4S 1R. P, RNR 271.

335. Plant Materials I (4) I Plant materials used in landscape design. 3R. 3L. Field trips. P, PL S 100, RNR 202 (Identical with PL S 335)

401. Site Planning and Design I (4) I Planning and design problems at site scale with particular concern for conservation and energy utilization. 1R, 8S, P. 302. May be convened with 501.

402. Regional Landscape Planning and Design (5) II Planning and design problems of regional scope and emphasis. 2R, 8S, P. 401. May be convened with 502.

404. Professional Portfolio Design I (4) I Design and preparation of a professional portfolio. Past projects will be reviewed, graphically revised, photographed, and integrated into a professional quality portfolio. Open to majors only. 2R, S, P. 401.

407. The American Landscape (3) I (Identical with GEOG 407) May be convened with 507.

427. Field Methods in Environmental Psychology (3) II (Identical with PSYC 427) May be convened with 527.
438. Planting Design (3) II Application of plant materials in landscape design; principles of xeriscape and energy-conserving design. Open to majors only. 2R, 2S, P, 335, 401. May be convened with 538.

442. History and Theory of Landscape Architecture (3) II Examination of the historical background and theoretical bases of landscape architecture. May be convened with 542.

443. Contemporary Landscape Architecture (3) I Examination of modern and post-modern design in landscape architecture. P, 442. May be convened with 543.


452. Landscape Construction (4) II Introduction to construction materials and methods, working drawings and specifications related to the profession of landscape architecture. 2R, 5L. P, 451. May be convened with 552.

453. Irrigation Design (3) I Principles of irrigation system design; introduction to system components and applications; construction responsibilities and design liabilities. 2R, 2S, P. 452. Open to majors only. May be convened with 553.

460. Professional Practice (3) II Professional services, contract documents, contract administration, office organization, ethics, professional registration, roles of the landscape architect, the practice of landscape architecture. P, 402. May be convened with 560. Writing Emphasis Course.*

482. Professional Practice Studio (5) II Synthesis studio in landscape architecture. Complex problems in regional, site and urban planning and design. Emphasis upon "real world" problems and professional practice. Open to majors only. 2R, 7S, P. 402. May be convened with 582.

497. Workshop
i. Community Design for Non-Designers (3) I (Identical with ARCH 497i, which is home) May be convened with 597i.

*P, satisfaction of the upper-division writing-proficiency requirement (see "Writing Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

501. Site Planning and Design (4) I For a description of course topics, see 401. Graduate-level requirements include additional readings and exercises in site planning and design. P, 302. May be convened with 401.

502. Regional Landscape Planning and Design (5) II For a description of course topics, see 402. Graduate-level requirements include additional readings and exercises in regional planning and design. 2R, 8S, P. 401. May be convened with 402.

503. Advanced Landscape Design (3) I Issues and problems in landscape design. Relationships with architects, engineers, planners and natural resource scientists are stressed. 1R, 6L. Field trips.

504. Advanced Landscape Planning (3) II Advanced techniques in landscape planning and problem analysis including visual simulation, computer map overlay, video applications, research in perception and behavior. 1R, 6L.

507. The American Landscape (3) II (Identical with GEOG 507) May be convened with 407.

527. Field Methods in Environmental Psychology (3) II (Identical with PSYC 527) May be convened with 427.

533. Landscape Planning (3) I Theories and models in landscape planning; planning issues, methods, and case studies. Two, 2-day field trips.

538. Planting Design (3) II For a description of course topics, see 438. Graduate-level requirements include a topical research paper on a planting design subject. May be convened with 438.

542. History and Theory of Landscape Architecture (3) I For a description of course topics, see 442. Graduate-level requirements include an initial outline and bibliography and subsequent scholarly paper on a specific person, place, and/or event. May be convened with 442.

543. Contemporary Landscape Architecture (3) I For a description of course topics, see 443. Graduate-level requirements include a topical research paper on a contemporary issue in landscape architecture. May be convened with 443.


551. Site Engineering (4) I For a description of course topics, see 451. Graduate-level requirements include additional readings and exercises in site planning and design. P, 202. May be convened with 451.

552. Landscape Construction (4) II For a description of course topics, see 452. Graduate-level requirements include a scholarly paper of intellectual inquiry into a material or method used in landscape construction. P, 451. May be convened with 452.

553. Irrigation Design (3) I For a description of course topics, see 443. Graduate-level requirements include a topical research paper on an irrigation design subject. May be convened with 453.

560. Professional Practice (3) II Professional services, contract documents, contract administration, office organization, ethics, professional registration, roles of the landscape architect, the practice of landscape architecture. P, 402. May be convened with 560. Writing Emphasis Course.*

562. Landscape Construction (4) II For a description of course topics, see 460. Graduate-level requirements include an in-depth research paper on a topic of professional practice in landscape architecture. P, 502. May be convened with 460.

566. Professional Practice Studio (5) II For a description of course topics, see 482. Graduate-level requirements include an written evaluation of the impact of the student projects on the environmental, social, political and economic community for which the project is planned. P, 402. May be convened with 482.

595. Colloquium
d. Landscape Architecture Research (3) I Professional Leadership (1) [Rpt./4 units] I II

596. Seminar
u. Interdisciplinary Environment-Behavior Design (3) II (Identical with ENV 596u, which is home)

597. Workshop
i. Community Design for Non-Designers (3) I (Identical with ARCH 597i, which is home) May be convened with 497i.

694. Practicum
a. Landscape Architecture Teaching (1-2) I II

696. Seminar
a. Landscape Architecture (I) [Rpt.] I II

Range Resources
E. Lamar Smith, Program Leader

Range Management (RAM)
The major in range management prepares students to begin professional careers concerned with management of rangelands for livestock production, wildlife habitat, watershed protection, and other range resource values. Range management students obtain a Bachelor of Science in Renewable Natural Resources. The B.S. in Renewable Natural Resources meets standards for federal employment as a range conservationist and is accredited by the Society for Range Management.

Range management majors may tailor their program to career objectives by selecting appropriate minors and/or elective courses. Students planning a career in federal or state rangeland management agencies are advised to select a minor in wildlife management or watershed management. Those interested in ranch management, agricultural lending institutions, private consulting, international development, ranch appraising, or similar careers should consult the Department of Agricultural and Resource Economics for a minor in agricultural and resource economics. Students planning on careers in research or teaching may wish to emphasize additional basic sciences and mathematics.

Required courses are: ENGL 101, 102 or 103H, 104H, 307 or 308; COMM 100, 102; ECON 201a; AREC 375; MCB 181, 460; ECOL 182; CHEM 103a-103b, 104a-104b; STAT 160 or 263; S W 200, 201; AN S 330; 477 or 474; RNR 200, 202, 271, 316, 321, 384, 480, 486a-486b; RA M 382, 436, 446, 456, 487. In addition, students must complete at least two of the following: WS M 422; PHYS 102a; S W 431; MATH 123; GEOS 101, 103.

Students majoring in other fields may take a minor in range management. Twenty-one units of foundation courses must be completed before the minor is initiated. Foundation courses are six units of chemistry, eight units of biological sciences, S W 200, 201, and STAT 160 or 263. Required courses in the minor
proaches, principles, ecology, and objectives of revegetation, reclamation, and restoration of semiarid and arid wildlands. Field trip. P. ECOL 182 or RNR 316, S W 200.

587. Rangeland Management Plan (2) II For a description of course topics, see 487. Graduate-level requirements include development of additional management alternatives and environmental and economic analyses. All-day field trips. P. 456. May be convened with 487.

590. Colloquium
a. Rangeland Policy (3) [Rpt.] II 1994-95
b. Range Research Techniques (2) I 1994-95
P; STAT 509.
c. Diet Selection of Free-ranging Ruminants (2) 1993-94

696. Seminar
a. Rangeland Management (1) [Rpt.] I II

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 with resource management agencies. Emphasis is placed on the role of people in the management of rangelands, areas of rangelands in the Southwest for the critical resources of water, wildlife habitat, recreation, and other values. Students in watershed management may select one of several areas of specialization to further develop their knowledge in physical hydrology, forest hydrology, rangeland hydrology, soil hydrology, water quality, or aquatic biology.

In addition to the requirements for the degree in natural resources, students majoring in watershed management must complete: CHEM 103a-103b, ECON 104a-104b; ECON 201a; ENGL 101, 102 or 103H, 104H; 107, 108; MCB 181, ECOL 182; GEOS 101; 103, 107, 125a-125b, STAT 160 or 263; PHYS 102a-102b; RNR 200, 202, 204, 216, 316, 321, 384, 480, 484a-486b; S W 200, 201; COMM 100, 102, ABF 406; AERC 375; ATMO 171; ENGR 101; WS M 460, 462, 468. Students must also complete 17 units in one of the defined specializations.

Minors are available in watershed management. Foundation courses consist of prerequisites to the courses selected for the minor. The minor consists of 20 units includingWS M 408, 410, 460 and 462 in consultation with a watershed faculty advisor.

250. Forest Pathology (3) I (Identical with PL P 250)

330. Introduction to Remote Sensing (3) I (Identical with GEG 330)

408. Wildland Fire Management (3) I Principles of fire behavior in forest, range and other vegetation types; interrelationships of fuels, weather, and topography; pyrobiology; and the fire resource planning process. Field trips. P. RNR 202.

497c. Dendrochronology (4) (Identical with GEOS 464) May be convened with 597c.

497d. Advanced Watershed Hydrology (3) II Advanced topics in watershed hydrology; rainfall-runoff, infiltration, overland flow routing, sediment modeling, statistical analysis, and research methods in hydrology. P. May be convened with 564.

498c. Wildland Water Quality (3) II Introduction to water quality and its influences in natural environments. Interactions with land management and conservation to the health of the environment. Field trips. May be convened with 564.

597c. Workshop

508. Wildland Fire Management (3) I 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. Field trips. May be convened with 408.

510. Silviculture (3) II For a description of course topics, see 410. Graduate-level requirements include a creative endeavor applicable to the silviculture area. May be convened with 410.
515. Mensuration (3) II 1994-95 Measurement and inventory of forest land, forest growth, raw materials and products. Special analysis of mensurational data from an arid land inventory. 3R; P; RNR 271, 321; MATH 123.

520. Photogrammetry (1) II 1994-95 For a description of course topics, see 420. Graduate-level requirements include a scholarly paper on geodetic control, topographic mapping techniques, or computer mapping. P or CR 522. May be convened with 420.

522. Photointerpretation (2) II For a description of course topics, see 422. Graduate-level requirements include the preparation of a detailed report based on the application of the principles of photointerpretation to a specific problem in the management of natural resources. May be convened with 422.

531. Dryland Forest Management (3) II 1994-95 Utilization and management of forest resources in dry environments; biophysical and socio-economic issues related to the development of forest commodities and amenities. P, 6 units of upper-division WS M.

532. Agroforestry (3) I 1993-94 Ecological and socioeconomic factors related to the planning and implementation of agroforestry systems. P, 6 units of upper-division WS M.

534. Tree Nursery Management (3) I 1994-95 Tree nursery establishment and management, with emphasis on dryland ecosystems. P, 6 units of upper-division WS M.

535. Water Management in Dryland Ecosystems (3) I 1993-94 Hydrologic principles as applied to arid and semiarid ecosystems with water management applications in dryland resources management. P; STAT 509, S W 201. (Identical with AR L 535).

560. Watershed Hydrology (3) I For a description of course topics, see 460. Graduate-level requirements include an in-depth paper on the application of hydrologic principles to problems in watershed management. P; GEOS 101; S W 200, 201; STAT 160 or 263. (Identical with HWR 560). May be convened with 460.

561. Watershed Field Studies (3) S For a description of course topics, see 461. Graduate-level requirements include a research paper related to watershed data base management or completion of a data analysis project. P, 560, 562. May be convened with 461.

562. Watershed Management (3) II For a description of course topics, see 462. Graduate-level requirements include the development of a watershed management scenario and accompanying report. 2R, 3L, P, 460. May be convened with 462.

563. Plant-Water Relations (3) II (Identical with PL S 563) May be convened with 463.

564. Introduction to Dendrochronology (4) (Identical with GEOS 564) May be convened with 464.

565. Environmental Hydrochemistry (3) II 1994-95 (Identical with S W 565)

566. Advanced Watershed Hydrology (3) II For a description of course topics, see 467. Graduate students will be required to do additional exercises. P, 560. May be convened with 467.

567. Wildland Water Quality (3) II For a description of course topics, see 468. Graduate-level requirements include a class report and presentation on a negotiated topic of interest. Field trips. May be convened with 468.

577. Advanced Topics in the Economics of Environmental Regulation (3) II (Identical with AREC 577)

595. Colloquium e. Dendrochronology: Physical Applications (3) [Rpt./2] I II (Identical with GEOS 595e, which is home) f. Dendrochronology: Biological Applications (3) [Rpt./2] I II (Identical with GEOS 595f, which is home) g. Dendrochronology: Chronometric Applications (3) [Rpt./2] I II (Identical with GEOS 595g, which is home)

597. Workshop c. Dendrochronology (3) 3L. May be convened with 497C. (Identical with GEOS 597C, which is home)


604. Water Management (3) II 1994-95 (Identical with GEOS 509, S W 201).

609. Seminar a. Watershed Management (1-2) [Rpt.] I II

Wildlife and Fisheries Resources

William W. Shaw, Program Leader

Wildlife and Fisheries Science (WFSC)

A major in wildlife and fisheries science prepares the student for careers that apply ecological sciences for the management and conservation of fish and wildlife resources. Career opportunities include positions with state fish and wildlife agencies, federal wildlife and land management agencies, environmental consulting firms, and nongovernment conservation organizations. The major has two closely related options: fisheries science and wildlife ecology. Students are encouraged to obtain practical experience as summer employees, interns, or volunteers with natural resource management agencies or conservation organizations.

In addition to the requirements for the curriculum in natural resources, the following courses are required for both options in wildlife and fisheries science: CHEM 103a-103b, 104a-104b, 241a, 243a; ECON 201a; AREC 375; ENGL 101, 102 or 103H, 104H; 307 or 308; MCB 181; ECOL 182; 320 or AN S 213; PHYS 102a, 180a; S W 200, 201; COMM 100, 102; MATH 123 or 124 or 125a; STAT 160 or 263; RA M 382; RNR 200, 202, 271, 316, 321, 384, 480, 486a-486b; WS M 410; WFSC 444, 446, 448, 455R. The wildlife ecology option also requires: V SC 400a or 400b; two courses from WFSC 483, 484, 485. The fisheries science option also requires: CHEM 241b, 243b; WS M 468; WFSC 441, 455L, 482.

A minor is available in wildlife and fisheries science. Twenty-one units of foundation courses must be completed before the minor is initiated. Foundation courses are CHEM 103a-103b, STAT 160 or 263, MCB 181, ECOL 182, and S W 200, 201. Required courses in the minor are RNR 200, 321, 384 and a minimum of 10 units from the following: WFSC 444, 446, 448, 455R, 482, 483, 484, 485.


126. Wildlife Conservation Laboratory (1) I Laboratory exercises and field trips covering conservation techniques; animal census, habitat analysis, population dynamics, and management techniques. 3L. Field trips. P, CR, 125.

213. Animal Genetics (3) I (Identical with AN S 213)

300. Principles of Nutrition (3) I II (Identical with AN S 330)

405. Aquatic Entomology (3) I 1994-95 (Identical with ENTO 405) May be convened with 505.

411. Limnology (4) I Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating in fresh waters. 2R, 3L. Field trips. P, six units of biology and 3 units of chemistry. (Identical with ECOL 441) May be convened with 541.

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, RNR 384. May be convened with 544. Writing-Emphasis Course.*

446. Wildlife Management/Avian Species (4) II Field and laboratory methods used in avian species management; evaluation of avian habitats; census, productivity, diagnosis, and control of avian populations. 3R, 3L and field work. Weekend field trips. P, RNR 384. May be convened with 546.

484. 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.

499. Diseases of Wildlife (3) I II (Identical with V SC 449) May be convened with 549.

555R. Fishery Management (3) I II Methods and concepts pertaining to fishery investiga-
Graduate-level requirements include a description of course topics, see 441. Graduate-level requirements include a report that synthesizes literature on a research issue of current concern, an in-class presentation and several discussion meetings. Weekend field trips. P, 441 or 444. May be convened with 455L.

455L. Fishery Management Laboratory (1) II Field and laboratory methods pertaining to fishery investigations and management. P, CR, 455R, 482. May be convened with 555L.

456. Aquaculture (3) II 1993-94 For a description of course topics, see 456. Graduate-level requirements include a topic report (Identical with V SC 556) May be convened with 456.

556. Aquaculture (3) II 1993-94 For a description of course topics, see 456. Graduate-level requirements include a topic report (Identical with V SC 556) May be convened with 456.

555R. Writing-Emphasis Course.* A writing-emphasis course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements of this catalog).


582. Ichthyology (4) I 1993-94 (Identical with ECOL 582) May be convened with 482.

583. Herpetology (4) II (Identical with ECOL 583) May be convened with 483.

584. Ornithology (4) II (Identical with ECOL 584) May be convened with 484.

585. Mammalogy (4) I (Identical with ECOL 585) May be convened with 485.

589. Selected Studies of Birds (2) I [Rpt.] (Identical with ECOL 489) May be convened with 589.

*Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements of this catalog).

649. Fishery-Water Quality and Toxicology (3) I Pertinent water quality parameters essential for fish life, and the effects of various substances and their interrelationships to fish and aquatic organisms. 2R, 3L. P, 441 or 455R; CHEM 241a. (Identical with V SC 649)

650. Aquatic Entomology (3) I 1994-95 (Identical with ENTO 505) May be convened with 405.

651. Limnology (4) I For a description of course topics, see 441. Graduate-level requirements include a report that synthesizes literature on a research issue of current concern, an in-class presentation and several discussion meetings. Weekend field trips. P, six units of biology and 3 units of chemistry. (Identical with ECOL 541) May be convened with 441.

544. Wildlife Management/Mammalian Species (4) I For a description of course topics, see 444. Graduate-level requirements include an in-depth research paper on an aspect of wildlife management and an oral presentation of results. Weekend field trips. P, RNR 384. May be convened with 444.

546. Wildlife Management/Avian Species (4) II For a description of course topics, see 446. Graduate-level requirements include an in-depth research paper on an aspect of avian wildlife management and an oral presentation of the results. Weekend field trips. P, RNR 384. May be convened with 446.

549. Diseases of Wildlife (3) II (Identical with V SC 549) May be convened with 449.

555R. Fishery Management (3) II For a description of course topics, see 455R. Graduate-level requirements include a report on a current issue in management and a report on a research issue, plus several discussion meetings. P, 441 or 444. (Identical with V SC 555) May be convened with 455R.

555L. Fishery Management Laboratory (1) II For a description of course topics, see 455L. Graduate-level requirements include a detailed report and presentation on a current advance in field or laboratory methods of study. P, CR, 555R, 582. May be convened with 455L.

556. Aquaculture (3) II 1993-94 For a description of course topics, see 456. Graduate-level requirements include a topic report (Identical with V SC 556) May be convened with 456.


582. Ichthyology (4) I 1993-94 (Identical with ECOL 582) May be convened with 482.

583. Herpetology (4) II (Identical with ECOL 583) May be convened with 483.

584. Ornithology (4) II (Identical with ECOL 584) May be convened with 484.

585. Mammalogy (4) I (Identical with ECOL 585) May be convened with 485.

589. Selected Studies of Birds (2) I [Rpt.] (Identical with ECOL 489) May be convened with 489.

650. Aquatic Entomology (3) I 1994-95 (Identical with ENTO 505) May be convened with 405.

651. Limnology (4) I For a description of course topics, see 441. Graduate-level requirements include a report that synthesizes literature on a research issue of current concern, an in-class presentation and several discussion meetings. Weekend field trips. P, six units of biology and 3 units of chemistry. (Identical with ECOL 541) May be convened with 441.

544. Wildlife Management/Mammalian Species (4) I For a description of course topics, see 444. Graduate-level requirements include an in-depth research paper on an aspect of wildlife management and an oral presentation of results. Weekend field trips. P, RNR 384. May be convened with 444.

546. Wildlife Management/Avian Species (4) II For a description of course topics, see 446. Graduate-level requirements include an in-depth research paper on an aspect of avian wildlife management and an oral presentation of the results. Weekend field trips. P, RNR 384. May be convened with 446.

549. Diseases of Wildlife (3) II (Identical with V SC 549) May be convened with 449.

555R. Fishery Management (3) II For a description of course topics, see 455R. Graduate-level requirements include a report on a current issue in management and a report on a research issue, plus several discussion meetings. P, 441 or 444. (Identical with V SC 555) May be convened with 455R.

555L. Fishery Management Laboratory (1) II For a description of course topics, see 455L. Graduate-level requirements include a detailed report and presentation on a current advance in field or laboratory methods of study. P, CR, 555R, 582. May be convened with 455L.
205. Reading Scientific Russian (4) Alternate course for 201b for students interested in reading and translating scientific literature. P. 201a.

207a-207b. First Level Russian Conversation (2-2) P. 101b.

215. Phonetics (1) [Rpt./3 units] I General improvement of the student's language skills through aural/oral training in Russian phonetics. P. 101b.

217. Intonation (1) [Rpt./3 units] II General improvement of the student's language skills through aural/oral training in Russian intonation. P. 101b.

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 beginnings through the 19th century. 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. 250a is not prerequisite to 250b.

285. Introduction to Humanities Computing (3) S (Identical with GER 285)

296. Seminar
   a. Language Program in U.S.S.R. I (3) S Training in Russian language, literature and culture at St. Petersburg State University. Field trips.

301a-301b. Advanced Grammar and Composition (3-3) P. 201b or 205.

305a-305b. Readings in Russian Texts (3-3) Reading of original texts, with emphasis on the development of reading skills and the acquisition of passive vocabulary through the study of word formation. P. 201b or 205.

307a-307b. Second Level Russian Conversation (2-2) 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 within their artistic, historical, ideological and sociological contexts. Taught in English. Open to non-majors. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

330. Russian Literature from Beginnings to 1850 (3) Readings and discussion in English of representative Russian literary works from earliest times to 1850.

340. Nineteenth Century Russian Literature (3) Readings and discussion in English of representative Russian literary works of the 19th century.

350. Twentieth Century Russian Literature (3) Readings and discussion in English of representative Russian literary works of the 20th century.

396f. Honors Prosenseinar (3) I

405a-405b. Survey of Russian Literature (3-3) Historical survey of Russian literature from the earliest times to the Soviet period; designed to acquaint students with literary terminology and facilitate comprehension of lectures in Russian. P. 301b or 305b.

407a-407b. Third Level Russian Conversation (3-3) P. 307b.

485. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 485) May be convened with 585.

501a-501b. Russian Stylistics (3-3) Designed to improve the student's practical mastery and understanding of Russian at a higher and more sophisticated level. P. 301b.

507a-507b. Advanced Russian Conversation (3-3) Emphasis on attaining proficiency at the advanced level in accordance with the guidelines established by the American Council on the Teaching of Foreign Languages (ACTFL). P. 407b.

510. Theory and Methods (3) I, II Provides broad theoretical, critical and biographical introduction to the field of Russian/Slavistics.

579a-579b. Problems of Teaching Russian (1-1) Survey of modern methods of language teaching, with emphasis on the particular problems presented by Russian. All GTAs must complete both a and b.

581. Russian Phonology and Morphology (3) II Synchronic study of the phonology and morphology of modern Russian. P. 301b or 305b.

583. History of the Russian Language (3) I Diachronic study of the Russian language from Indo-European up to the modern period. P. 301b or 305b.

585. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 585) May be convened with 485.

587. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)

684. Poetry (3) Examination of 19th and 20th century Russian poetry with emphasis on 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
   b. Russian Literature: 18th Century (3) [Rpt./12 units]
   c. Russian Literature: 19th Century (3) [Rpt./12 units]
   d. Russian Literature: 20th Century (3) [Rpt./12 units]

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**Russian and Soviet Studies (RSS)**

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

Committee on Russian and Soviet Studies

Professors Robert Browder (Emeritus, History), Richard Reeves (Geography and Regional Development), William Welsh (Political Science), Allen Whiting (Political Science)

Associate Professors Alexander Dunkel (Russian and Slavic Languages), Grace Fielder (Russian and Slavic Languages), Frederick Kellogg (History), John Olsen (Anthropology), Douglas Weiner (History), John Willerton (Political Science)

Assistant Professors Galina De Roeck (Russian and Slavic Languages), Beth A. Mitchneck (Geography and Regional Development)

Russian and Soviet studies is an interdisciplinary committee that offers courses in the many disciplines involved in the study of Russia and the former Soviet Union. It is designed to prepare students for careers in government, academia, and business. The committee offers the Bachelor of Arts degree with a major in Russian and Soviet studies.

The major consists of 30 units of course work: RUSS 120 and 301a-301b, 250a or 250b or 310; RSS 409, 422, 425, 443, 495, 496a, 496b. RSS 496a must be taken in the spring semester of the junior year; 496b in the fall semester of the senior year. Appropriate independent study credits may be substituted.

Although not required for the major, a number of classes in area studies, the humanities and the social sciences are recommended as introductory courses for Russian and Soviet studies majors.

The minor in Russian and Soviet studies consists of 21 units of course work chosen from one of the following departments: Geography and Regional Development, History, Management Information Systems, East Asian Studies and/or Near Eastern Studies, and Political Science. A list of courses considered suitable for the minor is available from Russian and Soviet Studies advisors.

In addition to the courses listed above, the committee offers courses taught by visiting Soviet specialists for which the student may receive credit.

The committee participates in the honors program.

305. Soviet Economic System (3) I (Identical with ECON 305)

309. Russia and the Former Soviet Union (3) I (Identical with GEOG 409)

421. History of Russia: Early Period (3) I (Identical with HIST 421)

422. History of Russia: Modern Period (3) II (Identical with HIST 422)

423. Intellectual History of Russia (3) II (Identical with HIST 423)

424. The Russian Revolution (3) (Identical with HIST 424)

425. History of the Soviet Union (3) (Identical with HIST 425)
Second Language Acquisition and Teaching (SLAT)

Modern Languages Building
Room 445
(602) 621-3531

Graduate Interdisciplinary Program in Second Language Acquisition and Teaching Committee:

Professors Muriel Saville-Troike, Chair (English), Richard Demers (Linguistics), Kenneth Ian Forster (Psychology), Roseann Duenas Gonzalez (English), Kenneth Goodman (Language, Reading and Culture), Yetta M. Goodman (Language, Reading and Culture), Jane Hill (Anthropology), Terry Langendoen (Linguistics), Adrienne Lehrer (Linguistics), Judy Nichols Mitchell (Language, Reading and Culture), Manuel Pacheco (President), Susan Philips (Anthropology), Hamdi Qafisheh (Near Eastern Studies), Renate A. Schulz (German), Rudolph C. Troike (English)

Associate Professors H. Douglas Adams (English), Shirin Antia (Special Education and Rehabilitation), Robert Ariew (French), Margaret I Gibson (Russian), Donna M. Johnson (English), Luis C. Moll (Language, Reading and Culture), Frank Pialorsi (English), Duane H. Roen (English), Richard Ruiz (Language, Reading and Culture), Karen L. Smith (Spanish and Portuguese), Linda Swisher (Speech and Hearing Sciences), William J. Wilson (Near Eastern Studies), Ofelia Zepeda (Linguistics)

Assistant Professors: Eloise Jelinek (Linguistics), Kimberly A. Jones (East Asian Studies), Cynthia Kahn (Classics), Simin Karimi (Near Eastern Studies), Fang-hsi Liu (East Asian Studies), Teresa L. McCarty (Linguistics), Sini Prosop Sanou (French and Italian), Robert N. Smed (Spanish and Portuguese), Samuel J. Supalla (Special Education and Rehabilitation), Octaviana Trujillo (Language, Reading and Culture), Mary Wildner-Bassett (German), Haru Yamada (East Asian Studies), Mary L. Zampini (Spanish and Portuguese)

The Program in Second Language Acquisition and Teaching offers a program leading to a Doctor of Philosophy degree with a major in second language acquisition, learning and teaching. The cooperating departments include Anthropology; Classics; East Asian Studies; English; French and Italian; German; Language, Reading and Culture; Linguistics; Near Eastern Studies; Psychology; Russian and Slavic Languages; Spanish and Portuguese, and Speech and Hearing Sciences. Students may choose from specializations in (1) second language analysis (grammar; contrastive linguistics/interlanguage studies), (2) second language use (discourse analysis, sociolinguistics, language policy/planning, rhetoric, pragmatics), (3) second language processes and learning (second/foreign language acquisition: theory and research), (4) second language pedagogical theory and program administration (ESL/FL methods, curriculum development, testing and evaluation, reading and writing, educational technology).

For admission and degree requirements, please consult the Graduate Catalog.

Secondary Education

(See Teaching and Teacher Education)

Sociology (SOC)

Social Sciences Building, Room 400
(602) 621-3531


Associate Professors James T. Borhek (Emeritus), Courtney B. Cleland (Emeritus), Robert R. Evans (Emeritus), Patricia L. MacCorquodale, Terry L.L. Miller (Emeritus), Kathleen S. Schwartzman, James L. Shockley

Assistant Professors Susan Gonzalez Baker (Public Administration and Policy), Elisabeth S. Clemens, Hector Delgado, Debra Friedman, Donald S. Grant, Alfonso Morales, Calvin K. Morrill (Communication), Michael Polakowski (Public Administration and Policy), James Ranger-Moore, Marc Schneiberg

Adjunct Professor Andrew M. Greeley

Sociology is the study of human society, its origins, functions, and problems. It focuses on relations among people, groups, organizations, classes, and cultures. Sociology explores and analyzes issues vital to our personal lives, our communities, our nation, and the world. The curriculum in sociology is designed to show students the social character of human life and the impact of varying forms of social organization on human affairs. Students are introduced to the methods by which knowledge is obtained, and may examine the results of research on such diverse topics as the family, religion, education, politics, and crime.

The major provides a foundation for careers in many professional fields, such as law, criminal justice, and social service, and for graduate training as a professional sociologist in government, business, community agencies, research organizations, or educational institutions.

Students are important to the department, and the names and office hours of faculty and student advisors are posted on the department's undergraduate bulletin board. Students should feel free to discuss academic, career, or related matters with these advisors.

Undergraduates are encouraged to become actively involved in the design of their education, and to take advantage of the opportunities and services offered by the department. Internships, practicums, and independent study courses (393, 394, and 399), help students establish ties to social service agencies and individual professors. The Sociology Club and the Undergraduate Criminal Justice Club offer further opportunities for participation in departmental and community affairs. Alpha Kappa Delta, the national honorary society, and the Maynard Erickson Award provide opportunities for those interested in academic excellence. Details are available in the Handbook for Sociology Majors, which may be obtained in the departmental office.

The major for the B.A. requires a minimum of 36 units of sociology, 21 of which must be upper-division courses. All majors must take 101, 274, 275, and 300, which provide students with an overview of the discipline and the fundamentals of its research methods and statistics. The student may then select one of five programs: (1) a general program that allows the student to select...
eight courses from the entire range of courses offered by the department (six of which must be upper division); (2) a topical specialization that requires a minimum of four courses in one of the four areas. The four areas, with appropriate course listings, are as follows: (a) social problems and policy: 150, 160, 189, 201, 313, 341, 342, 343, 459, 467; (b) institutions and organizations: 251, 303, 315, 317, 321, 322, 326, 420, 422, 434, 441; (c) social and cultural diversity: 150, 160, 161, 384, 450, 459, 467; (d) self and society: 310, 324, 333, 340, 436.

Students planning to major in sociology should complete 101, 274, 275, and 300 before enrolling in other sociology courses. (Upper division courses require completion of 56 units, or permission of the instructor. Otherwise unless specifically indicated, sociology courses do not have prerequisites.) The Writing-Emphasis course is 300 (for prerequisites, see course listing). Required courses other than 101 (274, 275, and 300) are not offered in summer sessions. Electives may include up to six units of 393, 394, and 399.

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, 274, 275, and 300.

101. Introduction to Sociology (3) I II Sociological concepts and principles, with special reference to contemporary society.

150. Sociology of Women (3) I II Sociological examination of women's status and role in American society, including socialization and experience in family, educational, and work institutions. Emphasis on theories of origin and maintenance of gender inequalities. P, 101. (Identical with W S 150)

160. Minority Relations and Urban Society (3) I II Analysis of minority relations and mass movements in urban society; trends in the modern world, with special reference to present-day race problems and social conflict. (Identical with AAS 160 and MAS 160)

161. The Chicano in American Society (3) I II Study of Mexican Americans (Chicanos) as an ethnic-cultural group in American society, analysis of their present problems as a minority group, focus on Chicano-Anglo relations in southwestern U.S. (Identical with MAS 161)

189. World Population (3) I II Basic concepts of population studies; analysis of social trends, problems and solutions in relation to environmental factors, with reference to both advanced and developing nations.

201. American Social Problems (3) I II An examination of current theoretical perspectives and research on social problems.

251. Sociology of Education (3) I II Educational system as a basic social institution; its structure, impact on society, and effects on students; consideration of alternative structures.

274. Social Statistics (3) I II Techniques of statistical description and elementary statistical inference as applied to sociological data. P, 101 and MATH 117R/S

275. Social Research Methods (3) I II Problems of conceptualization and measurement of social phenomena; design of research projects; techniques of data collection and analysis. P, 273

300. Sources of Sociological Theory (3) I II Critical review of the works of leading sociologists. Writing-Emphasis Course. P, satisfaction of the upper-division writing-probability requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

301. Medical Sociology (3) I II Organization of health care in the U.S.; its impact on patients and society: health care practitioners; medical industries; policy debates.

310. Culture and the Individual (3) I II (Identical with ANTH 310)

313. Collective Behavior and Social Movements (3) I II Study of riots, panics, crazes, reform and revolutionary movements; their origins, social bases, careers and consequences.

315. Political Sociology (3) I II Current competing theories of socio-political institutions. (Identical with POL 315)


321. Sociology of the Family (3) I II Analysis of the modern family and its characteristics in a social and historical setting.

322. Sociology of Religion (3) I II Religion as a social institution with special reference to industrial societies. (Identical with RELI 322)

324. Sociology of Sexuality (3) I II Impact of individual and communal sexual attitudes and behaviors on other sociological and psychological functioning. Credit is allowed for this course or HLTH 330, but not for both.

326. Industrial Sociology (3) I II Survey of the sociology of work and its organization, with emphasis on social supports of work motivation and effectiveness.

333. Group Processes (3) I II Study of processes that form, maintain, and dissolve groups, including their objectives, cohesion, norms, role leadership and power structures, communication patterns, interpersonal relations, problem solving, and effectiveness.

340. Sociology of Childhood and Youth (3) I II Children, adolescents, and young adults in American society: their social roles, relationships, and problems.

341. Juvenile Delinquency (3) I II Nature, causes, and consequences of delinquent behavior. (Identical with PA 341)

342. Criminology (3) I II Study of the social origins of criminal law, criminal behavior, and reactions to crime. (Identical with PA 342)

343. The Crime Problem (3) I (Identical with PA 343)

344. Legal Aspects of the Criminal Justice Process (3) I II (Identical with PA 344)

348. Sociology of Latin American Societies (3) I II Analysis of their social structures and institutions, including government, religion, family, education, stratification, urban and rural development, economics, migration. (Identical with ANTH 384 and LA S 384)

396H. Honors Proseminar (3) I II

412. Peasants and Peasant Societies (3) I (Identical with ANTH 412)


422. Complex Organizations (3) I II Theories and research regarding large- scale organizations and their relations to the individual and society.

431. The Criminal Justice System (3) I II (Identical with MAP 431)

434. Kinship and Social Organization (3) I (Identical with ANTH 434)

436. Social Structure and Personality (3) I II Relation between the person and the group; social factors in character formation.

441. The Criminal Justice System (3) I II (Identical with PA 441)

444. Group-Process Methods in Management (3) I II (Identical with MAP 444)

450. Social Stratification (3) I II Theories of social class, caste, and rank; social mobility in contemporary society. (Identical with ANTH 450)

457. Bio-Social Determinants of Socialization (3) I II (Identical with FS 457)

459. Sociology of Gender (3) I II Social construction, variation and consequences of gender categories across time and space. Topical (decision-making, deviance) and institutional (family, religion, politics) approaches. (Identical with W S 459)

467. Race and Ethnic Relations (3) I II Social processes involved in minority groups in terms of race, caste, class, ethnicity, politics, and religion. (Identical with AAS 467, ANTH 467, AINS 467 and MAS 467)


505. World-System Theory and Research (3) I II Theory and research on the modern world-system.

508. Sociology of Culture (3) I II Theory and research on the nature of cultural systems, cultural production and consumption, and strategies of interpretive analysis. P, consult with department before enrolling.

509. Objects and Methods of Cultural Analysis (3) I From content analysis to statistical analysis, means of gathering and analyzing data on cultural objects.

510. Political Sociology (3) I Basic approaches in political sociology, with emphasis on the
relationship of economic and political processes.

515. Social Movements and Collective Action (3) A sociological examination of the emergence and development of social movements/collective action at both the societal and individual levels. Major theoretical perspectives on social movements/collective action will be reviewed as well as recent and classical empirical works in the area. P, admission to graduate program or departmental approval.


521. Social Policy (3) (Identical with PA 521).

524. Organization Ecology (3) Survey of theory and research in organizational ecology, focusing on the organizational population as the level of analysis. Topics include population boundaries, selection vs. adaption, evolutionary dynamics.

525. Organization Theory (3) Basic review of classic and contemporary approaches to the study of complex organizations; formation, development, and internal processes.


530. Theories and Research in Social Psychology (3) A comprehensive introduction to the major theoretical perspectives, methodologies, research areas, and issues in contemporary social psychology.

531. Socialization and Society (3) Various theoretical perspectives are applied to the content, process, and contexts of socialization throughout the life cycle to see how individuals become social beings and societal participants. P, 530, or consult department before enrolling.

532. Role, Self, and Identity (3) An examination of the concepts of role, self, and identity in relation to social action and social psychological functioning. Alternative approaches are presented, but the symbolic interactionist perspective is highlighted. P, 530, or consult department before enrolling.

533. Social Relations, Groups, and Networks (3) An analysis of social interaction in relations, groups, and networks, emphasizing the reciprocal influences of social structure and social process. Theories of exchange, power, status, and justice are considered. P, 530, or consult department before enrolling.

537. Social Cognition, Affect and Emotion (3) Theories and research that describe how we perceive and react emotionally to the social world. Topics include social attribution, stereotyping, attitude-behavior relations, social accounts, culture emotion and culture management.

540. Theories of Crime and Public Policy (3) (Identical with PA 540).

541. Deviance and Social Control (3) Theory and research on the origins of various forms of deviant behavior, and on the consequences of efforts to control them. P, 201, 341 or 342. (Identical with PA 541).

551. Stratification and Class (3) Basic examination of concepts and research in the area of stratification, with emphasis on the classic statements and contemporary research.

555. Advanced Topics in Stratification (3) (Rpt./1) In-depth study of one contemporary area of research in stratification. Topics will vary.

556. Gender Issues in Organizational Behavior (3) (Identical with MAP 556).

557. Gender and Labor (3) Sources and consequences of gender differentiation and inequality, with attention to occupations, earnings, labor markets, household work, and the family. P, 3 graduate credits in women's studies, sociology, or economics; or undergraduate major in one of these three fields.

558. Gender Identities and Interactions (3) Examination of the interaction of gender, race, class, and ethnicity in the context of social structures and institutions. Focuses upon identities and social interaction as keys to understanding how gender inequality is created, perpetuated, or altered in families, schools, peer groups, work settings, and cultural symbols. P, 3 graduate credits in sociology, social psychology or women's studies. (Identical with W 558).

560. Race and Ethnicity (3) Analysis of recent research on the relations among racial and ethnic groups in society, with special attention to current empirical and theoretical issues.

569. Basic Quantitative Methods (3) An introduction to basic quantitative methods for professional sociologists, including computer, mathematical, and statistical concepts.

570a - 570b. Social Statistics (3 - 3) 570a: Probability, distributions, estimation and hypothesis testing. 570b: Ordinary least squares regression, generalized least squares regression, structural equation models (path analysis and non-recursive systems).


576. Field and Observational Methods (3) Comprehensive and critical examination of the collection, coding, analysis, and presentation of ethnographic/qualitative field data. Original field research required. P, admission to graduate program or departmental approval. (Identical with COMM 576).

580. Population Studies (3) Theory and research in the fields of fertility, mortality, and migration, with emphasis on their relationships to social structure. An original research project is required.

585. Constructing Social Theories (3) The nature and fundamental types of social theories. Formulating theories to guide research across a range of substantive areas. Criteria for choosing among alternative theories.

595. Colloquium (1 - 3)
   a. Introduction to Graduate Study (1)
   f. Criminal Justice (3) (Rpt./12 units) (Identical with MAP 955f, which is home)

596. Seminar (1 - 3)
   a. Advanced Problems in Research (1 - 3)
   b. Graduate Teaching (3) II 2R, 3L.

597. Gender and Labor (3) Sources and consequences of gender differentiation and inequality, with attention to occupations, earnings, labor markets, household work, and the family. P, 3 graduate credits in women's studies, sociology, or economics; or undergraduate major in one of these three fields.

Advanced Problems in Deviant Behavior (1 - 3)

Social Organization (3) (Rpt./6 units) P, completion of first-year graduate program curriculum in sociology. [Note: This is a two-semester course beginning in fall which receives a "K" grade at end of first semester.]

Soil and Water Science (SW)
Shantz Building, Room 429
(602) 621-1646

Associate Professors David M. Hendricks, Alfredo R. Huet, Allan D. Mathias
Assistant Professors Mark L. Brusseau, Raina M. Miller, Thomas L. Thompson
Adjunct Assistant Professor Mary S. Moran
Assistant Research Scientist Janick F. Arbolata
Associate Research Scientist Charles A. Sanchez
Extension Specialists Paul W. Brown, Thomas A. Doerge, Jeffrey C. Silvertooth (Plant Sciences), John E. Watson

The Department of Soil and Water Science provides students with a broad background in soil science and water quality, with emphasis on soil-plant-water relationships or environmental aspects of land and water use. The department offers the Bachelor of Science in Agriculture, Master of Science, and Doctor of Philosophy degrees with a major in soil and water science.

All undergraduate students majoring in soil and water science must satisfy the general education requirements of the College of Agriculture, and must complete the following courses: CHEM 103a, 103b, 104a, 104b; 219a or 322, 323; PHYS 101a, 180a; MCB 181; GEOS 101 or 110; and MATH 123. The University Writing-Emphasis Course requirement can be met by completion of S W 411, 426, 450, 461 or 470.

A major with an emphasis in soil-plant-water relationships must complete S W 200, 201, 316, 317, 431; ABE 250 or 404; S W 411, 410, 412, 417, 426, 450, 461 and 470.

A major with an emphasis in environmental science must complete S W 200, 201, 411, 425; AREC 217, POL 481; and two of the following: S W 431, 450, 453, 470; HWIR 250, SW 105; 106 are recommended but not required for majors with an emphasis in environmental science.

Students are encouraged to take additional classes in chemistry, physics,
mathematics, biology, and geosciences, as well as classes in computer science and statistics.

A minor in soil and water science, emphasizing either soil-plant-water relationships or environmental science, is available to students from other disciplines. Requirements include SW 200, 201, and three of the following: SW 105 and 106, 316 and 317, 411, 431, and 470. In addition, students must take 6 units (at least 3 upper-division units) of geosciences, hydrology, irrigation, or soil and water science.

Courses listed in this department satisfy the 13-unit College of Agriculture requirement for microbiology undergraduate majors.

The environmental science major is interdisciplinary and leads to the Bachelor of Science in Environmental Science. It is administered through the Department of Soil and Water Science, with an advisory committee formed from the Departments of Civil Engineering and Engineering Mechanics, Chemistry, Ecology and Evolutionary Biology, Economics, Geology, Hydrology and Water Resources, Soil and Water Science, and Toxicology.

There are four program areas: land and water emphasis, biology emphasis, environmental health emphasis, environmental engineering sciences emphasis. The major is a science-oriented curriculum, and provides a strong background in the chemical, biological, and physical sciences. The environmental science major provides students with an understanding of the scientific processes that affect pollution of land, water and air.

The general education requirements are set by each college. The degree will allow a student to use the general education requirements for microbiology undergraduate majors.

The B.S. in Environmental Science curriculum consists of several core groupings. The basic sciences and mathematics core includes: CHEM 103a-103b, 104a-104b, 241a, 243a, MATH 124, STAT 263, PHYS 102a, 102b, and ECOL 181a. The environmental sciences core includes: SW 405 or CHEM 325/326, SW 493 (Internship), AREC 217, POL 481, OSH 486, and three courses selected from advanced environmental science, toxicology, and regulations. SW 105, 106 are recommended but not required for environmental science majors. In addition to these two core areas, students select one of the four emphasis areas described above. Suggested curricula and course listings are available from the department.

105. Introduction to Environmental Science: Land, Water and Air (3) I II Introduction to contemporary environmental issues and their relationship to physical, chemical, and biological principles. Discussion and evaluation of risks and tradeoffs in addressing solutions to environmental pollution. Optional field trip. P, high school chemistry recommended; CR, 106 encouraged. Caldwell

106. Environmental Science Laboratory: Land, Water and Air (1) I II Exercise and field trip experiences to study environmental problems related to land, water, and air resources. Basic physical, chemical, and biological principles that relate to understanding environmental problems will be discussed. Fluid trip. P, algebra and high school chemistry recommended.

197. Workshop

a. Issues in Environmental Protection (1) S Field trips. Offered only through the Horizons Unlimited Summer Program.

200. Soils (3) I II GRD Fundamental principles of soil science—origin, nature, and constitution of soils; their chemical, physical, and biological properties in relation to plant growth and the nonplant uses of soils. P, CHEM 101a and 102a or 103a and 104a. Post


250. Water and Its Uses (3) I GRD Identical with ABE 250

316. Soil Fertility and Plant Nutrition (3) I CDT Chemical and biological properties of soil as they affect soil nutrient availability and crop production. Principles of plant nutrition and fertilizer use will also be discussed. Additional topics are fertilizers and fertilization, irrigation, water quality, soil salinity, environmental impacts of fertilizers, and principles of soil development. Laboratory exercises for 200. P, CR, 200.


318. Soil Morphology, Classification and Survey (3) I CDT Theory and practice of describing and identifying soils, emphasizing properties of agricultural and environmental soils. Laboratory exercises will also be included. P, 200. Thompson

320. Introduction to Remote Sensing (3) I (Identical with GEOG 330)

401. Management of Arid Lands and Salt-Affected Soils (3) II Principles and practices of soil, salt and water management under arid and semiarid conditions, design of diagnostic procedures for evaluating soils and waters, reclamation, and economics of irrigation project development. 2R, 3L. Field Trips P, 200, 201. May be convened with 501.

404. Irrigation Principles and Management (3) II GRD (Identical with ABE 404) May be convened with 504.

405. Environmental and Soil Analysis (3) II Principles and methods of chemical analysis of soils, water and biological materials emphasizing properties of agricultural and environmental significance. 1R, 6L. P, CHEM 322, 323, PHYS 102a, 100b. May be convened with 505. Hendricks, Artiola, Brussseau.

411. Soil Chemistry (3) I CDT Soil chemical interactions with water, air, plants and polluants. 2R, 3L. P, CHEM 103b, 104b. May be convened with 511. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog). Bohn/Hendricks

417. Introduction to Geographic Information Systems (3) I (Identical with RNR 417) May be convened with 517.

421a-421b. Microbiological Techniques (3-3) (Identical with MIC 421a-421b)

425. Environmental Microbiology (3) I (Identical with MIC 425) May be convened with 525.

426. Environmental Microbiology Laboratory (2) I Basic techniques for isolation and characterization of environmental soil and water microflora including methods for enumeration and measurement of physiological activity. P, 425. (Identical with MIC 426) May be convened with 526.

428. Microbial Genetics (3) I (Identical with PL P 428)

430. Environmental Monitoring (3) I Theory and application of environmental measurements to the sampling and monitoring of groundwater, soil, surface water, and near-surface atmosphere systems. 1R, 6L. P, HRW 450 or SW 411 or equivalent. May be convened with 530. Artiola/Brussseau/Matthus.

431. Soil Morphology, Classification and Survey (3) I Theory and practice of describing characteristics of soils; principles of soil classification and the classification systems; methods and applications of soil surveys. 2R, 3L. Field trips. P, 200, 201. May be convened with 531. Post

440. Biodegradation of Pollutants in Soil and Groundwater (3) II 1993-94 Description of modern pollution problems and potential biological remediation techniques focusing on the chemistry, biochemistry and molecular biology of biodegradation of hazardous and toxic compounds. P, MIC 425. May be convened with 540. (Identical with MIC 440) Miller

450. Anticipating the Future: Focus on Environment (3) I II Techniques to understand broad issues about the future with focus on environmental topics. Uses computer conferencing and significant student discussion with opportunities for team approaches and reporting. P, upper-division standing. May be convened with 550. Caldwell Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

453. Remote Sensing of the Environment (3) I II Remote sensing techniques and applications for improved natural resource utiliza-
tion of soils, water, grasslands, and forest. Fundamental energy-matter interactions that influence the spectral characteristics of vegetation, soil, and water. 2R, 3L. Field trips. P, 330 or PHY5 102b. May be convened with 553. Huan

461. Soil and Water Conservation (3) II 1994-95 Consideration of major world soil and water conservation problems and solutions; principles of soil erosion by wind and water and their effects on world food problems. 2R, 3L. Field trips. P, 200. May be convened with 561. Post


470. Soil Physics (3) II CDT Soil structure and physical constitution of soils; the physical properties of soil-water systems, movement and exchange of gases in the soil, and physical laws governing the movement and availability of soil water. 2R, 3L. P, 200, PHY5 102b, CR, MATH 125a. May be convened with 570. Warrick

475. Freshwater Algae (4) II 1993-94 (Identical with ECOL 475)

490. Remote Sensing for the Study of Planet Earth (3) II 1993-94 (Identical with REM 490) May be convened with 590.

501. Management of Arid Lands and Salt-Affected Soils (3) II For a description of course topics, see 401. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. Field Trips P, 200, 201. May be convened with 401.

504. Irrigation Principles and Management (3) II GRD (Identical with ABE 504) May be convened with 504.

505. Environmental and Soil Analysis (3) II For a description of course topics see 405. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. P, CHEM 323; PHY5 102b, 180b. May be convened with 405. Hendricks, Artiola, Brusseau.

511. Soil Chemistry (3) I CDT For a description of course topics, see 411. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. 2R, 3L. P, 200, CHEM 103b, 104b. May be convened with 411. Bohm/Hendricks

517. Introduction to Geographic Information Systems (3) II (Identical with RNR 517) May be convened with 417.

520. Physics of Plant Environments (3) I 1993-94 Principles of energy, momentum, and gaseous exchanges within the environments of agricultural land surfaces; emphasis on models and measurements of potential and actual evaporation of water. P, MATH 125b, PHY5 102b. Matthews

525. Environmental Microbiology (3) I (Identical with MBIM 525) May be convened with 425.

526. Environmental Microbiology Laboratory (2) I For a description of course topics, see 426. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. P, 200, PHY5 102b, CR, MATH 125a. May be convened with 470. Warrick

530. Environmental Measurements (3) II For a description of course topics see 430. Graduate-level requirements include preparation of a term project. 1R, 6L. P, HW5 450 or HW5 517 or SW 511 or equivalent. May be convened with 430. Artiola/Brusseau/Matthias.

531. Soil Morphology, Classification and Surveying (3) II For a description of course topics, see 431. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. Field trips. P, 200, 201. May be convened with 431. Post

540. Biodegradation of Pollutants in Soil and Groundwater (3) II 1993-94 For a description of course topics, see 440. Graduate-level requirements include a short oral presentation about a recent journal article and a paper pertaining to recent advances in biodegradation studies. P, MBIM 525. May be convened with 440. (Identical with MBIM 540) Miller

541. Soil Genesis (3) II 1994-95 Physical and chemical processes and mineralogy of weathering and soil formation; quantitative pedology; the soil as part of the ecosystem. Field trips. P, GEOS 101 and CHEM 103b. (Identical with GEOS 541) Hendricks

546. Environmental Biotechnology (2) II 1994-95 Molecular methods for detection of microorganisms in the environment. Fate and survival of introduced organisms in the environment. Molecular mechanisms of microbial inactivation in waste treatment systems and microbial risk assessment. P, 525 (Identical with MBIM 546)

550. Anticipating the Future: Focus on Environment (3) II For a description of course topics, see 450. Graduate-level requirements include a report in an area of special interest. May be convened with 450. Caldwell

553. Remote Sensing of the Environment (3) II For a description of course topics, see 453. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. P, 330 or PHY5 102b. May be convened with 453. Huan

561. Soil and Water Conservation (3) II 1994-95 For a description of course topics, see 461. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. Field trips. P, 200. May be convened with 461. Post

565. Environmental Hydrochemistry (3) II 1994-95 The occurrence, transport, and fate of organic and inorganic contaminants in the subsurface environment. Emphasis on the physical, chemical, and biological processes influencing transport and fate in unsaturated and saturated zones. Transport and fate models are discussed. P, 470 or HW5 407 or 431, CHEM 480a. (Identical with WS M 565) Brusseau

566. Soil and Groundwater Restoration (3) II 1993-94 For a description of course topics, see 466. Graduate-level requirements include a research paper. May be convened with 466. Brusseau

570. Soil Physics (3) II CDT For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. P, 200, PHY5 102b, CR, MATH 125a. May be convened with 470. Warrick

573. Monitoring Biome Processes (2) I 1994-95 Global-scale interactions of soils with their plant cover and climate. The spatial distributions and dynamics of soil-plant-water processes with emphasis on measurements from space. P, 200, 330 or 453. Huan


602. Soil-Plant Relationships (3) I Principles of soil solution and colloid chemistry, soil-water relationships, soil microbiology, and plant physiology and metabolism will be discussed. These principles will be applied to processes of soil nutrient cycling, nutrient availability, and plant growth. P, 200. Thompson.

605. Soil-Water Dynamics (3) II 1994-95 Water flow in soils; closely related problems of solute, pollutant, and heat transfer; emphasis on current concepts and research. P, MATH 254. (Identical with ABE 605 and HW5 605) Warrick

694. Practicum

696. Seminar
a. Topics in Soil, Water and Environmental Science (1) [Rpt/4] II

Southwest Studies
1052 North Highland Avenue
(602) 621-2484
The Southwest Center
Director Joseph C. Wilder

Southwest Studies are designed to bring new perspectives to regional subjects through interdisciplinary approaches. Courses on the Southwest are taught through many university departments and programs, including American Indian Studies, anthropology, English, geography, history, Latin American studies, linguistics, Mexican American studies, political science, sociology, Spanish and Portuguese, and women's studies. For information, contact the Southwest Center.

Spanish and Portuguese
(SPAN/PORT)
Modern Languages Building,
Room 545
(602) 621-3123
Professors Charles M. Tatum, Head, Leo L. Barrow, A. Dolores Brown (Emerita), Jack Emory Davis (Emeritus), John J.
The Department of Spanish and Portuguese offers courses in language skills, linguistics, pedagogy, grammar and composition, literature, and culture. There is an alternate track designed especially for native speakers of Spanish with courses in language and culture, culminating in creative writing and a variety of classes in Mexican and Mexican-American literature. The department provides academic direction in summer programs in Spanish at the Guadalajara Summer School in Mexico, in summer and year programs in Spain, and in Portuguese in a semester program in Rio de Janeiro.

The department offers programs leading to the following degrees: Bachelor of Arts with a major in Spanish, with a specialization in either language and culture or in Hispanic language and linguistics; or the Bachelor of Arts with a major in Portuguese, with a specialization in language and literature; the Bachelor of Arts in Education with a teaching major in Spanish; Master of Arts with a major in Spanish, and an emphasis in either literature or language and linguistics; the Master of Arts in Education with a teaching major in Spanish; and the Doctor of Philosophy with a major in Spanish. For further information regarding the graduate programs, please consult the Graduate Catalog.

The major in Spanish for the B.A. shall consist of 36 upper-division units, consisting of two qualifying courses of three units each, plus 30 upper-division units, with a primary concentration in either language and linguistics or in language and literature (eight courses minimum) and a secondary emphasis (two courses minimum) in the alternate area.

Contact the department for specific course requirements.

In the language and literature concentration all students will complete three survey courses: 400, 401 and 403. A senior thesis in literature is an option for the literature major, and is under the direction of a student-selected faculty mentor. The course will be devoted to the creation of an original research paper by the student, and is conceived as an introduction to literary research methods and materials by the faculty mentor.

The complementary language/linguistic component shall consist of 425 or 450, and one linguistics course.

The language and linguistics concentration courses are being revised. Please contact the department for specific requirements.

The complementary literature component shall consist of 350 and either 400, 401 or 403.

The major in Portuguese for the B.A. shall consist of 30 units, beginning with 206 or higher.

The supporting minor for majors in Spanish or Portuguese: recommended subjects are classics, drama, English, philosophy, other modern languages, humanities, history and theory of art or music, journalism, speech, anthropology, political science, business, economics, history, linguistics, psychology, sociology, or other subjects as may be individually justified.

The teaching major for the B.A. in Education: 24 units in upper-division Spanish to include the following courses: 340, 350, 425 or 450, and one of the literature surveys (400, 401, or 403) and one of the cultural surveys (430, 431 and 457 or 473).

The teaching minor for the B.A. in Education: 20 units in Spanish, including 325, 340, and 350.

Spanish 101, 102, 201, 202 and Portuguese 101, 102 are for the student who is learning a second language. Spanish and Portuguese 205 and 206 are for the student who has already learned a second language, preferably a Romance language. SPAN 203, 253a-253b, 323, 333, comprise the alternate track in communication skills for native speakers of Spanish.

Students will be placed in the proper class level according to one or more of the following factors: previous experience or study, departmental placement examinations, individual counseling. Placement examinations are given during the summer to incoming freshmen and during the week of registration preceding the fall and the spring semesters to all students in need of advising or placement. Non-credit proficiency examinations are available during registration and the first week of classes for students interested in challenging 300-level language courses; no credit or grade is given for this type of intra-departmental examination. Consult an undergrad student advisor. For information about proficiency examinations with credit, consult the Academic Policies and Graduation Requirements section of this catalog.

The four-semester language proficiency requirement may be satisfied by completing with a passing grade SPAN 202, 203, 206 or PORT 206. It 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 or language-skills sequence is successfully completed, no lower numbered course taken subsequently in that sequence will count toward the major.

Writing-Emphasis Course: Since writing in all upper-division courses is in Spanish or Portuguese, the completion of either 325 or 425 will constitute the fulfillment of a bilingual proficiency in composition.

The department participates in the honors program.

For further information, contact your advisor and those of the Department of Spanish and Portuguese.

Spanish (SPAN)

101. First Semester Spanish (4) GRD Oral approach. For the student with no previous experience in Spanish.


201. Second Year Spanish (4) GRD Credit allowed for 201 or 203, but not for both. P, 102 or placement by examination.

202. Second Year Spanish (4) GRD Credit allowed for 202 or 333, but not for both. P, 201 or placement by examination.

203. Oral Communication in Spanish (4) Designed for native speakers of Spanish only; considered to be at the third-semester level. Credit allowed for this course or 201, but not for both. (Identical with MAS 203)

204a-204b-204c. Intensive Spanish (8-8-8) Offered in Guadalajara only. 204a is the equivalent of 101 and 102. 204b is the equivalent of 102 and 201. 204c is the equivalent of 201 and 202. P, recommended for highly motivated students and/or those with experience in another Romance language.

205. Intensive Spanish (4) 205 is the equivalent of 101 and 102. Recommended for highly motivated students and/or those with experience in another Romance language.

206. Intensive Spanish (4) 206 is the equivalent of 201 and 202. Recommended for highly motivated students and/or those with experience in another Romance language. P, 205.

251a-251b. Intermediate Spanish (3-3) I II CDT Combines all forms of language skills (speaking, reading, writing, and comprehension) with intermediate grammar. Credit is allowed for this course or 253a-253b, but not both. P, 202.

253a-253b. Comprehensive Spanish for the Native Speaker of Spanish (3-3) I 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 251a-251b, 325, or 330. (Identical with MAS 253a-253b)
287. Eroticism and Love in the Middle Ages (3) III S (Identical with GER 277)

285. Introduction to Humanities (3) S (Identical with GER 285)

302. Intensive Spanish, Fifth and Sixth Semesters (6) GRD S Offered in Guadalajara only. For those who have completed four semesters of college Spanish or equivalent. Will cover the 5th and 6th semester Spanish. A complete immersion in the study of intermediate Spanish, teaching all four skills. P, 202. Credit allowed for this course or 325, but not both.

323. Mexican-American Spanish and Bilingualism (3) II Mexican-American Spanish and bilingualism as a point of departure for developing standard vocabulary and grammar at the intermediate level. Credit is allowed for this course or 330, but not both.

325. Intermediate Grammar and Writing (3) I II P, 251b. (Identical with LA S 330)


333. Writing and Oral Skills for the Native Speaker of Spanish (3) I II P, 323. Credit is allowed for this course or 330, but not both.

340. Phonetics (3) I II Offered for students who need to perfect pronunciation and for non-native speakers of Spanish. P, 202 or 203.

350. Readings in the Literary Genres (3) I II P, 251b. (Identical with LA S 350)

371a-371b. Commercial and Technical Spanish (3-3) P, 253b or 330. 325. (Identical with LA S 371a-371b)

400. Survey of Spanish Literature (3) Introduction to Spanish literature from the Middle Ages to the contemporary period. P, 350.

401. Survey of Spanish-American Literature (3) Introduction to Spanish-American literature from the colonial to the contemporary period. P, 350. (Identical with LA S 401a-401b)

402. Survey of Mexican Literature (3) S Major works by Mexican writers. Offered in Guadalajara only. P, five semesters of Spanish. (Identical with LA S 402)

403. Mexican-American Literature (3) II Study of the literature, in Spanish and English, created by the Mexican-American in the United States. P, 350. (Identical with ENGL 403, LA S 403, and MAS 403)

414. Teaching of Modern Languages (3) II (Identical with TTE 414)

415. Creative Writing in Spanish (3) II Practice in writing poetry and fiction in Spanish. P, 450. (Identical with LA S 415)

422. Introduction to Romance Philology (3) I Survey of the development of the modern Romance tongues from the Latin language. P, knowledge of two Romance languages. (Identical with FREN 422, ITAL 422 and PORT 422)


437. Spanish Theater (3) I 1993-94 Spanish theater selections from the middle ages through the twentieth century. P, 400.

441. Children’s Literature in Spanish (3) I Survey of children's literature in Spanish, with special attention to the needs of American schools and libraries. P, 350. (Identical with LA S 441, LI S 441 and MAS 441)

442. Advanced Spanish American Theater (3) I 1993-94 Spanish American theater selections from the colonial period to the present. P, 401.


444. Mexican and Mexican-American Prose Fiction (3) I Introduction to Mexican and Mexican-American prose fiction with emphasis on the contemporary period. P, 350. (Identical with LA S 444 and MAS 444)

445. Novel of the Mexican Revolution (3) I How the revolution of 1910 has been portrayed by Mexico’s leading writers. P, 350. (Identical with LA S 445)

446. Mexican and Mexican-American Theater (3) I Introduction to Mexican and Mexican-American theater with emphasis on the contemporary period. P, 350. (Identical with LAS 446 and MAS 446)

447. Contemporary Mexican Literature (3) II S Major novelists of modern Mexico; their works, narrative perspective, characterization, language, time, space, and themes. P, 350. (Identical with MAS 447)


450. Conversation and Writing Skills (3) I II Study and practice in formal and informal usage of Spanish as oral communication. P, 330, 333.

453. Theory of Spanish Morphosyntax (3) Introduction to current theories of syntax to describe specific phenomena. (Identical with LING 453)

457. Applied Linguistics (3) I Application of linguistic theory, including psycholinguistic and sociolinguistic approaches to pedagogy. (Identical with LING 457)

473. Spanish for the Native Speaker of Spanish Classroom Teacher (3) II Practical Spanish for the elementary and secondary school subject-matter teacher who uses Spanish as the medium of instruction. P, 253a or 325 or 330. (Identical with MAS 473)

485. Linguistic and Computer-assisted Approaches to Literature (3) [Rpt./6 units] II (Identical with GER 485) May be conveved with 985.

510. Development of Spanish Medieval, Renaissance, and Golden Age Literature (3) Spanish medieval, renaissance and golden age literature (short fiction, poetry, novel and drama) from the twelfth through the seventeenth century.

511. Topics in Medieval Literature, Renaissance, and Golden Age Literature (3) [Rpt./3 when topic varies] Representative topics include the development of lyric poetry Mester de Clerecia, Juglaria and Romancon; the development of prose; Renaissance and baroque prose; Renaissance and baroque poetry; Cervantes’ Don Quixote and other representative works; golden age drama of the 16th and 17th centuries; the Picaresque; the Spanish enlightenmen.


521. Topics in Eighteenth, Nineteenth and Twentieth-Century Spanish Literature (3) [Rpt./3 when topic varies] Representative topics include Spanish romanticism; nineteenth century realism and naturalist Spanish prose; the generation of '98; modern Spanish prose fiction; modern Spanish poetry; the contemporary novel of the post-Franco era; contemporary Spanish poetry; modern and contemporary Spanish theater.

530. Development of Spanish Literature from the Pre-Columbian Period to Independence (3) Spanish American literature from the Pre-Columbian period to independence (short fiction, poetry, novel and drama). (Identical with LAS 530)

531. Topics in Spanish American Literature from the Pre-Columbian Period to Independence (3) [Rpt./3 when topic varies] Representative topics include pre-Columbian Aztec, Mayan, and Maya-Quiche literature; the chronicle; Renaissance and baroque poetry.

540. Development of Spanish American Nineteenth and Twentieth-Century Literature (3) Spanish American nineteenth and twentieth-century literature (short fiction, poetry, novel and drama). (Identical with LAS 540)

541. Topics in Spanish American Nineteenth and Twentieth Century Literature (3) [Rpt./3 when topic varies] Representative topics include: nineteenth-century Hispanic-American prose fiction; modernismo; modern Hispanic-American prose fiction; modern Hispanic-American poetry; contemporary Hispanic-American prose fiction; contemporary Hispanic-American poetry; modern and contemporary Hispanic-American theater; trends in the Hispanic-American short story.

550. Development of Mexican and Mexican American Literature (3) Mexican and Mexican-American literature (short fiction, poetry, novel and drama) (Identical with MAS 550)

551. Topics in Mexican and Mexican American Literature (3) [Rpt./3 when topic varies] Representative topics include: novel of the Mexican revolution; trends in Mexican and Mexican-American films; trends in contemporary Mexican literature; Mexican-American prose fiction since 1965; trends in Mexican-American theater; major movements and authors of Mexican-American literature.
561. Topics in Hispanic Literature (3) [Rpt./3 when topic varies] Representative topics include Hispanic women writers; U.S. Hispanic literature; trends in modern and contemporary Spanish film; trends in modern and contemporary Hispanic American film.

571. Topics in Literary Theory and Criticism (3) [Rpt./3 when topic varies] Topics include historical overview of major developments in literary theory and criticism with theoretical and critical analysis of Hispanic texts.

572. Linguistic Perspectives on Mexican-American Spanish and Bilingualism (3) I II For a description of course topics, see 474. Graduate-level requirements include two examinations and a tape/analysis. P. 340. (Identical with LING 574 and MAS 574) May be convened with 474.

580. Introduction to Hispanic Linguistics (3) [Rpt./2 when topic varies] Introduction to Hispanic linguistics. Representative topics include introduction to Spanish phonology, introduction to Spanish morpho-syntax, history of the Spanish language; Spanish in the Americas.

581. Topics in Secondary Language Linguistics Theories and Applications (3) [Rpt./2 when topic varies] Various topics such as theories and techniques of teaching Spanish, theories of second language acquisition, applied linguistics, theories of second language evaluation.

582. Topics in Hispanic Linguistic Theories and Applications (3) [Rpt./2 when topic varies] Various topics such as Hispanic sociolinguistics, theoretical issues in Spanish phonology, Spanish semantics, linguistic perspective on Mexican-American Spanish.

585. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)

596. Seminar a. Spanish Peninsular Literature (3) [Rpt./3] b. Spanish American Literature (3) [Rpt./3] c. Mexican and Mexican American Literature (3) [Rpt./3] d. Hispanic Linguistics (3) [Rpt./3]

Portuguese (PORT)

101. First Semester Portuguese (4) GRD Oral approach. Portuguese for students with no previous experience with the language.


205. Intensive Portuguese (4) 205 is the equivalent of 101 and 102. Recommended for highly motivated students and/or those with experience in another Romance Language.

206. Intensive Portuguese (4) Recommended for highly motivated students or those with experience in another Romance language. P. 102, 205.

325. Intermediate Grammar, Conversation and Writing Skills (3) I For intermediate students to enhance their writing, speaking and reading abilities and to prepare for the transition from language learning to studies in literature as well as in culture and civilization of the Lusophone world. P. 206. (Identical with LA S 325)


410. Lusophone Literature to 1900 (3) Overview of literary periods and introduction to the major literary figures of Portugal, Brazil, and the Lusophone African countries (Angola, Mozambique, Cape Verde, Guine-Bissau, and Porto Principe) from the beginning of their literature to the present. P. 325.

414. Teaching of Modern Languages (3) II (Identical with TTE 414)

422. Introduction to Romance Philology (3) I (Identical with SPAN 422)

425. Advanced Grammar, Composition and Writing Skills (3) II For more advanced students to increase comprehension of written Portuguese, to improve oral skills, to practice written skills, and to prepare for transition from language learning to the study of literature. P. 325.

430. Brazilian Civilization (3) I 1993-94 A broad survey of Brazilian culture. Thematic examination of some of the major cultural developments. Topics include: Brazilian popular music, Afro-Brazilian culture, the role of women in Brazilian society, Brazilian popular culture. P. 325. (Identical with LA S 430) May be convened with 530.


449. Brazilian Literature in Film (3) I 1994-95 The masterpieces of Brazilian literature and the great films based upon them. P. 325. (Identical with LA S 449) May be convened with 549.

501. Lusophone Literature to 1900 (3) For a description of course topics, see 401. Graduate-level requirements include a 12-15 page final paper and an oral report. May be convened with 401.

530. Brazilian Civilization (3) I 1993-94 For a description of course topics, see 430. Graduate students required to write four research papers and give one lecture on a topic of their choice. May be convened with 430.

549. Brazilian Literature in Film (3) I 1994-95 For a description of course topics, see 449. Graduate-level requirements include an in-depth research paper. P. 325. (Identical with LAS S 449) May be convened with 449.

563. Studies in Brazilian Literature (3) I 1993-94 Major works, authors and tendencies in modern Brazilian literature. P. 325. (Identical with LAS 563)

564. Studies in Portuguese Literature (3) II Major works, authors and tendencies in modern Portuguese literature. P. 325.

596. Seminar m. Mexican-American Heritage Bibliography A Library Seminar (3) [Rpt./6 units] I (Identical with MAS 596m, which is home)

Special Education and Rehabilitation (SER)

Education Building, Room 412 (602) 621-7822

Professors Amos P. Sales, Acting Head, Candace S. Bos, Head, William C. Healey, Sidney W. Bijou, James C. Chalfant, Bob G. Johnson (Emeritus), Jeanne McRae McCarthy, Inez Tucker (Emerita)

Associate Professors Shirin D. Antia, Daniel Head, C. June Maker, S. Mae Smith, John Umbreit

Assistant Professors Nancy Eldridge, James Organist, Samuel Supalla

The department is committed to scholarship and leadership in the development of theory and practice related to the empowerment of individuals with disabilities and special abilities. The department offers professional preparation of special teachers and specialists, teachers of the gifted and talented, rehabilitation counselors and psychologists, and administrators, researchers, and teacher educators.

The department offers programs of study leading to the Bachelor of Science in Education with a major in special education and rehabilitation. Prospective students should consult the Office of Student Services within the College of Education for more specific information. At the time of catalog production, the Bachelor of Science in Education was under review. Non-teaching minors in special education and rehabilitation are offered at the baccalaureate level. The department participates in the honors program.

The department also offers programs leading to the Master of Arts, Educational Specialist, Doctor of Education, and Doctor of Philosophy degrees with a major in special education and rehabilitation. For graduate admission and degree requirements, consult the Graduate Catalog.

301a-301b. Mainstreaming (2-2) GRD Introduction to the integration of special students into the regular elementary (301a) and secondary (301b) classrooms. 301a is open to elementary education majors currently enrolled in student teaching. 301b is open to secondary education majors currently enrolled in student teaching. P, TTE 322, 323, 324, 326, 327.

370a-370b. American Sign Language (4-4) II Designed for students with no previous knowledge of ASL and/or deaf culture. To de-
velopment skills in ASL vocabulary, grammar and use. Must be taken in sequence.

400. Foundations of Special Education and Rehabilitation (3) I II General characteristics of exceptional/disabled persons in interrelated human service delivery systems. May be convened with 500.

401a. Assessment and Instruction for Students with Learning Problems (3) I II Procedures, methods, strategies for assessment and instruction of students with learning problems in the areas of reading, spelling, handwriting, written expression, mathematics and socialization. Strategies and adaptations appropriate for use in the regular elementary or the special classroom. May be convened with 501a.

401b. Assessment and Instruction for Preschool Children with Learning Problems (3) I II Procedures, methods, strategies for assessment and instruction of children with learning problems in the preschool years. Strategies and adaptations for use with delay in physical development, cognitive development, communication development, socioemotional development, and the development of adaptive behavior will be emphasized.

402. Behavior Principles for the Handicapped (3) I II Use of behavior principles to modify the behavior of handicapped persons, especially moderately and severely handicapped. 3R, 1L. P, 400. May be convened with 502.

403. The Special Services in the Schools (3) I II S Information to aid teachers in dealing with responsibilities and concerns in school settings with 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. Cultural and Linguistic Diversity in Exceptional Learners (3) I Provides a theoretical and practical approach to the study of special needs of students with language and cultural differences; 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 Theories and history of programs for individuals with learning disabilities—definition, characteristics, etiology. Degree candidates must complete 400 prior to taking 405. May be convened with 505.

410. Introduction to Mental Retardation and Severe Disabilities (3) I History and philosophy of educational programs for persons with mental retardation and other developmental disabilities; etiology, classification, and characteristics, with consideration of educational, social, and psychological problems. P, 400 or CR. May be convened with 510.

411. Service Delivery Trends in Rehabilitation and Special Education (3) I II Critical examination of current trends, issues and initiatives affecting service systems for persons with disabilities.

415. Physical and Multiple Disabilities (3) [Rpt./1] I Physical and multiple impairments, etiology, intervention practices, adaptations, transferring and handling skills, and integration into typical environments. Field trips. May be convened with 515.

421. Introduction to Visual Impairments and Deaf-Blindness (3) I An overview of educational services for the student with visual impairments and multiple sensory impairments. An emphasis is placed on the psychosocial effects of visual impairments on the individual and means of compensating for those effects. May be convened with 521.


425. Strategies of Vocational Development and Supported Employment (3) I II Systematic study of the strategies used to place and retain individuals with disabilities in paid, community employment. Topics to include job development, consumer assessment, job placement, job-site training, and follow-up. P, 400. May be convened with 525.

430. Education and Rehabilitation of Deaf and Hard of Hearing Individuals (3) I Current and historical perspectives; educational and rehabilitative services; etiology; impact on families, psychosocial, cognitive and intellectual development and functioning of deaf and hard of hearing individuals. May be convened with 530.

431a-431b. American Sign Language (4-4) I II Designed to develop intermediate ASL conversational skills in a variety of settings, topics, and functions. P, 370b or department permission. May be convened with 531a-531b. Must be taken in sequence.

433a-433b-433c-433d. Special Topics in Deaf Studies (3-3-3-3) I II 433a: Introduction to the structure of ASL; 433b: Languages and cultures of deaf communities; 433c: History of the deaf community; 433d: ASL literature and film. Classes will be offered on a rotating basis in a b-c-d sequence; however, courses need not be taken in sequence. P, 431b or permission of department. May be convened with 533a-533b-533c-533d.

439a-439b-439c. Special Topics in Sign Language Studies (3-3-3) I II Courses will be offered on a rotating basis in the following sequence: 439a: ASL Acquisition and Bilingualism; 439b: Signed Language Policy, Planning, and Intervention; 439c: Methods and Materials of ASL/ESL Instructive. Courses need not be taken in sequence. P, 431b or permission of department. May be convened with 539a-539b-539c.


444a-444b-444c. ASL Discourse Processes (3 to 6-3 to 6-3 to 6) S 444a: Intensive ASL. 444b: Introduction to Interpreting. 444c: Classroom instruction in ASL. Courses need not be taken in sequence. P, 431b or permission of division. May be convened with 544a-544b-544c.

450. Introduction to Emotional or Behavioral Disorders (3) I Issues in education of the emotionally or behaviorally disordered; discussion of history, current issues, definitions, characteristics, and theoretical perspectives. P, 400. May be convened with 550.

455. Rehabilitation of the Aged (3) I II Emphasis on aging from the viewpoint of the aging person and those working with the aged. May be convened with 555.

460. Introduction to Early Childhood Special Education (3) I Focuses on the disabling conditions impacting on infants, toddlers and their families, preschool children, programs available to serve them and their families, and critical issues in this rapidly evolving field. P, 400. May be convened with 560.

468. Transition Methods (3) I II Provides an understanding of effective strategies for promoting the smooth transition of students with disabilities from school to work and adult living. May be convened with 568.

475. Observation and Participation in Special Education Programs (1-3) [Rpt./6 units] I II Observation and participation at sites serving exceptional individuals. Participation in seminars P, 400/500.

478. Prevention of Addictions (3) I Analysis of addictive behaviors (e.g., drug addictions, eating disorders, compulsive gambling) from a psychosocial and biological perspective and the implications of this analysis for primary, secondary, and tertiary prevention of addictions. May be convened with 578.


483. Supervised Casework in Rehabilitation (3) I II Application of fundamental professional rehabilitation theories and skills in field settings. P, 400, 411b; 481 or CR.

484. Problems of Drug Abuse (3) I II Survey course for teachers, counselors, and agency workers concerned with drug abuse; examination of community, cultural, and educational approaches to drug use and abuse. May be convened with 584.

485. Rehabilitating the Public Offender (3) I II Components in service delivery to the public offender; how the offender enters the criminal justice system, and treatment and rehabilitation services available.

494. Practicum

495. Colloquium

500. Foundations of Special Education and Rehabilitation (3) I II For a description of course topics, see 400. Graduate-level require-
ments include in-depth paper(s) on aspects of current issues in the field. May be convened with 400.

501a. Assessment and Instruction for Students with Learning Problems (3) I II For a description of course topics, see 401a. Graduate-level requirements include in-depth projects. May be convened with 401a.

501b. Assessment and Instruction for Preschool Children with Learning Problems (3) I II For a description of course topics, see 401b. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 401b.

502. Behavior Principles for the Handicapped (3) III 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 Special Services in the Schools (3) I II S For a description of course topics, see 403. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 403.

504. Cultural and Linguistic Diversity in Exceptional Learners (3) I For a description of course topics, see 404. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 404.

505. Introduction to Learning Disabilities (3) I II 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 testing. P, CR, 405/505 or department permission; CR, 593.

508. Teaching Elementary Students with Learning Disabilities (3) II Remediation of academic areas and cognitive processes involving perception, integration, and expression, with emphasis on strategies for planning and implementing instructional programs at the elementary level. P, 405/505, 507a-507b and permission of department; CR, 593, 594.

510. Introduction to Mental Retardation and Severe Disabilities (3) I For a description of course topics, see 410. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 410.


513. Educating Students with Mental Retardation and Severe Disabilities (3) III Methods of developing age-appropriate and functional programming, integration, community-based instruction, and integrative source delivery for students who have moderate to profound retardation and other physical, sensory and behavior disorders. May be convened with 431a-431b.

515. Physical and Multiple Disabilities (3) [Rpt./1] I For a description of course topics, see 415. Graduate-level requirements include additional assignments. Field trips. May be convened with 415.

518. Nonoral Communication (3) [Rpt./3] II Techniques for assessment and intervention of alternative communication skills other than speech for students with severe disabilities. Nonsymbolic communication skills development for all ages; social interaction skills; augmentative communication aids.

520. Low Vision and Visual Functioning (3) I Anatomy and physiology of the eye; implications of visual disorders including visual field losses; introduction to optics; use of optical and nonoptical aids in classroom settings; clinical and functional low vision assessments, including assessing children with multiple impairments; and report writing, P, 521.

521. Introduction to Visual Impairments and Deaf-Blindness (3) III I For a description of course topics, see 421. Graduate-level requirements include writing a grant proposal to obtain monies to enhance service delivery. May be convened with 421.

522a. Orientation and Mobility for Teachers of Individuals with Visual Impairments I (3) II Methods of teaching orientation and mobility skills to visually impaired and blind students. Emphasis on the school-aged child, with particular attention to concept development, orientation skills, pre-cane skills, personal safety, and independent ambulation, including an introduction to long-cane techniques.

523a-523b. Tactile Communication (3-3) For a description of course topics, see 423a-423b. Graduate-level requirements include in-depth paper(s) on aspects of current issues and class presentations. May be convened with 423a-423b.

524. Methods of Teaching the Visually Handicapped (3) II Curriculum development and adaptation in various educational programs; development of classroom materials and procedures for use with blind and partially sighted children and youth; emphasis on methods of teaching academic and non-academic skills and on educating students with nonhandicapped peers. P, 521; CR, 593.

525. Strategies of Vocational Development and Supported Employment (3) II For a description of course topics, see 425. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. P, 400/500. May be convened with 425.

530. Education and Rehabilitation of Deaf and Hard of Hearing Individuals (3) I For a description of course topics, see 430. Graduate-level requirements include an in-depth paper and a class presentation. May be convened with 430.

531a-531b. American Sign Language (4-4) I II 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. Must be taken in sequence.


533a-533b-533c-533d. Special Topics in Deaf Studies (3-3-3-3) I For a description of course topics, see 433a-433b-433c-433d. Graduate-level requirements include an in-depth research paper on a course-related topic and a class presentation. Classes will be offered on a rotating basis in a-b-c-d sequence; however, courses need not be taken in sequence. P, 531b or permission of department. May be convened with 433a-433b-433c-433d.

534. Language Development for the Exceptional Child (3) I Pragmatic, semantic and syntactic aspects of pre-linguistic and linguistic development in exceptional children and youth; cognitive and social bases of language development.

535. Assessment of Bilingual Exceptional Learners (2) II Educational and psychological assessment of bilingual students with emphasis on informal and formal evaluation methods and procedures for purposes of identification and educational planning. P, 507.

536. Teaching Bilingual Exceptional Learners (2) II Instructional interventions and program development for exceptional students from culturally and linguistically diverse backgrounds. Emphasis on current intervention methods and practices. P, 508.

537. Language and Reading Intervention for Deaf and Hard of Hearing Children (3) II Receptive and expressive language assessment techniques of language and reading intervention and remediation for deaf and hard of hearing children and youth. P, 534; CR, 594b.


539a-539b-539c. Special Topics in Sign Language Studies (3-3-3) I For a description of course topics, see 439a-439b-439c. Graduate-level requirements include an in-depth research paper on a course-related topic and a class presentation. P, 531b or permission of department. May be convened with 439a-439b-439c.

540. Education of Gifted Children (3) I For a description of course topics, see 440. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 440.

541. Teaching the Gifted: Questioning Strategies (3) III Mastery of skills involved in develop-
oping abstract thinking abilities in gifted children by using the Hilda Tabo Teaching Strategies. Emphasis on using these sequential questioning methods in all content areas and at all grade levels. P, 440/540.

542. Teaching the Gifted: Productive Thinking Models (3) I Mastery of skills involved in developing productive thinking abilities in gifted children by using teaching-learning models developed by Parnes, Williams, Taylor, Guilford, Renzulli and Tref finger at all grade levels and in all content areas. P, 440/540.

543. Teaching the Gifted: Hierarchical Models (3) I 1990-91 Introduction to general principles involved in providing a curriculum for the gifted. Overview of ten teaching-learning models commonly used with the gifted. Mastery of skills involved in using the hierarchical models with gifted students. P, 440/540.

544a-544b-544c. ASL Discourse Processes (3 to 6) -3 to 6 -3 to 6) S For a description of course topics, see 444a-444b-444c. Graduate-level requirements include an in-depth paper on aspects of current issues in the field. P, 531b or permission of department. May be convened with 444a-444b-444c.

550. Introduction to Emotional or Behavioral Disorders (3) I For a description of course topics, see 450. Graduate-level requirements include an in-depth paper(s) on a single aspect of current issues in the field. May be convened with 450.

551. Teaching Children with Emotional or Behavioral Disorders (3) II Assessment techniques, academic and behavioral intervention strategies, and classroom management with emotionally or behaviorally disordered children and youth.

555. Rehabilitation of the Aged (3) II For a description of course topics, see 455. Graduate-level requirements include an in-depth research paper and a class presentation on a topic related to course content. May be convened with 455.

560. Introduction to Early Childhood Special Education (3) 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 Children with Disabilities (3) II Deals with competencies required to teach all categories of disabilities found in preschool children except deaf/blind. Field trips. P, 460, 560, 562, 575, CR 593.

562. Methods of Assessment for Preschool Children with Disabilities (3) I Norm-referenced and criterion-referenced instruments for screening, diagnosis and assessment of infants, toddlers, and preschool children will be reviewed. Emphasis will be placed on teacher involvement in the assessment process. P, 400/500.

563. Client Assessment in Rehabilitation (3) II Exploration of the world of work; critical review of vocational choice theories; experiences in the use and interpretation of individual assessment techniques. P, 565 or CR; ED P 458.

565. Principles of Rehabilitation (3) I Principles underlying rehabilitation programs and interdisciplinary relationships of agencies engaged in rehabilitation services.

568. Transition Methods (3) II For a description of course topics, see 468. Graduate-level requirements include additional assignments including a term paper. May be convened with 468.

570. Administration of Special Education Programs (3) II Practical aspects of organization and development of special education programs, including philosophy, issue resolution, public relations, personnel, case finding, evaluation, placement, and records systems. P, consult director before enrolling.

571. Supervision of Special Education (3) I Practical aspects of supervising special education programs and services, curriculum development, service delivery models, staff development, program development, and legal issues and requirements.

572. Policy and Program Evaluation Analysis in Special Education (3) I Practical aspects of policy analysis and program development/evaluation in schools and other social agencies that serve with disabilities and/or giftedness.

575. Observation and Participation in Special Education Programs (1-3) [Rpt.6 units] II For course topics, see 475. P, 400/500.

578. Prevention of Addictions (3) I For a description of course topics, see 478. Graduate-level requirements include an in-depth research paper or other project. May be convened with 478.

580. Medical Aspects of Disability (3) I Etiology, therapy, and prognosis of the major disabilities, including drug and alcohol; assessment of physical capacities and limitations; typical restorative techniques.


582. Principles and Practices of Vocational Evaluation (3) I Understanding work skills and labor market conditions; process of vocational evaluation of rehabilitation clientele; collecting and synthesizing evaluation data and writing meaningful reports.

583. Counseling Practices in Rehabilitation Setting (3) I 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) II For a description of course topics, see 484. Graduate-level requirements include an in-depth research paper and a class presentation on a topic related to course content. May be convened with 484.

585. Vocational Planning and Placement (3) 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 occupational and career choice information, job placement and development. P, 565, 580, 563 or CR.

586. Psychosocial Assessment of the Deaf Person (3) II Selection, administration, and interpretation of various psychosocial evaluation instruments used with deaf persons. P, ED P 673, 674.

587. Construction and Development of Assessment Samples (3) II Use of occupational information, career exploration and job analysis techniques; development, construction, standardization, and use of work samples and related vocational assessment techniques. P, 565, 582, 563.

588. Professional Problems and Ethical Concerns in Rehabilitation Psychology (3) I Introduction to the field of rehabilitation psychology including an examination of ethical and legal considerations in the practice of rehabilitative psychology, foundational material in professional psychology, and an overview of the rules and functions of rehabilitation psychology.


590. Applied Research with Exceptional Learners (3) II Review of principles and practices underlying applied research with exceptional learners; practice in preparation of research proposals; conduct of research emphasized.

593. Internship (1-12) I II Special sections in each concentration to be arranged in the department office.

594. Practicum
a. Communication Development for Deaf and Hard of Hearing Children (1-6) I II
b. Teaching the Gifted (1-6) [Rpt.9 units] I II S CR, 440, 541, 542, 543.

595. Colloquium
a. Substance Abuse Education (1) II May be convened with 495a.
b. Language, Learning, and Reading Disabilities (3) II (Identical with LRC 595b)
c. Mental Retardation and Severe Disabilities (3) II P, 400.
d. Recent Advances in Special Education and Rehabilitation (3-6) II
f. Emotional or Behavioral Disorders (3) I Open to majors only.
k. Group Processes (3) I II

597. Workshop
a. Creativity and Giftedness (3) [Rpt.9 units]

605. Colloquium
a. Issues, Trends, and Futures in Special Education: Doctoral Think Tank (3) II
b. Emotional or Behavioral Disorders (3) II
f. Rehabilitation Psychology (3) [Rpt.9 units] II
h. Rehabilitation Administration (3) II
j. Rehabilitation of the Deaf (3) II
l. Diagnosis in Rehabilitation Psychology (3) II
Speech and Hearing Sciences (SPH)

Speech and Hearing Sciences
Building, Room 214
(602) 621-1644

Associate Professors Kathryn A. Bayles, Linda Swisher
Assistant Professors Jeanette D. Hoit, Yingyong Qi
Clinical Instructors James Dean, Suzanne K. Guinn, Betty Nunnery, Rebecca B. Vance

Director Anthony B. DeFeo (Speech-Language Clinic)

The Department of Speech and Hearing Sciences prepares students for careers in basic and clinical sciences (speech-language pathology, audiology, speech science, and hearing science) in university, laboratory, medical, public school, or other clinical settings. Professional certification in the state of Arizona and with the American Speech-Language-Hearing Association requires graduate study with the acquisition of a Master of Science degree.

The department offers the following degrees: Bachelor of Science in Speech and Hearing Sciences, Master of Science and Doctor of Philosophy with a major in speech and hearing sciences. For graduate admission and degree requirements, consult the Graduate Catalog.

The major: The major requires 30 units, including 260, 280, 367, 370a-370b and 493a and 496a.

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 beyond the minimum requirement. A 20-unit minor is also required. Students enrolled in the American Indian Professional Training program should consult with their advisors regarding the mathematics and science requirements. At least 24 units in the major must be university credit. Minimum total units for the degree with this major—125.

107. Survey of Hearing, Language, and Speech: Normal and Disordered (3) I II The role of hearing, language and speech processes in human communication and its disorders is covered through readings, lectures, and observations in laboratories and clinics.

260. Speech Science (4) I Anatomy, neuroanatomy, physiology of the speech mechanism; acoustical characteristics of voice and speech sounds; frequency, intensity, time and wave composition. 3R, 3L. (Identical with LING 260.)

280. Hearing Science (4) II Anatomy, neuroanatomy, physiology of the auditory mechanism; acoustics and psychoacoustics; decibel scale, normal auditory function. 3R, 3L.

350. Language Science (3) I Core features of language are identified and integrated into a model of language that is applicable to first and second language acquisition and language disorders. Topics may include: phonology, morphology, syntax, semantics, and pragmatics.

367. Phonetics (3) I Scientific study of speech sounds; articulatory phonetics, transcription, normal and disordered speech.

370a-370b. Introduction to Communication Disorders: Children and Adults (3-3) Nature of disordered communicative processes; principles of assessment and intervention with these disorders. 370a: Communication Disorders of Children. 370b: Communication Disorders of Adults. Open to majors only or consult department before enrolling P, 260, 280.


458. Introductory Clinical Studies: Speech-Language Pathology (1-3) [Rpt./9 units] II S Basic clinical procedures for managing a limited range of speech and language disorders. Includes observation and supervised practice. Open to majors only. P, 451, 471 or CR.

459. Introductory Clinical Studies: Audiology (1-3) [Rpt./9 units] II S 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.

460R. Speech and Hearing Science Instrumentation (2) I Consideration of some common and specific instruments and methods employed in speech and hearing laboratories and clinics. P, 260, 280 or CR. May be convened with 560R.

461L. Speech and Hearing Science Instrumentation Laboratory (1) P, CR, 460R. May be convened with 560L.

471R. Articulation Disorders and Therapies (2) I Etymology, diagnosis, prognosis, and therapy for the articulatory aspects of communication problems. P, 350, 370a; 367, senior status advised. May be convened with 571R.

471L. Laboratory in Articulation Disorders (1) I Open to senior majors only. P, 471R or CR. May be convened with 571L.

483. Principles of Audiology (3) I II Basic principles and techniques of audiological testing, etiologies of hearing impairment, and intervention strategies. P, 280 or graduate standing. May be convened with 583.

484. Audiologic Rehabilitation: Adults (3) II Speech reading; auditory training; problems encountered with amplification units; social, psychological, educational, speech, and language difficulties encountered by the hearing handicapped. P, 260, 483. May be convened with 584.


496. Seminar a. Clinical Observation and Analysis (1) I II P, 370a-370b, 483 or CR. Writing-Emphasis Course.*

*Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of the catalog).

500. Introduction to Quantitative Methods and Research in Speech and Hearing Sciences (2) I Study of measurement and research design and their application in research and professional practice.

501. Professional Issues in Speech-Language Pathology and Audiology (1) I Professional practice issues including certification, licensure, supervision, quality control, ethics, federal and state legislation.

502. Principles of Neuroanatomy (4) II (Identical with Anat. 502)

510. Counseling Techniques in Communication Disorders (3) II Introduction to counseling the communication handicapped and their families.

551. Language Acquisition (3) III For a description of course topics, see 451. Graduate-level requirements include a scholarly paper/project on a selected topic relevant to the course. (Identical with LING 551) May be convened with 451.


553. Developmental Language Impairments (3) I Topics include: language and non-language characteristics and clinical management of children with developmental language impairment, acquired aphasia, bilingualism and auditory disorders.

554. Adult Aphasia (3) II Etiology, evaluation and therapy for language disorders associated with brain damage. P, 370; 350 or 551.

555. Developmental Language Disorders (3) I Research and clinical perspectives on etiology, changing symptomatology, and management; attention to related deficits, syndromes, learning disabilities, and multicultural issues. Case study focus. P, 451 or 551.
Statistics (STAT)
Economics Building, Room 200
(602) 621-4158
Professors Yashaswini Mittal, Head, Dan Bailey (Emeritus), J.L. Denny, Jean E. Weber
Associate Professors Scott Emerson, A. Larry Wright
Assistant Professors Chengda Yang

Study of statistics enables one to model the uncertainty in data and draw organized scientific conclusions from it. Data from different disciplines post different statistical problems and hence statistics is inherently an interdisciplinary field. The department offers both theoretical and applied courses. Statistics is available as a major in the Master of Science and the Doctor of Philosophy degrees.

160. Introduction to Statistics (3) I Descriptive statistics. Basic probability concepts and probability distributions, elementary sampling theory and techniques of estimation, hypothesis testing, regression and correlation. Some analysis of variance and non-parametric tests if time permits. Not applicable to the math major. P, MATH 117R/S.

263. Statistical Methods in Biological Sciences (3) I II Organization and summarization of data, concepts of probability, probability distributions of discrete and continuous random variables, point and interval estimation, elements of hypothesis testing, regression and correlation analysis, chi-square distribution and analysis of frequencies, introduction to analysis of variance as well as non-parametric statistics, with special emphasis on analysis of biological and clinical data. P, MATH 117R/S.

275. Statistical Methods in Management (3) I II Statistical analysis and methods with a view toward applications in business and economics. Basic concepts of probability, random variables, probability distributions and sampling distributions. Statistical inference techniques such as estimation, hypothesis testing, regression, correlation and analysis of variance are explored through examples and via the use of Minitab. Emphasis is put on the interpretations of Minitab outputs rather than running the Minitab itself. P, MATH 119, 123.

361. Statistics for Engineering and the Physical Sciences (3) I II Probability theory, point and interval estimation, hypothesis testing and regression analysis; applications to quality control and reliability theory. P, 9 units of calculus.


464. Theory of Probability (3) I II (Identical with MATH 464) May be conved with 564.


466b. Applied Stochastic Processes (3) II (Identical with MATH 466b) May be conved with 568.


548. Statistical Packages in Research (3) (Identical with NURS 548)


560a-560b. Probability and Random Processes (3-3) I First part of the sequence will deal with probability. Sample spaces, basic axioms of probability, combinatorial methods, conditional probability and distributions, independence. Random variables, discrete and continuous distributions, binomial, Poisson, geometric, normal, exponential and gamma distributions. Transformations of random variables and Jacobian, expectation, variance and other moments, laws of large numbers, central limit theorem. Characteristic and generating functions. Fundamental probability concepts without the use of measure theory. P, two years of calculus, e.g. MATH 125a-125b, and MATH 223, 560b. II Second part of the sequence will cover elementary random processes. Markov and stationary processes, random walk, renewal theory, queueing networks, branching processes, Poisson processes, martingales. Theory as well as some applications. No measure theory requirement. P, 560a.


564. Theory of Probability (3) I II (Identical with MATH 564) May be conved with 464.


568. Applied Stochastic Processes (3) I II (Identical with MATH 568) May be conved with 468.


595. Colloquium
a. (1) [Rpt./6 units] I II Attendance and participation in weekly departmental seminars.

596. Seminar
a. Research Methods (1-4) [Rpt./6 units] I II

597. Workshop
a. (1) [Rpt./6 units] I II Data analysis practice and skill.

641. Statistical Consulting (3) I A course for statistics graduate students providing experience in statistical consulting. Client and sta-
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 with a major in systems, industrial, or reliability and quality engineering, and Doctor of Philosophy with a major in systems and industrial engineering. For specific undergraduate program requirements, see the College of Engineering and Mines section of this catalog.


250. Introduction to Systems Engineering (3) I System modeling; the elementary constructs and principles of system models including discrete-time, discrete-state system theory; finite state machines; modeling components; coupling, modes, and homomorphisms. System design; requirements, life-cycle, performance measures, costs, tradeoffs, alternative design concepts, testing plan, and documentation. Applications and case studies from engineering. 2ES, 1ED. P, ENGR 102, MATH 125b.

260. Introduction to Industrial and Manufacturing Systems (3) I Analysis, design and control of manufacturing and production systems, including topics in facilities layout and location, materials handling, inventory control, computer-integrated manufacturing, information systems, and simulation. 2ES, 1ED. P, ENGR 102, MATH 125b.

265. Engineering Economic Analysis (3) I II S Methods and modern techniques of engineering economic analysis for decision making. Topics from evaluations of economic alternatives, cost control, capital budgeting, managerial cost accounting and deterministic inventory theory machines; decision-making under uncertainty. 3ES. P, ENGR 102, MATH 125b and PHYS 110.


330L. Engineering Statistics Lab (1) II Problem solving in the applications of engineering statistics. 0.5ES, 0.5ED. CR, 330R.

340. Deterministic Operations Research (3) I Deterministic models and methods of operations research linear programming, including models, theory and algorithms. 3ES. P, MATH 254.

350. Deterministic Systems (3) I II Analysis and design of linear deterministic systems in both the time and frequency domains using Fourier analysis, Laplace transforms and state space methods. Attention will be given to modeling physical and engineering systems. 3ES. P, MATH 254.

370. Microcomputer Systems (4) I II Boolean algebra, combinational and sequential logic circuits, state machines, simple computer architecture, assembly language programming, and real-time computer control. The computer is used as an example of systems engineering design; it is analyzed as a system, not as a collection of components. 3R, 3L. 1ES. 3ED. P, ENGR 102, ECE 207.

377. Software for Engineers (3) I FORTRAN and C. Modular design, program verification, data structures, and development of algorithms. Credit is allowed for this course or C SC 342, but not for both. 1ES, 1ED. CR, 321.

383. Integrated Manufacturing Systems (3) I II Introduction to the integrated manufacturing enterprise and automation. Topics include computer-aided design, process planning, computer numerical control machining, machine vision, application of robots and automation. 2R, 2L. 2ES, 1ED. P, 260. MIE 331.

406. Engineering Quality Control (3) I II Quality planning, on-line statistical process control techniques for monitoring and improving the quality of manufactured products, acceptance sampling, and government standards. 2ES, 1ED. P, 230 or A ME 474, CR, 330R, 330L.

408. Reliability Engineering (3) I Time-to failure, failure-rate, and reliability determination for early, useful and wear-out lives; equipment reliability predictions; spare parts provisioning; reliability growth; reliability allocation. Credit for this course or A ME 472. P, 330 or A ME 413a, MATH 223. 1ES, 1ED. May be convened with 508.


411. Human Interaction with Computers and Software (4) I II The interaction of technical requirements with the characteristics of computer hardware and programmers and how they affect the design of software, and the physical and cognitive interfaces between people and computers. 1ES. 3ED. May be convened with 511.

422. Engineering Decision Making Under Uncertainty (3) I Application of principles of probability and statistics to the design and control of engineering systems in a random or uncertain environment. Emphasis is placed on Bayesian decision analysis. 1ES. 2ED. P, 330R-330L or equivalent. May be convened with 522.

430. Engineering Statistics (3) I II Statistical methodology of estimation, testing hypothesis, goodness-of-fit, nonparametric methods and decision theory as it relates to engineering practice. Significant emphasis on the underlying statistical modeling and assump-
Using commercially available expert system data. Each student will build an expert system on quantitative methods. 2ES, lED. P, 321, 340. May be convened with 540.

453. Deterministic Control Systems (3) I The analysis and synthesis of deterministic linear control systems, with emphasis on design using both frequency-domain and state-variable approaches. 1.5ES, 1.5ED. P, 350.

462. Production Systems Analysis (3) I Production systems, quantitative methods for forecasting, aggregate planning, inventory control, materials requirement planning, production systems modeling, and decision support. 3ES. P, 340. May be convened with 346.

463. Facilities and Production Systems Design (3) I Case studies emphasizing aspects of production systems design such as facility location, facility layout, group technology, product and process design, material handling, and automated assembly. The student will be required to work in groups. Solutions will be presented using both written and oral reports. 3ED, CR, 462.

464. Facilities Layout and Location (3) II Modeling and solution of continuous and discrete, single and multifacility location problems for various objectives. Relative location and layout of facilities/departments for minimizing material handling and interaction costs. Emphasis on quantitative methods. 2ED, lED, P, 321, 340. May be convened with 506.

473. Concepts in Information and Communication Systems (3) II Modeling and analysis of information and communication systems, networks for applications in telecommunication, systems and computer communication networks. Topics selected from the following: signal representation, sampling, coding and error detection, modulation, OSI network architecture, network protocols, delay models of performance, routing and flow control. 3ES. P, 321, 340. May be convened with 573.

474. Expert Systems (3) I Building, testing and evaluating expert systems, computer systems that emulate the human and draw conclusions based on incomplete or inaccurate data. Each student will build an expert system using commercially available expert system shells. 1ES, 2ED. P, familiarity with computers. May be convened with 574.

475. Computational Methods for Games, Decisions, and Artificial Intelligence (3) II An introduction to automata, computer representation and optimal solution of games and decision problems. Principles of heuristic programming and machine learning. A programming project is to be selected from areas such as game strategies, graphics, recreational mathematics, and manufacturing simulation. Microcomputer experience is emphasized. 1.5ES, 1.5ED. P, 270 or C SC 227. May be convened with 575.


486. Modeling Manufacturing Systems (3) II An intermediate-level introduction to topics in hierarchical design, planning, and control of manufacturing systems. Topics include modeling automated transfer lines, cellular manufacturing, and flexible manufacturing systems. Emphasis on material flow and analysis of throughput rate. 2ES, lED, P, 321, 340. May be convened with 586.

495. Colloquium s. Senior (1) I Open to majors only. P, senior standing.

507. Advanced Engineering Quality Control (3) II Advanced techniques for statistical quality assurance, including multivariate control charting, principal components analysis, economic design of acceptance sampling plans and control charts, inspection errors, and Select papers from the recent literature. P, 530.

508. Reliability Engineering (3) I For a description of course topics, see 408. Graduate-level requirements include a special report of 30 pages on a specific reliability engineering topic. Credit for this course or A ME 572. May be convened with 408.


511. Human Interaction with Computers and Software (4) I An introduction to human-computer interaction topics, see 411. Graduate-level requirements include separate examinations and a major project. May be convened with 411.

513. Environmental Risk Analysis (3) I 1994-95 (Identical with HWR 513)

518. Reliability Testing (3) II Mean-time-between-failure and reliability confidence limits; sequential testing; sampling; accelerated, sudden-death, and suspended-items; non-parametric; and Bayesian testing. Credit for this course or A ME 575. P, 408, 530.


521a-521b. Advanced Systems Modeling and Simulation (3-3) (Identical with MIS 521a-521b)

522. Engineering Decision Making Under Uncertainty (3) I For a description of course topics, see 422. Graduate-level requirements include a semester research project. P, 330R, 330L. May be convened with 422.

525. Queuing Theory (3) I Application of the theory of stochastic processes to queueing phenomena; introduction to semi-Markov processes; steady-state analysis of birth-death, Markovian, and general single- and multiple-channel queueing systems. P, 520.

528. Maintainability Engineering (3) II Complex systems reliability; maintainability engineering; reliability and availability of maintained systems; operational readiness; system effectiveness; maintainability demonstration. Credit for this course or A ME 577, but not for both. P, 408, 530.


530. Engineering Statistics (3) I II For a description of course topics, see 430. Graduate-level requirements include additionally more difficult homework assignments. P, 330R, 330L or equivalent. May be convened with 430.

531. Digital Systems Simulation (3) I II For a description of course topics, see 431. Graduate-level requirements include a library research report. May be convened with 431.

532. Statistical Models in Engineering (3) Statistical distributions applicable in engineering, with emphasis on quality and reliability problems. Topics include model selection, parameter estimation, and approximations for large-scale systems. P, 530.

536. Experiment Design for Engineering I (3) I Design and analysis of experiments for engineering design and manufacture. Topics include classical designs, Japanese approaches, analysis of variance and regression analysis. P, 530 or STAT 566a.

537. Experiment Design for Engineering II (3) II Continuation of 536. Topics include response surface analysis, related empirical optimization methods, random effects models and nested designs. P, 536.

540. Survey of Optimization Methods (3) II For a description of course topics, see 440. Graduate-level requirements include additional assigned readings and a project paper. P, 340. May be convened with 440.
541. Dynamic Programming (3) I 1993-94 Application of the art and theory of dynamic programming to common stochastic and deterministic sequential decision problems, including equipment replacement, capacity expansion, inventory planning and decision analysis. P, 321, 340.


545. Nonlinear Programming (3) II Unconstrained and constrained optimization problems from a numerical standpoint. Topics include variable metric methods, optimality conditions, quadratic programming, penalty and barrier function methods, interior point methods, successive quadratic programming methods. P, 340.


550. Theory of Linear Systems (3) II An intensive study of continuous and discrete linear systems from the state-space viewpoint, including criteria for observability, controllability, and minimal realization; and optionally, aspects of optimal control, state feedback, and observer theory. P, 350.

551. Modeling Physiological Systems (3) Development and validation of models, sensitivity analyses, and applications of systems engineering techniques to physiological systems.


554. Mathematical Systems Engineering Design (3) I Tools for modeling and concurrent engineering of large-scale, complex systems: documentation, a system design language, quality function deployment, system coupling, subsystems, and homomorphisms.

558. Fuzzy Sets in Systems Analysis and Decision Making (3) I 1994-95 Fuzzy numbers’ definition, operations; fuzzy regression, interpolation and reliability, fuzzy logic, optimization and control; fuzzy events and decision applications in areas such as systems, civil, industrial, electrical, computer engineering and water management.


564. Facilities Layout and Location (3) II For a description of course topics, see 464. Graduate-level requirements include additional assigned readings and an in-depth research paper on a course topic. P, 340, 462. May be convened with 464.

567. Advanced Production Control (3) II Quantitative models in the planning, analysis, and control of multi-level production systems. Topics include aggregate planning, inventory control, capacitated and uncapacitated lot-sizing, and Just-in-Time systems. P, 344, 321.

573. Concepts in Information and Communication Systems (3) II For a description of course topics, see 473. Graduate-level requirements include a course project in the subject area. P, 321, 340. May be convened with 473.

574. Expert Systems (3) I For a description of course topics, see 474. Graduate-level requirements include a strong testing and validation study of student's expert system. P, familiarity with computers. May be convened with 474.

575. Computational Methods for Games, Decisions, and Artificial Intelligence (3) II For a description of course topics, see 475. Graduate-level requirements include a comprehensive and intensive programming project. P, 270 or C, 272. May be convened with 475.

576. Numerical Analysis (3) I For a description of course topics, see 476. Graduate-level requirements include a extra reading assignments and more sophisticated programming assignments. P, ENGR 102, MATH 254, or an 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) II Current topics in hardware for automation, selecting and implementing robots, part orientation, computer vision, automated warehousing and material handling, programmable controllers, NC machining, on-line computer control. Laboratory projects.

585. Introduction to Robotics (3) I For a description of course topics, see 485. Graduate-level requirements include two research projects. P, 350. May be convened with 485.

586. Modeling Manufacturing Systems (3) II For a description of course topics, see 486. Graduate-level requirements include additional assigned readings from the current literature and an in-depth paper on recent research on a course topic. P, 321, 340. May be convened with 486.

608. Selected Topics in Reliability (3) I In-depth analysis of selected advanced topics in reliability engineering from the recent archival literature. Project required. P, 530. A ME 577.


640. Topics in Optimization (3) [Rpt./2] I Convexity, optimality conditions, duality, and topics related to the instructor's research interests: e.g., stochastic programming, nonsmooth optimization, interior point methods. P, 544 or 540.

645. Large-Scale Optimization (3) I 1994-95 Decomposition-coordination algorithms for large-scale mathematical programming. Methods include generalized Benders decomposition, resource and price directive methods, subgradient optimization, and descent methods of nondifferentiable optimization. Application of these methods to stochastic programming will be emphasized. P, 544.

646. Integer and Combinatorial Optimization (3) II 1993-94 Modeling and solving problems where the decisions form a discrete set. Topics include model development, brand and bound methods, cutting plane methods, relaxation, computational complexity, and solving well-structured problems. P, 544.


685. Advanced Topics in Robotics (3) II Selected topics covering recent advances in robotics, to be chosen from a list including applications, kinematics, dynamics, tactile sensing and vision. P, 485.

686. Advanced Manufacturing System Modeling (3) I 1993-94 Current topics in design and analysis of manufacturing systems. Topics include serial processing lines, queueing networks and FMS. Student projects. P, 567 or 586.

695. Colloquium a. Doctoral (1-3) [Rpt./2 units] I II Consult department before enrolling.

696. Seminar m. Operations Research Methods to Water Resources Systems (1-3) [Rpt./1] II P, consult department before enrolling. (Identical with HWR 696m, which is the home)
Teaching and Teacher Education (TTE)

Education Building, Room 735
(602) 621-1602


Associate Professors Ruth A. Beeker, Evelyn M. Carswell (Emerita), Kathy J. Carter, Vivian E. Cox, Vivian F. Dutton (Emerita), Willis J. Horak, Carol F. Larson, Glenn S. Pate, Alice S. Paul, James R. Rankin, D. Paul Robinson, Janice L. Streitmatter, Violet S. Thomas (Emerita)

Assistant Professors Carol A. Evans, Virginia W. Horak

Lecturers Sally N. Clark, Richard L. Lopez, Jr., Edward J. Van Metre (Emeritus)

The department offers programs directed toward the certification of elementary and secondary school teachers, the continuing education of certified members of the teaching profession, and advanced graduate preparation of professional educators.

At the undergraduate level, the department offers programs leading to the Bachelor of Arts in Education with a major in elementary education. In addition, students may work toward endorsements in bilingual education and middle level education. A specialization in early childhood education is also available.

In the area of secondary education, both the Bachelor of Arts in Education and the Bachelor of Science in Education degrees are available. Students interested in teaching at the secondary school level will select a subject area teaching major and earn the degree appropriate to the chosen major. See the College of Education section of this catalog. Secondary education students need a teaching minor unless they have an extended major, e.g. social studies or English. Prospective students should consult the Office of Student Services within the College of Education for more information.

A certification program for post-baccalaureate teacher candidates is also available. Interested students are encouraged to consult advisors in the academic discipline of their proposed teaching major for information about appropriate course work in that discipline. For information about courses in the College of Education, students should consult the Office of Student Services within the College of Education.

Admission requirements for undergraduate students and post-baccalaureate certification candidates are explained in the College of Education section of this catalog. Restrictions on enrollment in education courses are also detailed in this section of the catalog.

For information regarding the professional education course sequence, please consult an advisor in the Office of Student Services. Requirements for teaching majors and minors are listed under the Departments and Courses of Instruction section of this catalog.

The department participates in the honors program.

Classroom Processes and Instruction (4)
I II Classroom observation, management, instruction, and planning processes. Attention to microcomputers, culture/language differences, special students and substance abuse. 3R, 3L. The methods courses required for elementary certification are offered only in a block format. The courses in this block are TTE 322, 323, 324, 326, 327, and 394a.

Teaching Language Arts and Communication in Elementary School (3) I II The teaching of language and communicative arts in the elementary school, with special emphasis on current approaches and organization of methods and materials. P, ED P 301, TTE 300.

Teaching Reading and Decoding in Elementary School (3) I II The teaching of reading and decoding in the elementary school, with special emphasis on current approaches and organization of methods and materials. P, ED P 301, TTE 300.

Teaching Science and Health in Elementary School (3) I II Basic course in methods of elementary school science and health instruction, with special emphasis on the skills and structure of science in relation to the processes of inquiry. P, ED P 301, TTE 300, 8 units of science.

Teaching Elementary School Mathematics in a Technological Age (3) I II Concepts, methods, and use of materials, calculators and computers in the teaching of elementary school mathematics. P, ED P 301, 7 units of mathematics including MATH 301, TTE 300.

Teaching Elementary School Social Studies in a Multicultural Society (3) I II Methods and materials for teaching elementary school social studies with a multicultural emphasis. P, ED P 301, TTE 300.

338. The Teaching of Secondary School Subjects Specific methods, objectives, organization of subject matter, and evaluation in the various subjects.

a. Agriculture (4) I II 3R, 3L, P, ED P 311; CR, 409; A ED 485. (Identical with A ED 338a)

b. Economics (4) I II Taken semester immediately preceding HE E 489. P, FS 377 or ED P 302; HE E 408; ED P 310; CR HE E 288 and EDUC 350. (Identical with HE E 338g)

c. English (3) I P, TTE 300, ED P 310

d. The Teaching of Art (3) I II, 3R, 3L, P, EDUC 350, ED P 310; CR, ARE 431/531 and 400/500. (Identical with ARE 338)

e. Music (3) I II (Identical with MUS 338m)

f. Theatre Arts (3) I II (Identical with T AR 338)

u. Social Studies (3) I P, TTE 300, ED P 310 y. Mathematics (3) I P, TTE 300, ED P 310

TTE 394b must be taken concurrently.

NOTE: Several specific method courses, or courses in the teaching of the several high school subjects, required of prospective secondary teachers, are listed under the general number 338, with letters designating the teaching areas. Other methods courses are: 408, 410, 411, 412, 414.

342. Middle School Curriculum and Teaching (3) I II Functions of the middle school as they pertain to curriculum organization, instructional strategies, student activities, guidance and evaluation. P, admission to teacher preparation program.

372. Early Childhood Education (3) I II Curriculum practices in the primary grades. P, ED P 301, or CR.

384. Records/Information Management (3) I II Systems of information management; creation, distribution, storage, transfer and disposition of office records; management aspects of establishing information systems and evaluating their efficiency.

394. Praxicum

a. Elementary School Reading (1) I II CR, 322, 323.

b. Secondary Methods (1) I II Open to majors only. P, 300, ED P 310, EDUC 350; CR, 338h or 338u or 338y or 414 or one only 410, 411, or 412.

405. Mathematics in the Secondary School (2) I II Study and analysis of curriculum changes in school mathematics, with emphasis on the design and content of experimental programs. P, CR, MATH 315, 330, 362. (Identical with MATH 405)

408. English as a Second Language in Bilingual Education (3) I II (Identical with ENGL 408)

409. Principles of Vocational Education (2) I II Social and economic values of vocational education, federal laws, state policies and administration; theories and principles, with special reference to programs in the secondary school. P, CR 338a, A ED 385. (Identical with A ED 409)

410. Teaching English Composition (3) I II (Identical with ENGL 410)
411. Teaching of Literature (3) I II (Identical with ENGL 411)

412. The Teaching of English Language (3) I II (Identical with ENGL 412)

414. Teaching of Modern Languages (3) II Specific methods, objectives, organization of subject matter and evaluation in modern languages. (Identical with FREN 414, ITAL 414, SPAN 414, PORT 414).

492. Internship
a. Student Teaching in Elementary School (3-12) I II P, 300, 320, 322, 323, 324, 326, 327, ED P 301, EDUC 350, CR TTE 496c and SER 301a.
b. Student Teaching in Secondary School (6-12) I II P, 300, ED P 310, EDUC 350, LRC 435 and appropriate methods course(s), CR, TTE 496c and SER 301b.

503. Teacher Leadership and School Change (3) I II S Teacher leadership and involvement as it applies to change process, school improvement, collaborative decision-making, school assessment, strategic planning, and school restructuring.

515. Observation and Supervision of Student and Inservice Teachers (3) I II S Research-based strategies to supervise and critique teaching events and to determine positive ways of thinking and acting in classrooms.

520. The School Curriculum: Science (3) I II 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. 324 or 338h.

521. The School Curriculum: Mathematics (3) I II 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. 324 or 338h.

522. The School Curriculum: Social Studies (3) I II 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. 324 or 338h.


524. Curriculum Issues and Practices: Mathematics (3) I II S Current issues in mathematics education and their application to classroom instructional practices and procedures. Topics selected based upon recent concerns and developments. P. 324 or 338h.

525. Curriculum Issues and Practices: Social Studies (3) I II S Current issues in social studies education and their application to classroom instructional practices and procedures. Topics selected based upon recent concerns and developments. P. 324 or 338h.

526. Investigations in Early Childhood Education (3) I II S Critical study and evaluation of research findings and learning theories with emphasis upon pedagogical implications related to early childhood education.

528. Developing Programs for Young Children (3) I II S Contemporary early education programs with an emphasis upon the child's changing needs in the home, school and society. Criteria unique to particular ECE programs are analyzed to establish guidelines for program development.

529. Classroom Organization and Management (3) I II S An analysis of concepts, research findings, and effective practices for organizing and managing classrooms. Experiences in solving management problems provide. P. 539 or CR, and EDUC 500.

530. Environmental Education Topics (3) I II S Environmental Education in schools. Emphasis on diverse prospective of environmental education and on strategies for changing curriculum. P. 324 or 338h.

531. Mathematics Diagnosis and Remediation (3) I II S The nature and causes of students' difficulties in mathematics, diagnostic techniques, and the development of prescriptive principles of remedial instruction in mathematics. P. 326.

536. Alternatives in the Secondary Classroom (3) I II S Theoretical bases, methods and strategies for delivering instruction in secondary classrooms are examined, discussed and applied.

537. Equity in Schools and Society (3) I II S Implicit and explicit ways in which values are introduced into the classroom and school. Research on the hidden curriculum, ethnic/ racial and sex equity and prejudice and methods for combating inequities.

539. Recent Research on Teaching and Schooling (3) I II S An overview of the concepts, methodologies and findings of recent research on teaching and schooling practices.

542. The Middle School/Junior High (3) I II S History, purposes, curriculum, instructional organization, and classroom processes for middle schools/junior high schools.

545. Curriculum Theory and Policy (3) I II S A survey of theoretical frameworks in curriculum; the processes of content representation and enactment; planning evaluation, and change; analysis of curriculum policy.

595. Colloquium
   e. Master's Colloquium (3)

597. Workshop
   e. Learning Through Play (3) I II S
   m. Middle Level School Development (3) S
   p. Parents as Partners in Education (3) I II S
   w. Elementary Science Demonstrations (3) I II S P, 324 or 338h

610. Applied Curriculum Theory (3) I II S The theories, techniques, and organization of curriculum construction are discussed, evaluated and applied. P. 545.

612. Staff Development (3) I II S The concept, context, content, processes and evaluation models of staff development as enacted in school settings. P. EDUC 500.


621. Instructional Research in School Subjects: Mathematics (3) I II S Analysis of approaches to the study of instructional processes in mathematics education. P. 521 or 524 and EDUC 500.

635. Policy Analysis in Teaching and Teacher Education (3) I II S Examination of policy development and enactment related to teaching and teacher education at local, state, and national levels, as well as methods and approaches to policy analysis. P. 539 and EDUC 500.

640. Teacher/Student Cognition and Instruction (3) I II S An 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 and 696b; and EDUC 500.

642. Middle-Level Curricular Process (3) I II S Examination of procedures for curriculum/instructional development, implementation, improvement, and evaluation at the middle-school level. P. 542.

696. Seminar
   a. Research on Teacher Education (3) I II S P, 539, 545, EDUC 500.
   b. Research on Teaching (3) I II S P, 539, 545 and EDUC 500.

793. Internship
   a. Classroom Research (3) I II [Rpt./1] P, EDUC 600 or 601.
   b. Teacher Education Research (3) I II [Rpt./1] P, EDUC 600 or 601.

Theatre Arts (TAR)
University Fine Arts Complex
Drama Building
Room 239
(602) 621-7008

Professors Albert D. Tucci, Head, Robert C. Burroughs (Emeritus), Irene F. Comer (Emerita), Harold W. Dixon, Robert A. Keyworth (Emeritus), Frank K. LaBan, Sam Smiley
Associate Professors Richard T. Hanson, Peggy Kellner, William A. Lang, Mary Z. Maher, Jeffrey L. Warburton, Dianne J. Winslow
Assistant Professors Jerry R. Dickey, Karen K. Husted, Julie A. Mack, Charles D. O'Connor, Daniel Yurgaitis

The Department of Theatre Arts offers the following degrees: Bachelor of Arts in Theatre Arts; Bachelor of Fine Arts with a major in theatre production with options available in acting and design/technical production; Bachelor of Fine Arts with a major in musical theatre; Bachelor of Fine Arts with a major in theatre arts education; and Master of Arts and Master of Fine Arts with a major in theatre arts. For graduate admissions and degree requirements, consult the Graduate Catalog.

The Department of Theatre Arts is committed to providing professional training at the undergraduate and graduate levels in the theatre arts through a program of performance-centered activities and creative studies, the object of which is to insure that each student acquires a thorough understanding and appreciation of the theatre arts through classroom study, studio-laboratory training, and university theatre production. The programs of study are designed for those who intend to pursue a professional theatre career, as well as those who may enter other fields where theatre skills are desirable. The programs are designed to instill in the student the highest academic standards and professional skills required to initiate a career in educational or professional theatre.

**Theatre arts core curriculum:** All entering freshmen except musical theatre majors (see musical theatre degree requirements) will be admitted to the Bachelor of Arts degree program and must take the following core program in their first year. T AR 101, 111, 113, 115, 116a or 116b, 118, 145, 149, 151, 340a-340b, 440, 455 or 460a, 1 unit selected from 497a-f, and 6 units of dramatic literature. A 20-unit minor is also required in a related field. (See the Faculty of Fine Arts section for details.) If the minor is selected in theatre, it must be from one of the following two minors in theatre arts: performance studies (courses to be selected from T AR 207, 238, 239, 306, 367, 430, 431, 432, 456, 460a, 460b, 468, 497a-f) or production studies (courses required are T AR 120, 220, 222, 224, 225, 2 units of 497a-f; 8-12 units to be selected from T AR 215, 401, 420, 421, 422, 424, 429, 497a-e). If the minor is in a field other than the fine arts, it is recommended that additional general electives be taken in fine arts. At least 18 units in the major must be University credit. Minimum total units required for a degree with this major: 125.

**Bachelor of Fine Arts**

**MAJOR IN THEATRE PRODUCTION:** The Bachelor of Fine Arts with a major in theatre production is an extensive professional training program for highly talented and motivated theatre students. Admission to the major is granted only if the student has demonstrated strong potential for a professional career in musical theatre. The faculty in the student's area of specialization will evaluate each student's professional potential, trainability, and talent after an audition, interview, and/or portfolio review. Options are as follows:

**Professional actor training program:** Admission is by interview and audition at the completion of the theatre arts core curriculum. 80 units must be taken in the major and the following requirements must be met: T AR 340a, 340b, 440, 421, 425, 427, 429, 440, 445, 4-8 units selected from 497a-f, 497b, 497c, 497d, or 497e, and 6 units of dramatic literature. At least 18 units in the major must be University credit. Minimum total units required for a degree with this option: 125.

**MAJOR IN MUSICAL THEATRE:** The musical theatre major is an intensive professional training program for those students interested in a career in musical theatre. The course of study, offered in cooperation with the School of Music and Committee on Dance, emphasizes the collaborative process of musical theatre and provides an intensive course of study in music, dance, and theatre arts. Admission to the upper division is granted only if the student has demonstrated strong potential for a professional career in musical theatre. Preliminary admission to the program is by audition at the beginning of the freshman year. Admission to advanced musical theatre course work is by interview and audition at the completion of the theatre arts core curriculum at the end of the sophomore year. At that time, the faculty will evaluate each student's professional potential, trainability, and talent. Required course work: Lower-division theatre arts courses: T AR 111, 113, 115, 116a or 116b, 118, 140a or 140b, 149, 151, 203, 204, 205, 250, 251. For musical theatre majors, concurrent registration is not required in 145, 111 and 113, or 116 and 118 with either 149 or 151. Music courses: 110a, 110b, 120a, 120b, 130a, 130b, 8 semesters of voice (to include 4 units of 285v, minimum level of proficiency), and 8 units of MUS 200/400 ensembles, (up to 8 units of 497i may be substituted with the approval of the area head). Dance courses: 112a or 112b, 112c, 143, 152a, 175, 176a, 241a or 241b, 244a, 244b, 244c, or 244d. Upper-division theatre arts course work: T AR 305, 306, 403, 404, 405, 415, 451, 452, 497i (4 units). It is recommended that students take 15 units in music; 13 units in dance and 52 units in theatre. Of these, 16 units must also satisfy general education requirements. Minimum total units for a degree with this major: 129.

**MAJOR IN THEATRE ARTS EDUCATION:** Students may be admitted upon completion of theatre arts core curriculum and an interview. This major is designed for students planning to teach in the elementary, middle or high schools.
Graduates qualify for the K-12 Theatre Arts Specialist Endorsement on a Secondary Certificate from the State of Arizona. This program approximates certification requirements in most states. The prerequisites for entry into this program include the following: completion of the theatre arts core curriculum, an interview, acceptance both by the Department of Theatre Arts and the College of Education, and passing scores on a College of Education designated admission test. 46 units are required in the major and the student must complete the following theatre arts courses: T AR 340a or 340b, 410, 440, 455, and 456; and at least 6 units selected from 203, 204, 238, 239, 267, 336, or 468, and the following education courses: ED P 310, TTE 300, 338, 396, 493B, EDUC 350, LRC 435, 493; SER 301b. A teaching minor is not required, but those students anticipating employment in areas where a teaching minor might be advantageous should consult with their advisor. At least 18 units in the major must be University credit. Minimum total units required for the degree with this major: 125.

NOTE: All Bachelor of Fine Arts students are required to take at least one 3-unit course focusing on gender, race, ethnicity, or non-western civilization.

Minors

Theatre arts minor/teaching minor (20 units): Teaching minors must take T AR 410 and 338t. Minors may select classes from the following (6 units minimum): T AR 103, 336, 338t, 410, 431, 432, 468, 468b: (Theatre arts minors may not take T AR 149 and 151 to satisfy this requirement.) Production classes (6 units minimum) choose from T AR 111, 113, 115, 116a, 116b, 118, 120, 220, 222, 223, 225. Theatre arts minors must take theatre history classes 140a and 140b.

100. Acting for General College Students (3) I II S The craft of acting with emphasis on body, voice and mind. Theoretical background and practical experience, including in-class performances of selected scenes. Open to non-majors only.

101. Introduction to Theatre (3) I Investigation of the nature of theatre as a performance event through theoretical readings, resource materials, attendance at live theatre performances and lecture/discussion. Open to majors only.

103. Theatre Appreciation (3) I II An introduction to the art used in producing the play: directing, acting, technical production. Open to non-majors only.

111. Stagecraft (3) I II Basic principles of the scenic process: construction and use of materials, shop techniques and practices. 2R, 1L.

113. Stagecraft Crew (1) [Rpt./2] I II S Crew work on building theatrical sets or properties for department productions. P, CR, 111 for majors.

115. Makeup (1) I II History and essentials of makeup; straight, character, and special types; effects of light on makeup; opportunity for experience in production. 2S.

116a-116b. Stage Costume History (3-3) I II Trends of historic dress analyzed in relation to social and economic background; design and execution of costumes, and the organization and care of departmental wardrobes. 116a is not prerequisite to 116b. 2R, 1L.

118. Stage Costume Crew (1) [Rpt./2 units] I II S Crew work involved with costume construction, wardrobe maintenance and storage. P, CR, 116 for majors.

120. Basic Theatre Graphics (2) I II Practical graphic skills essential to theatrical productions. 4S.

140a-140b. History of the Theatre and Drama in Western Civilization (3-3) Origins and development of the arts of theatre from primitive ritual to modern times; integrated study of plays, theatre architecture, dramatic styles, and theories of significant periods. 140a is not prerequisite to 140b. Open to non-majors.


149. Acting I (3) I Fundamental techniques of acting, with emphasis on the actor's approach to characterization and the performer's relationship to all parts of the play's production. 2R, 2S. Concurrent registration required in 111 and 113, or 116a-116b and 118. Open to theatre arts majors only.

151. Acting II (3) II Intensive study of text analysis and the actor's approach to characterization as it pertains to modern realism. 2R, 2S. Concurrent registration required in 145, 111 and 113, or 116a and 116b. P, 149.

194. Practicum

a. Performance (1-2) [Rpt./4 units] I II S

203. Voice and Movement for the Actor I (2) [Rpt./1] I Beginning voice and movement skills for the actor including the Linklater approach, phonetics, physical isolation and awareness exercises. 4S. Open to acting majors only. P, 151, audition.

204. Voice and Movement for the Actor II (2) [Rpt./1] II Continued voice and movement skills for the actor. 4S. Open to acting majors only. P, 203, 250, audition.

205. Musical Theatre (2) [Rpt./1] I S American musical theatre: its origins, development and influences. Practical applications. 1R, 2S. Opens to majors only.

215. Sound for the Theatre (2) I II Basic technical and aesthetic principles of theatrical sound production. 2R, 2S.

220. Stage Lighting (3) Studies in stage lighting equipment, procedures, design techniques, and shop practices. 2R, 1L, P, 120.


223. Scene Design (3) I II Basic principles of scenic design, painting techniques and shop practices. 2R, 1L.

225. Scene Design Crew (1) [Rpt./2 units] I II S Crew work involved with painting and decorating sets for department productions. P, CR 223 for majors.

238. Modern Drama Through Performance (3) II Interpretation of modern plays from Ibsen to the present; presentation of speakers in drama, with emphasis on the physical and vocal qualities that project these characters, deals with the modern masters, such as Shaw, Miller, and Williams.

239. Speaking in the Arts (3) I II A studio course for presenters in the fine arts who wish to develop skills in appearing on the electronic media, stressing background, current trends, and performance techniques. (Identical with M AR 239)

250. Acting III (3) I Intensive work in expanding the versatility of the actor's instrument. Improvisation, class exercises and scene work. 2R, 2S. P, 151, audition. CR, 203.

251. Acting IV (3) II Nonrealistic styles, including expressionism, absurdism and the contemporary avant-garde; work with select exercises in both representational and performative modes. Analytical skills, scene performance and critique. 2R, 2S. P, 203, 254, audition. CR, 204.

305. Voice and Movement for the Actor III (2) [Rpt./1] I Intermediate voice and movement skills for the actor including standard stage speech and period manners and movement; emphasis on Shakespearean style. 4S. Open to majors only. P, 204, 251, audition.

306. Voice and Movement for the Actor IV (2) [Rpt./1] II Continued intermediate voice and movement skills for the actor including individualized attention to special vocal problems and period manners and movement. Emphasis on Commedia dell'Arte, Molier and English Restoration styles. 4S. Open to majors only. P, 305.

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 intent of the plays being studied.

338t. Teaching of Theatre Arts (3) I Carries credit in education only. (Identical with TTE 338t)

340a-340b. History of the Theatre (3-3) I II Origins and development of the arts of theatre from primitive ritual to modern times; integrated study of plays, theatre architecture, dramatic styles, and theories of significant periods. For majors only. 340a and 340b are Writing-Emphasis Courses. P, 145 and satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).
367. English Phonetics (3) I Scientific study of the sounds of speech; emphasis on laws and principles determining articulatory features, dialect variation, sound change, and sound as communication context.

396H. Honors Proseminar (3) II

397. Workshop
a. Writing and the Arts (3) I II P. ENGL. 101. 102.

401. Advanced Stagecraft I (3) I Advanced studies in scenic construction methods and techniques. P. 111. May be convened with 501.

403. Musical Theatre II (3) I Intensive text and score analysis in relation to the process of characterization for the actor, singer, dancer in musical theatre. Individual and group performance. Audition materials and techniques for a professional career in theatre. Open to majors only. 2L, 2S, P. 205 and audition.

404. Musical Theatre III (3) II Intensive scene study and exploration of the major historical styles and genres of the American musical theatre. 2R, 2S. Open to majors only. P. 403 and audition. May be convened with 504.

410. Methods of Teaching Creative Drama (3) I Principles and procedures of improvisation, role-playing, creative playwriting techniques, and program development in creative dramatics applicable to the elementary and secondary school levels. P. 12 units of theatre arts and education. May be convened with 510.

414. Advanced Make-up (2) [Rpt./2] History and practical application of theatrical make-up. Design and construct such items as masks, prosthetic pieces, wigs and beards. P. 115. May be convened with 514.

415. Theatre Graphics II: Drafting (3) I Advanced theatrical perspective, scenicographic and graphic techniques. P. 120. May be convened with 515.

416. Theatre Graphics III: Rendering (3) [Rpt./3] II Advanced practical color theory in pigment and illustration, rendering mediums and techniques. P. 120. May be convened with 516.

419. Sound Design (3) II Advanced study in theatrical sound production and design. P. 215 or consult department before enrolling. May be convened with 519.

420. Advanced Lighting Design I (3) II Special problems, practice and trends in designed light for theatrical productions. P. 220. May be convened with 520.

421. Special Effects for Theatre (3) III Applied theory and techniques associated with sound system and visual effects in the theatre. 2R, 3L. May be convened with 521.

422. Theatre Properties (3) [Rpt./2] I 1993-94 Construction and collection of stage properties. Experimentation with the use of materials and techniques. May be convened with 522.

423. Scene Painting (3) I 1994-95 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.

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.

429. Advanced Stage Costume Design I (3) I Advanced techniques in costume design. P. 116. May be convened with 529.

430. Stage Management (3) I Principles and techniques of stage management, practical applications, problems and analysis of stage managing. P. 111, 151. May be convened with 530.

431. Theatre Publicity and Box Office (3) I Publicity, press releases, sales, advertising, display techniques, subscription procedures. P. 12 units of theatre arts or related arts fields. May be convened with 531.

432. Theatre Management (3) II Amateur, educational and professional theatre organization and management; theatrical contracts, professional unions and representative organizations. P. 12 units of theatre arts or related arts fields. May be convened with 532.


440. History of the Modern Theatre (3) III I Major movements, plays, and theories in theatrical art from 1915 to the present. P. 145. For majors only.

442. Advanced Stage Lighting II (3) II An advanced study of lighting design: theoretical (light plots) and practical (light lab) projects. P. 420/520. May be convened with 542.

449. Acting V (3) I Intensive study of classical acting styles with emphasis on Shakespeare. Individual and group performance. 2R, 2S, P. 251 and audition. May be convened with 549.


452. Acting VII (3) I [Rpt./1] Audition material, techniques and research into problems of a professional career in the theatre, television, film, and motion pictures. 2R, 2S, P. 305, 449, audition. May be convened with 552.

453. Acting VIII (3) II Intensive scene study and character analysis. Survey and review of major modern acting theories and techniques. 2R, 2S, P. 452, audition. May be convened with 553.

455. Directing I (3) I Basic techniques of stage directing including play analysis, director-actor communication and technical problems of movement, composition, picturization and blocking. 2R, 2S. May be convened with 555.

456. Directing II (3) II Techniques of stage direction with the study of factors leading to a completed production; special attention given to director-designer communication and the production process. Direction of one-act plays. 2R, 2S, P. 455. May be convened with 556.

460a-460b. Writing for Stage and Screen (3-3) Preparation and analysis of short scripts for stage and motion pictures. Recommended for senior-level students only. Writing-Emphasis course for cinema option (General Fine Arts Studies Major). P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). May be convened with 560a-560b.

461. Artist Collaboration (2) [Rpt./2] II The development and communication of a visual idea for performance art; exploring all mediums of visual and aural communication. May be convened with 561.

468. Dialects in Performance (3) Application of suitable phonetic theory toward a systems approach to acquiring dialects for performance in stage, television and radio presentations. 1R, 4S. P. ability to do close transcription in International Phonetic Alphabet (IPA). May be convened with 568.

475. Screen Acting Techniques (3) II Principles and techniques of various performance methods involved in acting for television and motion pictures; basic problems faced by the professional actor seeking employment in these media; on camera experience with directed exercises and dramatic scenes. 2R, 3L. P. 151, audition. May be convened with 575.

495. Colloquium
a. Evaluation of Dance and Body Technique (3) I (Identical with DNC 495a)

496. Seminar
d. Dance-Related Art Forms (3) II 1994-95 (Identical with DNC 496d, which is home) May be convened with 596d.

497. Workshop
a. Technical Production (1-6) [Rpt./20 units] I II S May be convened with 597a.

b. Costume Production (1-6) [Rpt./20 units] I II S May be convened with 597b.

c. Lighting Production (1-6) [Rpt./20 units] I II S May be convened with 597c.

d. Sound Production (1-6) [Rpt./20 units] I II S May be convened with 597d.

e. Scenic Production (1-6) [Rpt./20 units] I II S May be convened with 597e.

f. Performance (1-6) [Rpt./20 units] I II S May be convened with 597f.

501. Advanced Stagecraft I (3) I For a description of course topics, see 401. Graduate-level requirements include an additional creative and/or research project. P. 111. May be convened with 401.

503. Musical Theatre II (3) I For a description of course topics, see 403. Graduate-level requirements include an additional creative and/or research project. Open to majors only. P. audition. May be convened with 403.

504. Musical Theatre III (3) II For a description of course topics, see 404. Graduate-level requirements include an additional performance and/or research project. Open to majors only. P. 304 and audition. May be convened with 404.

510. Methods of Teaching Creative Drama (3) I For a description of course topics, see 414. Graduate-level requirements include an additional creative and/or research project. May be convened with 410.

514. Advanced Make-up (2) [Rpt./2] For a description of course topics, see 414. Graduate-
level requirements include an additional creative and/or research paper. P. 115. May be convened with 414.

515. Theatre Graphics II: Drafting (3) I For a description of course topics, see 415. Graduate-level requirements include an additional creative and/or research project. P. 120. May be convened with 415.

516. Theatre Graphics III: Rendering (3) [Rpt./3] II For a description of course topics, see 416. Graduate-level requirements include an additional creative and/or research project. P. 120. May be convened with 416.

519. Sound Design (3) II For a description of course topics, see 419. Graduate-level requirements include an additional creative and/or research project. P. 215 or consult department before enrolling. May be convened with 419.

520. Advanced Lighting Design I (3) II For a description of course topics, see 420. Graduate-level requirements include an additional creative and/or research project. P. 220. May be convened with 420.

521. Special Effects for Theatre (3) II For a description of course topics, see 421. Graduate-level requirements include an additional creative and/or research project. May be convened with 421.

522. Theatrical Properties (3) [Rpt./2] I 1993-94 For a description of course topics, see 422. Graduate-level requirements include an additional creative and/or research project. May be convened with 422.

523. Scene Painting (3) I 1994-95 For a description of course topics, see 423. Graduate-level requirements include an additional creative and/or research project. May be convened with 423.

524. Advanced Scenic Design I (3) II For a description of course topics, see 424. Graduate-level requirements include an additional creative and/or research project. P. 223. May be convened with 424.

525. Advanced Stage Costume Construction I (3) II For a description of course topics, see 427. Graduate-level requirements include an additional creative and/or research project. P. 116. May be convened with 427.

529. Advanced Stage Costume Design I (3) I For a description of course topics, see 429. Graduate-level requirements include an additional creative and/or research project. P. 116. May be convened with 429.

530. Stage Management (3) I For a description of course topics, see 430. Graduate-level requirements include an additional creative and/or research project. P. 111, 151. May be convened with 430.

531. Theatre Publicity and Box Office (3) I For a description of course topics, see 431. Graduate-level requirements include an in-depth research paper or project. P. 12 units of theatre arts or related arts fields. May be convened with 431.

532. Theatre Management (3) II For a description of course topics, see 432. Graduate-level requirements include an in-depth research paper or project. P. 12 units of theatre arts or related arts fields. May be convened with 432.

539. Theatre Graphics IV: Model Making (3) For a description of course topics, see 439. Graduate-level requirements include an additional creative and/or research project. May be convened with 439.

541. Scenography (3) The integration of scenery, costume, make-up, light and sound into a total production design.

542. Advanced Stage Lighting II (3) I For a description of course topics, see 442. Graduate-level requirements include an additional creative and/or research project. P. 420, 520. May be convened with 442.

543. Advanced Stage Lighting III (3) An advanced study of lighting design for musical theatre; theoretical (light plots) and practical (light lab) projects. P. 420.

546. Dance Program Administration (3) II 1994-95 (Identical with DCC 546)

549. Acting V (3) I For a description of course topics, see 449. Graduate-level requirements include an additional performance and/or research project. P. 305, 449. Audition. May be convened with 451.

550. Literary Resources for Choreography (3) II 1993-94 (Identical with DCC 550)

551. Acting VI (3) II For a description of course topics, see 451. Graduate-level requirements include an additional performance and/or research project. P. 305, 449, audition. May be convened with 451.

552. Acting VII (3) [Rpt./1] II 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) II For a description of course topics, see 453. Graduate-level requirements include an additional performance and/or research project. P. 452, audition. May be convened with 553.

555. Directing I (3) I For a description of course topics, see 455. Graduate-level requirements include an additional performance and/or research project. May be convened with 455.

556. Directing II (3) II For a description of course topics, see 456. Graduate-level requirements include an additional performance and/or research project. P. 455. May be convened with 456.

560a-560b. Writing for Stage and Screen (3-3) For a description of course topics, see 460a-460b. Graduate-level requirements include the preparation of full-length scripts for stage and motion pictures. May be convened with 460a-460b.

561. Artist Collaboration (2) [Rpt./2] For a description of course topics, see 461. Graduate-level requirements include an additional creative and/or research project. May be convened with 461.

566. Dialects in Performance (3) For a description of course topics, see 466. Graduate-level requirements include a close transcription of a selected dialect or dialects from oral presentation and a suitable analysis of the articulatory features. P. ability to do close transcription in International Phonetic Alphabet (IPA). May be convened with 468.

575. Screen Acting Techniques (3) II For a description of course topics, see 475. Graduate-level requirements include an additional performance and/or research project. P. 151, audition. May be convened with 475.

595. Colloquium a. Evaluation of Dance and Body Techniques (3) I (Identical with DCC 595a)

596. Seminar d. Dance-Related Art Forms (3) II 1994-95 (Identical with DCC 596d, which is home) May be convened with 496d.

597. Workshop a. Technical Production (1-6) [Rpt./20 units] P. 315S May be convened with 497a.

600. Introduction to Graduate Study of Drama (3) I Methods and materials for research in theatre and drama; introduction to the bibliography of these fields; organization and form of thesis.

605. Advanced Voice and Movement for the Actor I (3) [Rpt./1] I Advanced study and exercise in voice and movement for the actor: relaxation, breathing, physical and vocal freedom, articulation and improvisation, including the Linklater Approach, I.P.A., and Neutral Mask. 65. P. audition.

606. Advanced Voice and Movement for the Actor II (3) [Rpt./1] II Continued advanced study and exercise in voice and movement for the actor: standard stage speech, stage dialects, period customs, manners and movement. 65. P. audition.

640. Dramatic Criticism: Tragedy (3) I Comparative analysis of tragedy and theories of tragedy from antiquity to the present 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.

642. Advanced Studies in Theatre History (3) II Concentrated study in theatre history, with major emphasis on the physical theatre, standard scholarly works, and source materials.

644. History of the American Theatre (3) II Studies in the American theatre and drama. Directed and individual projects will be assigned.


655. Advanced Directing I (3) I Techniques of stage directing, including play analysis, director-actor communication, director-designer communication, blocking, movement, composition; use of directorial style...
and the adaptation of directorial philosophies. 2R, 2S.

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. 2R, 2S. P, 449, 655.

96. * Seminar
   a. Contemporary Trends (1-3) [Rpt./6 units] I
   b. Special Topics in Acting (1-3) [Rpt./6 units] II
   c. Special Topics in Directing (1-3) [Rpt./6 units] II
   d. Musical Theatre Production (1-3) [Rpt./6 units] III
   e. Special Topics in Playwriting (3) [Rpt./6 units] P, permission of instructor.
   f. Special Topics in Stage Costume Construction (1-3) [Rpt./6 units] I
   g. Period Design Style (1-3) [Rpt./6 units] II
   h. Special Topics in Costume Design (2-3) [Rpt./6 units] P, 429.
   i. Special Topics in Design (2) [Rpt./6 units] 1P, 401/501.

*Students may earn a maximum of 9 units in TAR 696, with a maximum of 6 units in any one area.

Toxicology
(See Pharmacology and Toxicology, College of Pharmacy)

Veterinary Science (VSC)
Pharmacy-Microbiology Building, Room 201
(602) 621-2355

Professors Charles R. Sterling, Head, Robert B. Chiasson (Emeritus), Ed W. Cupp, Leonard W. Dewhirst (Emeritus), Lynn A. Joens, C. John Mare, Raymond E. Reed (Emeritus), Jose M. Ribeiro (Entomology), James N. Shively (Emeritus), Norval A. Sinclair, J. Glenn Songer

Associate Professors Ronald W. Hilwig, Robert J. Jansen (Emeritus), Donald Lightner, David W. Sammons
Assistant Professor Michael W. Riggs
Lecturer Ted H. Noon

Affiliated Faculty: Greg A. Bradley, Richard C. Collins, Don W. DeYoung, F. Javier Enriquez, Fernando Lozano-Alarcon, Carlos Reggiardo, Jose M. Ribeiro, Sue E. Wilson-Sanders

The department offers a program leading to the Bachelor of Science in Agriculture with a major in veterinary science which prepares students for careers concerned with animal or human health and welfare, biological or biomedical sciences and biotechnology or related fields which require scientific-based academic preparation. Program courses also support the undergraduate major in microbiology offered through the College of Agriculture and the graduate program in pathobiology offered through the Department of Veterinary Science. Students may 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 quality of 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 competencies of the general requirements for the Bachelor of Science in Agriculture (see the College of Agriculture section of this catalog), include MATH 117R/S, STAT 263, plus 3 additional units; CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b; PHYS 102a-102b, and 103a-103b, 104a-104b, 241a-241b, 246a-246b, 247a-247b; MCB 410a and 456 and any animal production courses; MCB 410a and 456 and additional courses in biological sciences, business or environmental sciences. 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.


315R. Physiology of Reproduction (3) I (Identical with AN S 315R)
315L. Physiology of Reproduction Laboratory (1) I (Identical with AN S 315L)

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 prerequisite to 400b. P, ECOL 181, 182; CHEM 243a; MATH 117R/S. May be convened with 500a-500b.

403R. Biology of Animal Parasites (3) I Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential. P, 8 units of biology or microbiology. (Identical with ENTO 403R, ECOL 403R and MIC 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, ENTO 403L and MIC 403L) May be convened with 503L.

404. Molecular Parasitology (3) II GRD The molecular details of parasites, cell biology and biochemistry of host and host cell interactions. P, 403R, BIOC 460/462a. (Identical with MIC 404) May be convened with 504.

405. Animal Diseases (3) I Survey of selected diseases of domestic animals. Materials to be covered includes disease mechanisms, immunology and infectious agents as well as pertinent materials concerning husbandry, management, and nutrition. May be convened with 505. Noon.

419. General Immunological Concepts (3) I (Identical with MIC 419) May be convened with 519.

420. Pathogenic Bacteriology (3) II (Identical with MIC 420R) May be convened with 520.

421a-421b. Microbiological Techniques (3-3) (Identical with MIC 421a-421b)

423. Mechanisms of Disease (4) II General pathology of animal and selected human diseases with emphasis on pathogenesis, pathophysiology, and morphologic changes at the macroscopic, microscopic and molecular levels. Recitation will stress general mechanisms of disease. Laboratory will reinforce recitation and stress recognition of disease in organs and tissues at the gross and microscopic levels. 3R, 1L, P, 400a-400b, 409 or CR, MIC 205, MIC 419R or equivalent or instructor approval. (Identical with MIC 423 and TOX 423) May be convened with 523.


427. Insect Chemical Ecology (2) I 1993-94 (Identical with ENTO 427) May be convened with 527.

428. Microbial Genetics (3) I (Identical with PLP 428)

429. Introductory Virology (3) I (Identical with MIC 429)

437. Veterinary Physiology (4) I (Identical with ECOL 437)

438. Ecology of Infectious Disease (3) II Ecology of the major infectious diseases of humans and other animals. P, 419 or 420. (Identical with MIC 438) May be convened with 538.

443. Research Animal Methods (3) I Regulations, care, diseases and techniques involving common laboratory animals used in research.
and teaching programs. (Identical with AN S 443, BIOC 443, MIC 443) May be convened with 543.

449. Diseases of Wildlife (3) II Important diseases of wildlife. Disease mechanisms, infectious agents, diagnostic procedures, and postmortem techniques as well as a survey of selected but generally well-recognized diseases of wildlife. (Identical with WFSF 449) May be convened with 549. Noon

450L. Medical Mycology Laboratory (2) II (Identical with MIC 450L) May be convened with 550L.

450R. Medical Mycology (2) II (Identical with MIC 450R) May be convened with 550R.

452. Medical-Veterinary Entomology (4) [Rpt./3] II (Identical with ENTO 452) May be convened with 552.

456. Aquaculture (3) II 1993-94 (Identical with WFSF 456) May be convened with 556.


459. Comparative Vertebrate Histology (4) II Identification, phylogeny, and function of normal vertebrate tissues. 2R, 6L. P, 12 units of animal biology. A vertebrate anatomy and/or systematics course is strongly recommended. (Identical with ECOL 459) May be convened with 559.

466. Physiology Laboratory (3) II (Identical with ECOL 466) May be convened with 566.

468. Comparative Physiology (3) II (Identical with ECOL 468) May be convened with 568.

495. Colloquium

a. Topics in Veterinary Science (1) II Writing Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

500a-500b. Animal Anatomy and Physiology (3-3) For a description of course topics, see 400a-400b. Graduate-level requirements include two in-depth research papers on related pertinent topics in animal anatomy and/or physiology; written exams, and a final oral comprehensive exam. 500a is not prerequisite to 500b. P, ECOL 181, 182, CHEM 243a; MATH 117R/S. May be convened with 400a-400b.

503R. Biology of Animal Parasites (3) I For a description of course topics, see 403R. Graduate-level requirements include an in-depth research paper on the molecular biology/immune response of a single parasite. (Identical with ENTO 503R, ECOL 503R and MBIM 503R) May be convened with 403R.

503L. Parasitology Laboratory (1) I For a description of course topics, see 403L. Graduate-level requirements include an in-depth research paper dealing with the differential diagnostic techniques used to identify a single parasite species. P, 9 units of ecology or microbiology, CR, 403R. (Identical with ECOL 503L, ENTO 503L and MBIM 503L) May be convened with 403L.

504. Molecular Parasitology (3) II GRD For a description of course topics, see 404. Graduate-level requirements include attainment of a higher overall examination score and a research paper. P, 403R, BIOC 460/462a. (Identical with MBIM 504) May be convened with 404.

505. Animal Diseases (3) I For a description of course topics, see 405. Term paper required for graduate credit. May be convened with 405.

519. General Immunological Concepts (3) I (Identical with MBIM 519) May be convened with 419.

520. Pathogenic Bacteriology (3) II (Identical with MBIM 520) May be convened with 420.

523. Mechanisms of Disease (4) II For a description of course topics, see 423. Graduate-level requirements include preparation of a research proposal on a selected relevant topic. (Identical with MBIM 523 and TOX 523) May be convened with 423.


527. Insect Chemical Ecology (2) I 1993-94 (Identical with ENTO 527) May be convened with 427.

538. Ecology of Infectious Disease (3) III For a description of course topics, see 438. Term paper required for graduate credit. P, 419 or 420. (Identical with MBIM 538) May be convened with 438.

543. Research Animal Methods (3) I For a description of course topics, see 443. Graduate-level requirements include an in-depth research paper on one of the lecture topics presented in the course. (Identical with AN S 543, BIOC 543, MBIM 543) May be convened with 443.

549. Diseases of Wildlife (3) III For a description of course topics, see 449. Graduate-level requirements include either a term paper based on assigned reading or a research paper compiling field studies on other research experiences in wildlife disease. (Identical with and WFSF 549) May be convened with 449.

550L. Medical Mycology Laboratory (2) II (Identical with MBIM 550L) May be convened with 450L.

550R. Medical Mycology (2) II (Identical with MBIM 550R) May be convened with 450R.

552. Medical-Veterinary Entomology (4) [Rpt./3] II (Identical with ENTO 552) May be convened with 452.

555R. Fishery Management (3) II (Identical with WFSF 555R) May be convened with 456.

556. Aquaculture (3) II 1993-94 (Identical with WFSF 556) May be convened with 456.

558. Comparative Vertebrate Anatomy (4) I For a description of course topics, see 458. Graduate-level requirements include a library and/or dissection report. P, 8 units of animal biology. (Identical with ECOL 558) May be convened with 458.

559. Comparative Vertebrate Histology (4) II For a description of course topics, see 459. Graduate-level requirements include a written report on a selected topic. 2R, 6L. P, 12 units of animal biology. A vertebrate anatomy and/or systematics course is strongly recommended. (Identical with ECOL 559) May be convened with 459.

565. Shrimp Pathology (3) [Rpt./1] SC Comprehensive lectures and practical laboratory training on the current methods used to diagnose, prevent and treat the principal diseases of cultured penaeid shrimp. Field trip. Fee. P, B.S., M.S. and/or D.V.M. in biological and/or medically oriented fields.

566. Physiology Laboratory (3) II (Identical with ECOL 566) May be convened with 466.

568. Comparative Physiology (3) II (Identical with ECOL 568) May be convened with 468.

601. Experimental Surgery (2) II 1993-94 Exercises in the surgical procedures commonly necessary in animal experimentation, including aseptic technique, anesthesiology, surgical operations, and care of the postsurgical patient. 1R, 3L. P, 3 units of mammalian anatomy.

612. Biological Electron Microscopy (4) I (Identical with MCB 612)

630. Experimental Methods for Research (4) II (Identical with MBIM 630)

649. Fishery-Water Quality and Toxicology (3) I (Identical with WFSF 649)

680. Pathophysiology (3) II Principles of systemic disease processes. Physical, chemical or cellular events which alter body functions or produce disease. P, 400a-400b/500a-500b, 405/505 and 423R/523R or equivalent.

Watershed Management
(See Renewable Natural Resources)

Wildlife and Fisheries Science
(See Renewable Natural Resources)

Women's Studies (WS)
Douglas Building, Room 102
(602) 621-7338

Committee on Women's Studies
Professors Susan Hardy Aiken (English), Barbara Babcock (English), Gail Bernstein (History), Caren Deming (Media Arts), Paula England (Sociology), Barbara Gutek (Management and Policy), Donna Guy (History), Billie Jo Inman (English), Linda Molm (Sociology), Susan Philips (Anthropology), Eliana Rivero (Spanish and Portuguese), Alice Schlegel (Anthropology), Marilyn Skinner (Classics), Sheila Slaughter (Higher Education), Lynn Smith-Lovin (Sociology), Monique Wittig (French and Italian)
Associate Professors Karen Anderson, Chair (History), Esther Fuchs (Near Eastern Studies), Mary Beth Haralovich (Media Arts), Ingeborg Kohn (French and Italian), Judy Lensink (English), Patricia MacCorquodale (Sociology), Betty Newlin (Emerita), Chia-Lin Pao Tao (Near Eastern Studies), Lynda Zwinger (English)

Assistant Professors Ana Alonso (Anthropology), Laura Berry (English), Anne Betteridge (Middle Eastern Studies), Meg Lota Brown (English), Irene D'Almeida (French and Italian), Joan Dayan (English), Maureen Fitzgerald (History), Nancy Hunt (History), Marcia Inhorn (Anthropology), Janet Jakobsen (Religious Studies), Denise Kervin (Media Arts), Naomi Miller (English), Laura McCluskey (Psychology), V. Spike Peterson (Political Science), Laura Tabili (History), Abby Van Slyck (Architecture), Susan White (English)

Research Professor Myra Dinnerstein
Adjunct Lecturer Raquel Goldsmith (Mexican American Studies and Research Center)

Adjunct Assistant Research Professor Helen Henderson (Anthropology)
Reference Librarian, Women's Studies Specialist Ruth Dickstein

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 to pursue concentrated study in a supporting minor. The student is required to take 30 credit hours: three required courses 100, 200 and 305; one 200-level course chosen from 216, 225, 253a, 253b; one course in multi-cultural perspective chosen from either 465, 466, 468, 469, 485, 489, or 490; and five other upper-division, women's studies electives, at least one of which 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 consultation with the chairperson of the committee and approved by the student's advisor. Students with a minor in women's studies are encouraged to take courses sequentially, beginning with WS 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 professional 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, sociology, philosophy, anthropology, psychology, and political science; investigations of each discipline's approach to women's roles and status.

150. Sociology of Women (3) I I (Identical with SOC 150)

200. Women and Western Culture (3) Examines the various ways in which women have been depicted in Western philosophy, literature, and the arts from the classical Greek period to the present. Explores women's cultural expressions and representations of themselves.

216. Psychology of Gender (3) II (Identical with PSYC 216)

225. Introduction to Women and Religion (3) I Ways in which women's religious practices have interacted with religious traditions' constructions of gender. The course asks students to consider how the study of religion can illuminate their own self-understandings and cultural locations. (Identical with RELI 225)

253a-253b. History of Women in the United States (3) I II (Identical with HIST 253a-253b)

303. Gender and Language (3) I II 1994-95 (Identical with ANTH 303)

305. Feminist Theories (3) I Explores feminist theories from various disciplines, analytical frameworks, and subject areas. Examines the construction, differentiation, and representation of the genders in cultural settings and explores the interactions between gender systems and women's roles, statuses, and experiences. P, 3 units in women's studies, or consult committee before enrolling.

321. Women in Judaism (3) I II (Identical with JU 531)

325. Gender and Science (3) II The history and philosophy of science; women as subjects of scientific research; women as scientists; future public policy. Students will be required to write a research paper and to co-lead a class discussion. P, 3 units in WS at the 200-level or above, or 3 units in the sciences at the 200-level or above.

330. Women in Antiquity (3) I II (Identical with CLAS 330)

340. Gender and Politics (3) I II (Identical with POL 340)

361. Honors Seminar (3) II Course is primarily for honors students. Repeatable if topic is different.

366. Feminist and IR Theories (3) I II (Identical with ANTH 66)

406. Gender and Social Identity (3) I (Identical with ENGL 406)

417. Women Authors (3) I (Identical with ENGL 417)

418. Women in Literature (3) I (Identical with ENGL 418)

423. Representation of Gender in the Media (3) I (Identical with MAR 423)

425. Theoretical Issues in the Study of Women and Religion (3) I II The study of women and religion, including religious symbols and rituals; women's constraint and empowerment through religion; reading and writing cultures; women, religion and cross-cultural contact; women, religion and social change. P, WS 225, RELI 225 or permission of instructor. (Identical with RELI 425) May be convened with 525.

430. Lesbian/Bisexual Women's Theories/Lives/Activisms (3) I Exploration of the relationships between lesbian and bisexual women's lives and activities, and the theoretical understandings which concurrently both arise out of and construct those lives and activities. P, 3 units of women's studies, preferably 305, or permission of instructor. May be convened with 530.

453. History of Women and Work (3) I (Identical with HIST 453)

458. Feminism: A Comparative History (3) I II (Identical with HIST 458)

459. Sociology of Gender (3) I II (Identical with SOC 459)

461. Feminist and IR Theories (3) I II (Identical with POL 461) May be convened with 561.

464. Women in American Architecture (3) I II (Identical with ARCH 464) May be convened with 564.

465. Women in International Development (3) II (Identical with ANTH 465)

468. Women in China (3) I (Identical with CHN 468)

469. History of Women in Latin America (3) II (Identical with HIST 469)

476. Women and the Law (3) I II 1994-95 (Identical with POL 476)

480. Men, Women and Work (3) I II Open only to students who meet the requirement for Advanced Standing as specified in the College of Business and Public Administration section of the catalog. (Identical with MAP 480)

481. Work, Motherhood and Feminism (3) I II 1994-95 (Identical with POL 481) May be convened with 561.

490. Men, Women and Work (3) I II Open only to students who meet the requirement for Advanced Standing as specified in the College of Business and Public Administration section of the catalog. (Identical with MAP 490)

491. Work, Motherhood and Feminism (3) I II 1994-95 (Identical with POL 491) May be convened with 561.

493. Gender and African History (3) I II (Identical with HIST 493) May be convened with 583.

495. Mexicana/Chicana Women's History (3) I (Identical with HIST 495)

496. Seminar (3) I (Identical with HIST 496) May be convened with 596w.
525. Theoretical Issues in the Study of Women and Religion (3) II For description of course topics, see 425. Graduate-level requirements include a longer writing project, and an additional class presentation. (Identical with RELI 525) May be convened with 425.

530. Lesbian/Bisexual Women's Theories/Lives/Activisms (3) I For description of course topics, see 430. Graduate students will be asked to do an in-class presentation of selected materials and will have the choice of writing a single long-term paper. May be convened with 430.

554. Contemporary Feminist Theories (3) II Introduction to contemporary feminist theories, posing and analyzing the questions that propel theorizing about women’s relationships to processes of gender differentiation. By examining the assumptions about gender relations that ground theoretical positions from various disciplines, analytic traditions, and subject areas, students will be enabled to read, synthesize and critique across the spectrum of feminist theorizing. P, consult the committee before enrolling. (Identical with ENGL 554)

558. Gender Identities and Interactions (3) (Identical with SOC 558)

561. Feminist and IR Theories (3) (Identical with POL 561) May be convened with 461.

564. Women in American Architecture (3) II (Identical with ARCH 564) May be convened with 464.

571. Counseling Women (3) II (Identical with COUN 571)

581. Work, Motherhood and Female Identity in America: 1945 to the Present (3) I For a description of course topics, see 481. Graduate-level requirements include a longer more comprehensive research paper. (Identical with HIST 581) May be convened with 481.

583. Gender and African History (3) I II S (Identical with HIST 583) May be convened with 483.

596. Seminar w. Women's Studies (3) [Rpt.] I II (Identical with ENGL 596w, which is home)

606. Women’s Health in the United States (3) II (Identical with ANTH 606)

695. Colloquium e. Advanced Studies in the History of Women (3) [Rpt./5] I II (Identical with HIST 695e, which is home)

696. Seminar n. Comparative Women's History (3) [Rpt./4] P, consult committee before enrolling. (Identical with HIST 696n, which is home)
UNIVERSITY AFFILIATIONS, ORGANIZATION, ADMINISTRATION AND FACULTY

ACCREDITATIONS AND MEMBERSHIPS

Accreditations
Accreditation Board for Engineering and Technology; American Assembly of Collegiate Schools of Business; American Association for Accreditation of Laboratory Animal Care; American Association of Museums; American Chemical Society; American Council on Pharmaceutical Education; American Dietetic Association; American Library Association; American Planning Association; American Psychological Association (graduate program in clinical psychology and graduate program for school psychologists); American Speech-Language-Hearing Association; Association of American Law Schools and American Bar Association; Commission on Rehabilitation Education; Council on Education in Journalism and Mass Communications; Council on Rehabilitation Education; Liaison Committee on Medical Education of the American Medical Association and the Association of American Medical Colleges; National Architectural Accrediting Board; National Association of Schools of Dance; National Association of Schools of Music; National Association of Schools of Public Affairs and Administration; National Association of Schools of Theatre; National Council for Accreditation of Teacher Education; National League for Nursing; North Central Association of Colleges and Schools.

Memberships
Accrediting Council on Education in Journalism and Mass Communication; American Anthropological Association; American Association for Higher Education; American Association for Laboratory Animal Science; American Association of Colleges for Teacher Education; American Association of Colleges of Nursing; American Association of Colleges of Pharmacy; American Association of Collegiate Registrars and Admissions Officers; American Association of University Women; American College Dance Festival Association; American College Theatre Festival Association; American Council of Learned Societies; American Council on Education; American Home Economics Association; American Institute for Iranian Studies; American Institute of Maghribi Studies; American Institute for Yemeni Studies; American Newspaper Publishers Association; American Political Science Association; American Psychological Association; American Research Center in Egypt; American Research Center in Turkey; American Society for Engineering Education; American Society for Public Administration; American Statistical Association; Argonne Universities Association; Associated Western Universities; Association for Communication Administration; Association for Gerontology in Higher Education; Association for Public Policy and Management; Association for Theatre in Higher Education; Association for University Business and Economic Research; Association of Academic Health Centers; Association of American Colleges; Association of American Geographers; Association of American Medical Colleges; Association of American State Geologists; Association of American Universities 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 Education Association; Center for Arabic Study Abroad; College Art Association of America; College Entrance Examination Board; Consortium of Western Universities and Colleges; Council for Advancement and Support of Education; Council of Graduate Schools in the United States; Council of United States Universities for Soil and Water Development in Arid and Subhumid Areas; EDUCOM, Interuniversity Communications Council; Inter-University Consortium for Political and Social Research; Eisenhower Consortium; Graduate Management Admissions Council; Institute of International Education; International Museum of Photography; Latin American Scholarship Program of American Universities; Middle East Studies Association; Mid-America College Art Association; Midwestern Association of Graduate Schools; National Association for Bilingual Education; National Association for Chicano Scholars; National Association of Colleges and Teachers of Agriculture; National Association of College and University Attorneys; 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; United States Institute for Theatre Technology; United States 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 Collegiate Schools of Business; Western Association of Graduate Schools; Western College Association; Western Interstate Commission for Higher Education (WICHE); Western Institute of Nursing.

THE UNIVERSITY OF ARIZONA ALUMNI ASSOCIATION

The University of Arizona Alumni Association was organized June 2, 1897. It is incorporated under Arizona state law and operates in accordance with the Articles of Incorporation and By-Laws adopted by the membership in open meeting at Homecoming October 27, 1956, and amended October 20, 1981 and October 17, 1987.

Membership
All persons who have received a degree from the University of Arizona or former students who have completed at least 30 units are members of the Alumni Association and receive all of the publications and services afforded by the association.

In 1982 the Alumni Association initiated the Endowed Membership Program. The principal of the endowment will remain intact and only the interest will be used toward essential Alumni Association programs. An endowment contribution is not required for the former student to receive the services afforded by the Alumni Association.

Objectives
The objectives of the Alumni Association generally are to promote the interest and welfare of the State of Arizona, The University of Arizona, and the cause of education. More specifically they are to successfully support the interests of The University of Arizona, its alumni, and its current and future
students, through the development of mutually beneficial relationships. 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. The activities of the association are managed by a full-time Director of Alumni responsible to the board of directors and a staff of 25. The director manages the central alumni office on campus, the Phoenix office, and an office in southern California. The campus office, headquarters for all alumni activities, houses computerized record files of more than 348,000 graduates, former students, and donors.

Activities
The Alumni Association fosters the involvement of alumni with their alma mater in several ways:

CLUBS—There are active University of Arizona alumni clubs in 46 cities throughout the United States and Mexico, with plans to organize in an additional 20 cities. The clubs assist the University in its student recruitment efforts, raise funds for and award scholarships, and support university events in their cities. The Alumni Office provides speakers from campus, video tapes, and films for club meetings, as well as mailing event notices. Students and former students may obtain information about the club in their home area from the Alumni Office.

COUNCILS—Within the University of Arizona, 9 colleges have organized alumni councils, which serve to strengthen the ties between the college's students, its faculty, and its alumni. The councils provide service both to the community and to the college.

HOMECOMING AND REUNIONS—Alumni are encouraged to return to the University to interact with other alumni and students and to view the progress of their alma mater.

LIFELONG LEARNING AND TRAVEL—The Association sponsors an international and action travel program designed to meet educational objectives of alumni, while generating revenue for the Alumni Association.

AWARDS AND RECOGNITION—Each year alumni are honored for outstanding service to the University and/or for outstanding personal achievement.

PUBLICATIONS—The Alumni Office publishes the Arizona Alumni, 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 leadership newsletter is published quarterly and the association also produces a monthly TV 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.

RESEARCH AND SPECIAL PUBLIC SERVICE UNITS
The following divisions are a part of or are affiliated with the university. Additional information regarding their organization and services may be obtained upon inquiry to the director concerned.

THE AGRICULTURAL EXPERIMENT STATION (1890), one of the divisions of the College of Agriculture, is responsible for the basic and applied research programs in the schools, departments, and other units within the College of Agriculture. It is administered by the Director of the Experiment Station. Modern facilities for laboratory and field research and extension, as well as graduate and undergraduate teaching, are available on the university campus and at agricultural centers throughout the state of Arizona, including the Santa Rita Experimental Range. Research is also conducted on farms, orchards, ranches, rangelands, and forests in cooperation with farmers, ranchers, and officials of various state and federal agencies.

THE ARIZONA ARTHRITIS CENTER (1977) is a multidisciplinary organization which is universitywide and contains physicians, basic scientists, allied health personnel and a variety of other health professionals interested in research, education and comprehensive care of patients with arthritis, rheumatic and related diseases. The center's activities cover both basic and clinical research. Multiple programs in the area of basic mechanisms of disease in rheumatoid arthritis, systemic lupus erythematosus, metabolic bone disease, scleroderma, inflammatory muscle disease, spondylarthropathies and various autoimmune diseases are actively being pursued.

There is a large clinical pharmacology study unit within the center. Basic work on the immunology of inflammatory cell function and the immunology of bone formation and destruction is being studied. There is a large area of research and the development of artificial joint prostheses and biomaterials. Basic educational and health sciences research in rheumatic diseases are also carried on at the center. Educational activities are carried on at the level of medical student, postgraduate trainees in primary care medicine, specialists in the area of orthopedics, rheumatology, joint replacement surgery as well as physical and occupational therapy and podiatry. There are extensive programs in patient education and postgraduate and continuing educational programs in the state, region and nation. The patient care model of interdisciplinary team care is emphasized. There are large programs in both adult and pediatric rheumatic disease care that provide for statewide consultative programs.

The Arizona Arthritis Center is a division of the College of Medicine reporting to the Dean of the College. This program, however, includes faculty and staff in the college as well as on main campus and is linked to staff and university physicians in University Physicians, Inc. and University Medical Center.

THE ARIZONA CANCER CENTER (1976) is a comprehensive cancer center officially designated by the National Cancer Institute. The center has as its mission to significantly contribute to research related to the understanding, diagnosis, treatment and prevention of cancer. To attain its goal, the Arizona Cancer Center pursues the following objectives:
1. Serve as a major geographic resource which is comprehensive in the scope of its activities
2. Promote excellence in basic and clinical cancer research, patient care and professional training and education
3. Facilitate and coordinate cancer-related programs at The University of Arizona
4. Develop an outreach program to serve the State of Arizona

The Arizona Cancer Center has been involved with planning educational, clinical and scientific activities. The center's commitments have included educational programs for medical and graduate students as well as teaching of practitioners and allied health professionals at local and national continuing medical education programs. Graduate degree programs in cancer biology were opened at The University of Arizona in 1988 with the support of faculty from the Arizona Cancer Center. Opportunities exist for medical students to work in cancer-related projects with faculty throughout the College of Medicine. The monthly Tumor Board at the Arizona Cancer Center is open to all interested persons and discusses aspects of cancer patient management and cancer prevention. As part of the required curricula of medical students, individual lectures in cancer education are presented in the Departments of Biochemistry, Molecular and Cellular Biology, Microbiology and Immunology, Anatomy, and Pharmacology.

The clinical oncology research programs of the Arizona Cancer Center have continued to draw an increasing cancer patient volume to the Arizona Health Sciences Center which is the leading resource for cancer care in the state.

Multidisciplinary cancer research expertise is continually developed and expanded in numerous clinical and laboratory programs that include basic research studies on oncogenes and on carcinogenesis; the study of heat, radiation, biological modifiers, bone marrow transplantation and drugs in cancer therapy; the interaction of vitamins A and E and their synthetic derivatives with pre-neoplastic and neoplastic states; the definition of the pathophysiology of clonal growth of human tumors; clinical pharmacology of anticancer drugs; tissue kinetics; tumor virology; cellular and molecular biology; medical imaging of cancer; tumor immunology; cancer prevention; cytogenetics; and clinical trials of promising approaches to cancer prevention, diagnosis and treatment.

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 ON AGING (1991) in The University of Arizona College of Medicine was formed as a merger of two units, The Arizona Long Term Care Gerontology Center and The Division of Restorative Medicine. The primary goals of the center are: 1) development of a more effective, humane and comprehensive system for delivering medical, health and social services to chronically-ill elderly persons, 2) development of multidisciplinary education, clinical training programs involving college faculty, allied health professionals, university scientists and health administrators, and 3) engagement in research programs addressing the processes of aging and the delivery of services in the context of our society.

The center’s activities are diverse and comprehensive. It has established a statewide network for education and research in gerontology/geriatrics. Maintenance of geriatric clinical settings including specialty clinics, a home visitation program, academic nursing home, a geriatric hospital unit and an inpatient consultation program within the College of Medicine allow for direct involvement of students from medicine, nursing, pharmacy and allied health professions in direct service experiences. Internships, postgraduate training in geriatrics, as well as an accredited geriatric fellowship in geriatrics are major features of the center program. Expanding research activities include investigations of basic mechanisms of the aging process, dementias, depression, falls, incontinence, environmental factors affecting aging and government policy and delivery of quality services to older people and their families. All programs are designed to contribute to the increased well-being of the elderly.

THE ARIZONA CENTER FOR MATHEMATICAL SCIENCES (1988) provides an interdisciplinary 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, ocean waves, plasma physics, and neural networks with continuing investigations into pattern dynamics, chaos and turbulence, and in particular, their manifestation in optical contexts. The center supports graduate students, postdoctoral fellows, long- and short-term visitors and sponsors various workshops throughout the year. These activities serve to provide a rich environment for student and faculty interaction. The Arizona Center for Mathematical Sciences (ACMS) received funding as a University Research Initiative of the Air Force Office of Scientific Research (AFOSR) for six years, 1986-1992, and is currently supported by continued funding from AFOSR as well as by funds from the National Science Foundation and the Office of Naval Research.

THE ARIZONA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT (1951) engages in graduate education, research, and extension. The unit is supported by The University of Arizona, the Arizona Game and Fish Department, the U.S. Fish and Wildlife Service, and the Wildlife Management Institute. The facilities and personnel of the unit are available to graduate students who wish to pursue both class work and research programs leading to advanced degrees in fisheries science and wildlife biology. The unit is housed in the School of Renewable Natural Resources.

THE ARIZONA COOPERATIVE NATIONAL PARK RESOURCES STUDIES UNIT (1973), located in the School of Renewable Natural Resources, is engaged in research to support the 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 EMERGENCY MEDICINE RESEARCH CENTER (1990) has established as its mission the enhancement and expansion of the research, education and training available within Arizona and the Southwest in emergency medicine. The center will focus on multidisciplinary studies in the area of out-of-hospital medical care available to the acutely ill and injured.

To complete its stated mission, the center has established specific goals related to the research of acute medical and traumatic injuries, evaluation of prehospital training programs and personnel requirements, and development of educational pathways for all levels of health care providers dedicated to careers in emergency medical systems.
To accomplish these goals the center consists of three operational divisions: Research, Education, Training.

Research: The mission of this division is to develop and implement research projects with a multidisciplinary focus. Emergency medicine draws upon various specialties in the course of patient care. The multidisciplinary focus of this division will attempt to draw together these specialties in efforts to improve patient survival in out-of-hospital emergency situations.

Education: Emergency Medical Services (EMS) began in the late 1960s in an effort to provide quality out-of-hospital care and treatment to a variety of patients under unusual circumstances. Until recently, these individuals have had limited access to a degree program related to EMS. The mission of this division is the formation of a bachelor's degree program in EMS and an advanced degree program in public administration.

Training: The mission of this division is to guide the development of standardized criteria to the paramedic level of Emergency Medical Technician (EMT) training and develop statewide outreach programs for currently certified EMTs, nurses and physicians.

THE ARIZONA INSTITUTE FOR NEUROGENIC COMMUNICATION DISORDERS (1986) is a multidisciplinary academic unit designed to promote, coordinate, and administer research programs and a clinical center for speech and language disorders caused by diseases of the nervous system. Initiated by the Department of Speech and Hearing Sciences and the Department of Neurology, this unit includes the participation of cognitive science, exercise and sport sciences, linguistics, neuroscience, pediatrics, physiology, psychology, radiology, surgery, and systems and industrial engineering. In addition to its major thrusts involving research programs and a clinical center, the institute's mission includes fostering doctoral and postdoctoral education, state-of-the-art conferences, continuing education, and public service through advocacy for individuals with neurogenic communication disorders.

THE ARIZONA POISON AND DRUG INFORMATION CENTER (1980) is operated by the College of Pharmacy and is located in the Arizona Health Sciences Center Library. The center provides comprehensive poison information and advice on treatment of poisoning to the public on a statewide basis. It also offers drug information and therapeutic consultations to health professionals. The center has a toll-free telephone number (1-800-362-0101) and can be reached 24 hours a day, seven days a week. Full-time clinical pharmacists staff the center and serve as poison and drug information specialists. Serving as consultants are medical toxicologists and specialists in plant and animal poisons, drugs, and environmental and industrial poisons. The Arizona Poison and Drug Information Center also provides for clinical training of pharmacy and medical students in the areas of clinical toxicology, drug and poison information. The Arizona Poison and Drug Information Center is a component of the Arizona Poison Control System which was established at The University of Arizona by the Arizona State Legislature in 1980. The Arizona Poison Control System is certified as a regional poison control program by the American Association of Poison Control Centers.

THE ARIZONA REMOTE SENSING CENTER (1972), located in the Office of Arid Lands Studies, serves as a focus of remote sensing research in the College of Agriculture. The staff of the center is involved in interdisciplinary remote sensing and computer mapping projects related to agriculture and natural resource management. The center contains equipment for manual analysis of satellite and aircraft imagery and computer systems for digital processing and display of images and maps. These facilities are available to faculty, students and cooperators from outside the University.

THE ARIZONA RESEARCH LABORATORIES (1979) is an interdisciplinary research unit established to provide a mechanism for administering and fostering research which bridges disciplines embraced by departments from more than one collegiate unit. A major thrust of the organization is to form research groups to initiate new programs of high priority to the development of the educational and research mission of the University. The organization of the laboratories also provides a mechanism for serving as an organized research component for those teaching and research units that do not have such a capability.

THE ARIZONA STATE MUSEUM, founded as a territorial museum in 1893, is an educational, research, and service division of the University. Museum exhibits emphasize prehistoric and recent Indian cultures of Arizona and the Southwest. Special temporary exhibits on a variety of subjects are presented throughout the year. The museum is open daily to the public. Closed major holidays.

THE ARIZONA TRANSPORTATION AND TRAFFIC INSTITUTE (1959) is engaged in broad research aimed at developing advanced methods of analysis and obtaining answers to the transportation problems in Arizona. Topics considered include the planning, design, and operation of transportation facilities, including pavement design and highway materials, as well as maintenance of these systems. The institute acts as a technical information center, and its activities are closely tied to those of the Department of Civil Engineering and Engineering Mechanics.

THE ARIZONA VETERINARY DIAGNOSTIC LABORATORY, (1983) 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 (BARA) (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, cross cultural and multicultural learning, health, disease and diet, ecological transformation, social
and cultural impact assessment, agricultural and institutional development, educational innovation, and research methods. As part of the University, BARA promotes interdisciplinary research efforts. Also, BARA actively involves students of anthropology in its on-going research projects.

THE BUREAU OF MINERAL TECHNOLOGY (1915), formerly the Bureau of Geology and Mineral Technology, was reorganized by the state legislature, effective July 1, 1988, to form the Arizona Geological Survey as an independent state agency. The Arizona Geological Survey replaces the former Geologic Survey Branch of the bureau and continues to serve as the primary source of geologic information in the state.

The mission of the Mineral Technology Branch is maintained through the College of Engineering and Mines. Dissemination of information relating to mining, including health and mine safety and geological engineering, is accomplished by the Department of Mining and Geological Engineering. Information about mineral processing and extractive metallurgy can be obtained from the Department of Materials Science and Engineering.

THE CENTER FOR COMPUTING AND INFORMATION TECHNOLOGY (CCIT) (1985) provides campus-wide services in support of the instructional, research, and administrative computing needs of the University. The University's network of shared computers includes a VAXcluster comprised of two 3100s, and a 4000. Other mainframes include a Prime 6350, an IBM 3090-300E, and three CONVEX C240 minisupercomputers. CCIT also provides access to nearly 200 IBM PC, PC compatible, and Apple Macintosh microcomputers in labs available to faculty, staff, and students.

CCIT provides a campus-wide data communications network which supports both central and distributed processors. Access to facilities is available 24 hours a day. Additionally, CCIT provides access to external networks such as BITnet and the National Internet which provides access to academic institutions and supercomputer centers across the country. The University is a member of Cornell National Supercomputing Facility which supports both central and distributed processors. Access to these systems via terminal service centers at various campus locations. Remote access is also provided through the following dial-up numbers: 621-4141 and 621-9600.

CCIT offers many services to assist users in taking advantage of available computing resources. Services include mainframe and microcomputer open access facilities; Computing and Technology Store (CATS) for microcomputers, workstations, peripherals, and software; Courseware Library for Instructional Computing (CLIC); a wide variety of training; consulting on the use of the University's computers and various microcomputers; communications and networking between user-owned equipment and the University's systems; computing facility planning and preparation; mainframe and microcomputer training facilities; programming and applications support; dissemination of information through user publications, manuals, and program library documentation; and assistance in user acquisition of computing facilities.

The primary source for information and assistance on computing services and facilities is the CCIT Help Desk (621-HELP). The Help desk is located in Room 218 of the Computer Center Building. Computer users can keep informed of changes in and additions to CCIT services by reading the Computing & Communications News.

THE CENTER FOR CREATIVE PHOTOGRAPHY (1975), a division of the University Library, is an internationally acclaimed research museum and study center devoted to the collections and archives of 20th-century photographers. Its collections include over 50,000 master prints, more than 500,000 study prints and negatives, correspondence, manuscripts, artifacts, and related documents. It contains a major research library of over 12,000 volumes and a rare book collection. The center sponsors a lecture series of internationally prominent photographers, historians, critics, and related scholars. The center has an extensive publishing program, which includes a journal entitled The Archive. This publication is a benefit of membership and is also available for purchase at the center's bookstore. Photographs and archive materials are available through both exhibition and personal print viewing appointments.

THE CENTER FOR ELECTRONIC PACKAGING RESEARCH (CEPR) (1991) performs research in the areas of electrical and thermal characteristics of electronic device packages and interconnected devices. The main activity is in modeling and simulation of electrical and thermal characteristics of Level 1 and Level 2 packaging, and experimental verification of the modeling results. The work in high-speed interconnect systems is being extended to on-chip interconnects. Faculty members from Electrical and Computer Engineering and Aerospace and Mechanical Engineering are currently contributing to CEPR projects.

The long-term goal of the Center for Electronic Packaging Research is to develop an integrated package and Multichip Module (MCM) design/simulation/manufacturing system. This system will permit tradeoffs between performance, cost, reliability and manufacturability to be performed in the design phase. The simulation capability will assure first-pass achievement of packaging requirements, rather than require successive iterations. The CEPR is committed to expedient transfer of basic research results to research sponsors, the electronic packaging community, and the U.S. industry community, through reports, publications, workshops, education of students, and cooperative efforts which involve member industry personnel as both researchers and mentors.

THE CENTER FOR MICROCONTAMINATION CONTROL (1984) is located in the Department of Electrical and Computer Engineering. The center conducts fundamental and applied research that will lead to better control of defects in high density logic and memory technology. It is one of 45 centers throughout the country initiated by the National Science Foundation to increase the rate of technology interchange between the academic community and the scientists and engineers of industry. The center sponsors interdisciplinary research in more than six departments in several colleges. In addition, the center maintains a class-10 cleanroom, an equipment test-tower, and equipment for measuring low levels of airborne and surface contamination.

THE CENTER FOR MIDDLE EASTERN STUDIES (1975) is engaged in a variety of aspects of research on the modern Middle East. It is the headquarters for the University's Egypt Working Group, which promotes research by experts in several disciplines. Other areas of research include Afghanistan, Iran, Israel, North Africa, the Persian Gulf, and the Fertile Crescent. One of only thirteen federally funded Middle East centers in the country, this unit disseminates information about Middle East studies nationally and internationally. It also houses the Middle East Studies Association, which is the primary professional organization of scholars of the Middle East.

THE CENTER FOR PHARMACEUTICAL ECONOMICS (1989) is an interdisciplinary research and service unit of the College
of Pharmacy. The center was established to provide national and international leadership in the application of the economic and administrative sciences in health care and pharmaceutical research, education, and service. The center integrates clinical and economic research to achieve a framework for the economic evaluation of new therapies. Services will include economic/clinical analyses for individual client's needs; training programs for industry representatives, researchers, and practitioners; consultation on the design of studies to analyze cost and benefits of drugs; and the dissemination of information about pharmaceutical issues in managed health care systems.

THE CENTER FOR THE MANAGEMENT OF INFORMATION (CMI) (1985), partially funded by grants from IBM, the National Science Foundation, the U.S. Army, and a consortium of industrial companies, supports interdepartmental research in economic, political, social, and technological aspects of information management. The M.B.A. curriculum parallels these research priorities and includes a series of integrated courses which assures that graduates are highly literate and sophisticated users/consumers of information management products. The center has many facilities which host classes and corporate groups as part of an extensive research program into a variety of group processes such as planning, problem-solving and decision making.

THE CENTER FOR THE STUDY OF COMPLEX SYSTEMS, a multidisciplinary unit bringing together local and external researchers, is designed to identify and explore new concepts and features of complex nonlinear systems in various areas of science. Recent advances in the understanding of fundamental aspects of nonlinear systems, coupled with progress in computer technology, permit new approaches to 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 CENTER FOR TOXICOLOGY (1988) is an interdisciplinary organization that operates as a unit of the College of Pharmacy. Its mission is to strengthen and expand university and statewide efforts in toxicology. The goals of the center are to develop new research programs in toxicology, to insure that these and present programs have an interdisciplinary approach; to participate in graduate training at the master's, doctoral and postdoctoral levels; and to interact with local, state and federal agencies as well as with the private sector, to predict and prevent problems associated with exposure to toxic chemicals present in the home, workplace and environment. The underlying theme of the research activities of the center is elucidation of mechanisms by which chemicals produce adverse biological reactions.

THE COOPERATIVE EXTENSION SYSTEM (1914) brings information to interested people of Arizona. One of the three divisions of the College of Agriculture, it emphasizes agricultural production and natural resources, family and consumer resources, youth development (4-H), and community leadership and resource development. This informal education system is financed from federal, state, and county appropriations. It operates through the county extension agent, state and area specialist system with faculty trained in their specialty, and in the practical application of scientific information on farms, ranches and in rural and urban homes. Assistance is provided to target audiences in problem solving, information dissemination and educational programs.

THE DIVISION OF ECONOMIC AND BUSINESS RESEARCH (DEBR) (1949) is a research and service organization within the College of Business and Public Administration. Its broad objectives are to conduct research relating to business, economics, and public policy in Arizona; to complement the 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, and analyzes the effects of public policy alternatives. It publishes the quarterly Arizona's Economy, the semi-annual 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 NEUROBIOLOGY (1985) of the Arizona Research Laboratories is an interdisciplinary research unit devoted to the neurobiology and behavior of insects. Investigations under way in the division, probing experimentally favorable insect neural preparations at the cellular, developmental, molecular, and systems levels, seek to reveal fundamental neurobiological processes and mechanisms common to many animal species including human beings. These studies also promise to advance our understanding of agriculturally and medically harmful insects.

THE DIVISION OF SOCIAL PERSPECTIVES IN MEDICINE (1968) was established within the College of Medicine in recognition of the increasingly complicated cultural, social, economic, legal and ethical influences affecting the institution of medicine in American society. The efforts of this division are aimed at expanding and exciting the thinking of medical students and faculty in the area of human values and the role of medicine in contemporary society.

The activities of the division include symposia, seminars and workshops on such topics as cultural and economic factors in health and disease, ethical issues in medicine, medical jurisprudence, health needs of the elderly, care for the terminally ill, holistic medicine, innovations in medical education and other current issues. Local and national authorities are invited to participate in these programs from such fields as psychology, law, politics, sociology, anthropology, economics, theology and philosophy in addition to medicine.

THE ECONOMIC SCIENCE LABORATORY (ESL) (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, comparative evaluation of processes for the provision of public goods, and the design of new computer-assisted exchange institutions to meet the information and technological demands of a wide variety of environments. ESL operates two computer laboratories 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 research, and organization of internationally attended conferences.

THE ENGINEERING EXPERIMENT STATION (1941) administers the funds of sponsored grants and contracts of the faculty of the College of Engineering and Mines. Using state-appropriated funds, the station promotes, initiates, and conducts engineering research of potential benefit to the State of Arizona.

THE ENVIRONMENTAL RESEARCH LABORATORY (ERL) (1967) conducts research in controlled-environment agriculture (CEA) and aquaculture for intensive food production, in seawater crop irrigation, biospherics, environmental control systems, and solar heating and cooling. ERL has designed CEA vegetable systems which produce crops in the desert sands of the United States, Mexico and the Middle East, and it has developed CEA for the intensive culture of marine shrimp. ERL is developing halophytic crops for livestock feeds and other uses—plants which are irrigated solely with seawater or other highly saline water. ERL consults on such special projects as the portrayal of agriculture of the future at the EPCOT Center at Walt Disney World in Florida. ERL has also developed a series of demonstration solar homes at Tucson International Airport, where the laboratory is located. The work in biospherics research is reflected in the development of Biosphere II, a private venture of Space Biosphere Ventures, and in global studies of the greenhouse effect.

FLANDRAU SCIENCE CENTER AND PLANETARIUM (1975), a part of the College of Arts and Sciences, was built as a result of a gift to the university by Grace H. Flandrau. It houses a 50-foot projection dome, a Minolta Series IV planetarium projector, and a hemispheric 35mm motion picture projector. It is used as a teaching facility for university classes in astronomy, and 25,000 Tucson public school children attend its special educational programs each year. The planetarium presents dramatic public programs on astronomy and general science that take audiences on cosmic journeys through time and space. The 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 fundamental aspects of climate and global change, mesoscale meteorology, atmospheric dynamics, radiative transfer, remote sensing, atmospheric aerosols, atmospheric chemistry, cloud and precipitation physics, lightning, and atmospheric electricity.

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 specialized medical equipment.

THE KARL ELLER CENTER FOR THE STUDY OF THE PRIVATE MARKET ECONOMY (1983) is a research and education organization within the College of Business and Public Administration. It has three broad objectives: (1) to promote research in basic market processes, (2) to sponsor an Entrepreneurial Studies Program, and (3) to provide for business/academic exchange. Research is supported through the recruitment of Karl Eller Chair holders in the disciplines represented in the college. Faculty research fellowships are also available. The Entrepreneurial Studies Program offers both academic courses for students interested in entrepreneurship and practical courses on the development of business plans. Approximately 50 students are included in the program annually.

KUAJ COMMUNICATIONS GROUP (1959) provides a wide range of instructional media, production, and public broadcasting services to the University, community and state. The division operates five maximum-power public broadcasting stations: KUAJ-TV Channel 6; KLAS-TV Channel 27 (in the Catalina Foothills) and TV Translator K23CK, Duncan, Arizona; KUAJ-AM (1550 kHz); KUAJ-FM (90.5 MHz); KUAY-FM (89.1 MHz) and Transmitter Frequencies, 897 MHz in northwest Tucson and Sierra Vista, 895 MHz in Phoenix and Duncan, Arizona. The stations are affiliated with the Public Broadcasting Service (PBS), National Public Radio (NPR) and American Public Radio (APR).

Professional production facilities are maintained in the Modern Languages Building and the Harvill Building. Production capability includes a color studio.

The VideoServices department produces and distributes University of Arizona credit and noncredit courses to business and industry in the Tucson area through an 8-channel ITFS system called the Tucson Education Delivery System (TEDS), and across the nation by videotape and satellite transmission. The University is a member of the National Technological University (NTU) consortium.

The VideoServices department provides production and engineering support for the campus including: pre-production and post-production consultation, video production, television distribution nationwide via KU Band uplink facilities, locally through the TEDS system, microwave and ITFS transmission to Ft. Huachuca and Sierra Vista. The department also provides satellite reception and recording and a 2-way video teleconference origination facilities.

THE LABORATORY OF TREE-RING RESEARCH (1937) is an outgrowth of the pioneering tree-ring studies initiated by Andrew Ellicott Douglass at The University of Arizona in 1906. A division of the College of Arts and Sciences, the Laboratory conducts a unique program of teaching and research in all aspects of dendrochronology. Graduate-level instruction is offered through cooperating academic departments, and a limited number of graduate research assistantships are available to qualified students. Current research efforts are directed toward the quantification of tree-ring parameters, the establishment of new tree-ring chronologies throughout the world, the understanding of basic tree growth and environmental relationships, the reconstruction of paleohydrologic, paleoclimatic, and paleoecological variables, and the documentation and development of prehistoric chronological controls. Along with the world's largest collection of tree-ring specimens from living trees and ancient timbers, the laboratory maintains a variety of specialized equipment and data files containing processed tree-ring chronologies, relevant climatic and hydrologic records, and archaeological tree-ring dates and site information.

THE LATIN AMERICAN AREA CENTER (1974) is a unit of the Faculty of Social and Behavioral Sciences that fosters oppor-
tunities for students and researchers in Latin American Studies. In addition to offering undergraduate and graduate programs through its Committee on Latin American Studies, the center is a focal point of Latin American related research undertaken by scholars from every college of the University and whose interests range from medicine to law, from anthropology to ecology, from agriculture to history and from political science to international business. Each year the center engages in a variety of outreach activities: editing and publishing, television and radio programming, curriculum development for the public schools, conferences, lecture and film series, and government funded training programs for Latin American professionals. The center also works with students to arrange internship and study abroad programs designed to enhance career opportunities.

THE LUNAR AND PLANETARY LABORATORY (LPL) (1960) is the research unit connected with the Department of Planetary Sciences. Planetary Sciences faculty also hold appointments in the laboratory, which, in addition, has a large research staff to conduct vigorous investigations which span a wide range of planetary and related astrophysical and space science. Laboratory staff participate closely in the graduate research instruction of the department. Close relationships and cooperative programs are maintained with a number of other units on the campus, including the departments of Astronomy, Geosciences, Optical Sciences, Physics, and the Steward Observatory.

Together, the Department of Planetary Sciences and the Lunar and Planetary Laboratory form an institute uncommonly broad and complete in its approach to planetary science education research. The department and laboratory participate in many NASA space science missions. Among the current missions in which the faculty are participating are the Voyager Mission, the Magellan Mission to Venus, the Galileo Mission to Jupiter, the Cassini/Huygens Mission to Saturn, the Mars Observer Mission, the Russian Mars-94 Mission, and the Ulysses Heliospheric Probe. In addition LPL scientists make use of Earth orbiting observatories, including the Hubble Space Telescope and the Ultraviolet Explorer. The Laboratory's Space Imagergy Center contains one of the most extensive collections of planetary images in the world, beginning with those obtained from the earliest space projects and continuing to most current missions. LPL's Planetary Imaging Research Laboratory is a modern image processing facility for the analysis of planetary and astronomical data. Also available for student research are cosmochemistry and geochemistry laboratories, including a scanning electron microscope and microprobe facility, an experimental petrology laboratory, a radiochemistry separation and neutron activation laboratory, and a noble gas mass spectrometry laboratory. The numerous telescopes of The University of Arizona observatories are available for research projects, including instruments on Mt. Hopkins and in the Santa Catalina Mountains, as well as the Multiple Mirror Telescope on Mt. Hopkins; all are within easy reach of the University campus.

Laboratory staff and students also make use of major observatories around the world, including the NASA Infrared Telescope Facility on Mauna Kea, Hawaii, and conduct a regular program of planetary, solar, and stellar infrared spectroscopy using the NASA Kuiper Airborne Observatory. The University is developing a new observatory site on Mt. Graham, northeast of Tucson. The laboratory participates in interdepartmental programs in theoretical astrophysics and in applied mathematics. The laboratory is housed in the Gerard P. Kuiper Space Sciences Building, with additional facilities in the Gould-Simpson Building.

THE MEXICAN AMERICAN STUDIES AND RESEARCH CENTER (1983) engages in research, publication, public service, and undergraduate and graduate educational activities which enhance the study of the Mexican American experience and related issues. Major objectives of 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 service projects are provided through university funds and outside support. Funds of sponsored grants support training of students 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 public sectors.

THE BM ALAND 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 optics. Areas in which research is currently being conducted include electro-optics, image formation, image processing, infrared techniques, laser physics, materials, medical optics, nonlinear optics, optical bistability, optical design, optical fabrication and testing, optical properties of materials, pattern recognition, quantum optics, remote sensing, spectroscopy, surface physics, thin-film technology, and X-ray optics. Interdisciplinary programs in progress involve the departments of Applied Mathematics, Astronomy, Chemistry, 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 MBE and vacuum-deposition thin-film facilities, dark rooms, an electronics shop, infrared laboratory, instrument shop, massive-optics shop, small-optics shop, student/faculty machine shop, and teaching laboratories. In addition, a multitude of computing facilities are available for use in both research and training programs.

THE RESPIRATORY SCIENCES CENTER (1975) has members from many different academic departments. It is responsible for interdisciplinary pulmonary-allergy programs in research, training and clinical services. It coordinates activities of the Adult-Pediatric Chest-Allergy Clinic as well as University Medical Center's Adult and Pediatric Pulmonary Function Laboratories, Blood Gas Laboratory and Respiratory Care Ser-
vice. It is also responsible for collaborative postdoctoral training programs in Adult and Pediatric Pulmonary Medicine.

A major function of the center is to coordinate multidisciplinary research programs in pulmonary disease with a special emphasis on airways obstructive diseases (asthma, chronic bronchitis and emphysema). It is responsible for the Specialized Center of Research (SCOR) in Airways Obstructive Diseases established at the College of Medicine with funding from the National Institutes of Health. The center is widely known for its epidemiologic studies, including a longitudinal study of a representative sample of the Tucson population (The Tucson Epidemiologic Study of Airways Obstructive Diseases), a longitudinal study of newborns and their families (The Children's Respiratory Study) and studies of the health effects of environmental pollution (The Health and Environment Study). It is now very involved in more basic research, particularly in regard to the immunological, biochemical, pharmacological, neural, and physiological mechanisms which affect airway function and which may be relevant to the pathogenesis of airways obstructive diseases.

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.

SEMATECH CENTER OF EXCELLENCE FOR CONTAMINATION/DEFECT CONTROL AND ASSESSMENT (1988) is a joint effort by industry and the federal government to reverse a decline in U.S. competitiveness in semiconductors, particularly in the production of integrated circuits. Centers of Excellence established at universities represent SEMATECH's external research arm and are selected based on the quality and relevance of the programs proposed. They will bring graduate students into semiconductor manufacturing and will create major academic manufacturing research capability. In May 1990, the UA became one of the first five universities selected to become a center of excellence. Engineers working in the center are developing methods for measuring and removing impurities, contamination, and defects that are a major problem for semiconductor manufacturing.

The Department of Electrical and Computer Engineering, home to the SEMATECH Center of Excellence, provides a director that coordinates the efforts of principal investigators from Electrical and Computer Engineering, Materials Science and Engineering, Chemical Engineering, and Systems and Industrial Engineering. Part of the research is being carried out with Sandia National Laboratories in Albuquerque. The technical objectives of the center are threefold: (1) to understand and utilize chemical reactions and charge effects to develop methods and systems for removal of gaseous impurities and particulates from process gases and liquids; (2) to understand and develop control techniques for contaminants and defects originating from vacuum-related processes/equipment; and (3) to understand through test structures the role of specific contaminants in generating defects that limit yield, and to prioritize efforts in contamination/defect reduction. The center transfers technology to SEMATECH through reports, workshops, students, and cooperative research projects.

THE SOCIAL AND BEHAVIORAL SCIENCES RESEARCH INSTITUTE (1984) supports and coordinates organized research efforts within the Faculty of Social and Behavioral Sciences. Through a series of regular competitions, the institute provides support for faculty members and academic professionals undertaking pilot projects or small-scale studies likely to lead to externally-funded research. Support is also available for a small number of individuals to obtain release time from teaching in order to become Research Professors for a semester. The institute encourages both disciplinary and interdisciplinary research and takes initiatives to promote work in new areas of study. SBSRI contains two smaller units, the Data and Software Laboratory (DASL) and the Survey Research Center (SRC). DASL provides research support for faculty and their graduate students who are working on research problems requiring any form of data purchase and/or analysis, or who require wordprocessing support. SRC provides various forms of support for contract-based questionnaire delivery and analysis. SBSRI also liaises with other research units in SBS, including the Southwest Center. Annually, the institute sponsors a competition for the best research monograph and the best research article published by a member of SBS.

THE SOUTHWEST CENTER (1982) is a unit of the Faculty of Social and Behavioral Sciences that fosters research, teaching, academic development, publication, and public programming on the history, culture, and development of the Greater Southwest (including northwestern Mexico). 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' bureaus, cultural events. The center publishes Journal of the Southwest, a scholarly regional quarterly, and sponsors the Southwest Center book series, with the UA Press as well as an imprint with the University of New Mexico Press.

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.

STEELE MEMORIAL CHILDREN’S RESEARCH CENTER (1986) represents a multidisciplinary and interdisciplinary approach to research related to various medical problems facing children. The goals of the center include:

1. Coordinate, focus, facilitate and increase research related to children's health
2. Foster multidisciplinary research on medical problems related to children
3. Expand research training and education programs, thereby facilitating the training of future researchers
4. Enhance the rapid application of research observations to patient care

Special emphasis will be placed on molecular genetics, immunology, neurology, gastroenterology and nutrition, behavioral sciences and developmental biology.

The center's research programs are closely tied to the educational and clinical activities of the Department of Pediatrics.
which include extensive outreach programs in numerous communities throughout the state, and general and subspecialty pediatric clinics and inpatient services at University Medical Center, Tucson Medical Center and Kino Community Hospital.

THE STEWARD OBSERVATORY (1916) was established by a 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. Currently, the primary research telescopes of the observatory include the Multiple Mirror Telescope (MMT), located on the Mt. Hopkins summit in the Santa Rita Mountains, the 90-in. (2.3-m) reflector on Kitt Peak, and the 61-in. (1.55-m) reflector 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 very large optical telescopes.

The Steward Observatory offices and laboratories are located on the northeast part of the University campus adjacent to the original 36-in. dome. The main areas of research include quasars and active galaxies, degenerate stars, infrared sources, radio galaxies, and the formation of stars and galaxies. Observational programs are concentrated in the optical and infrared (using the facilities of the observatory) but outside facilities are also used at radio, ultraviolet, and x-ray wavelengths. The observatory activities are closely integrated with the University's Theoretical Astrophysics Program. The observatory is constructing a major new telescope on Mt. Graham for work in the mm- and submm-wave region, in collaboration with the Max Planck Institute for Radio-astronomy in Bonn, West Germany. The Mirror Laboratory is developing optics for the next generation of giant optical/infrared telescopes. It will furnish the optics for an upgrade of the MMT; the Carnegie Foundation's Magellan Project (a 6.5-m telescope in Chile), and for the Columbus project, a collaboration of Steward Observatory with Arcetri Observatory, the Research Corporation, and other partners which will use two 84-m mirrors and be placed on Mt. Graham. Two construction efforts for space astronomy are also centered at the observatory: the Near Infrared Camera, which will be mounted in the Hubble Space Telescope to replace one of the existing instruments, and the Multiband Infrared Photometer, which is one of three instruments for the Space Infrared Telescope Facility, planned for launch early in the next century.

The offices and laboratories of the National Optical Astronomy Observatories are located across Cherry Avenue from Steward Observatory, and a division of the National Radio Astronomy Observatory occupies the top floor of the Steward Observatory building. The three observatories jointly sponsor a weekly series of professional colloquia. Steward Observatory also works closely with the Department of Planetary Sciences, the Optical Sciences Center, the Department of Physics, the Vatican Observatory, and the Flandrau Science Center and Planetarium, as well as with the astronomy departments of the other Arizona state universities.

UNIVERSITY ANIMAL CARE (1987) is the organization that provides services for care and use of all animals used for teaching and research at the University. The unit reports to the Office of the Vice President for Research.

The Animal Care Unit of the Arizona Health Sciences Center is located on the first floor of the Basic Sciences Building and houses all animals used by the Colleges of Medicine, Pharmacy and Nursing. The facility has held accreditation by the prestigious American Association for Accreditation of Labora-

tory Animal Care since 1969. Six veterinarians and a staff of trained laboratory animal technologists and technicians provide high quality animal care.

University Animal Care staff and faculty are available to train and assist investigators, research technicians and students on proper methods of animal handling and use. Expertise in the use of specific animal models is provided to investigators, thus eliminating unnecessary use of animals. A student manual for animal research is available by contacting the University Animal Care office (602)621-3545.

Federal and local policy requires that all research, teaching and/or testing protocols involving the use of animals must be reviewed and approved by the Institutional Animal Care and Use Committee. The IACUC as well as the staff of University Animal Care-AHSC is involved in the assurance that all laboratory animals receive humane treatment. Concern for the welfare of animals, plus recognition of the need for quality biomedical research and education are the primary objectives of University Animal Care.

THE UNIVERSITY HEART CENTER (1986) is an interdisciplinary organization to help prevent and cure heart and vascular disease through research, education, and patient care. Its eighty members with Ph.D.s, M.D.s, or both, are located throughout the campus, but hold joint conferences and are organized into research focus groups, and educational and patient care sections.

The University 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 University Medical Center, and in other colleges and units in the University.

THE UNIVERSITY OF ARIZONA MUSEUM OF ART (1942)—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 of Ciudad Rodrigo by Fernando Gallego and one of the finest university collections of Renaissance sixteenth- and seventeenth-century art in the United States. Contemporary international painting and sculpture are well represented in the Edward Joseph Gallagher III Memorial Collection; 61 sketches and models by Jacques Lipchitz which comprise one of the largest collections of his works 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 scholarly and regional books. As a delegate of The University of Arizona to the larger world, the press publishes the work of scholars wherever they may be, concentrating upon scholarship that reflects the special strengths of The University of Arizona, Arizona State University, and Northern Arizona University.

The press publishes scholarly books in anthropology and archaeology, space sciences, Latin American studies, Native American studies, environmental studies, Western history, women's studies, and other fields. Also on the UA Press list are volumes of Native American and Chicano literature and trade books on the Southwest borderlands, including accounts by scholars and professional writers of the natural history,
geography, history, folklore, and life-ways of the region. The UA Press does not publish children's books.

The University of Arizona Press invites inquiries from the authors of works—whether scholarly books or works of general interest—that are appropriate to its list.

Also appearing under the press imprint is the quarterly Journal of the Southwest, with separate editorial and subscription offices at the Southwest Center.

THE WATER RESOURCES RESEARCH CENTER (1965) is Arizona's state water resources research institute, established under the Water Resources Research Act of 1964 to promote and assist water-related research at the three state universities and enhance their contribution to the solution of critical water problems within the state. To accomplish this mission, the WRRC administers a federal water resources research grant program that provides funds for research on water-related issues. Research findings are brought to the attention of potential users and disseminated throughout the state. As Arizona's water information center, the WRRC provides access to water data and publications; produces informational directories and monographs, newsletters, and presentations; and sponsors conferences, symposia and workshops. In addition, the center promotes and facilitates interdisciplinary research and carries out a policy analysis research program on water issues requiring examination from multidisciplinary perspectives.

THE UNIVERSITY OF ARIZONA FOUNDATION

Every institution of higher learning, whether supported by public or private funds, needs a group of friends who has 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, research and public service programs outside the scope of state funds and tuition income.

In Arizona and elsewhere, many people, aware of the importance of private funding, are assisting The University of Arizona. In order to unite these efforts, The University of Arizona Foundation was established in 1958 as a nonprofit corporation to ensure academic excellence at the University through the development of private support. The foundation is governed by a 33-member volunteer board of directors.

The foundation's principal objectives are:

1. To acquaint the public with programs, plans, and needs of the University.
2. To attract gifts and bequests to the foundation which may be directed to the University.

These objectives are met in two basic ways: Fund Raising and Asset Management.

Fund raising: The pivotal component to fund raising is identifying donors or prospective donors who are interested in investing in higher education. Because the investment opportunities at The University of Arizona Foundation reflect the many facets of campus, these opportunities are virtually limitless. Although there is no specific "profile" of a University donor, all donors share at least one characteristic: a belief in the University of Arizona and higher education.

Planned giving is an important part of the fund-raising process. The foundation assists prospective donors in planning trusts and will arrangements for the benefit of the University. Further, the foundation manages the gifts in accordance with the terms of the trust instruments and deeds of the gift.

Asset management: An important role of the foundation is to be a responsible steward of the funds with which it has been entrusted. As the asset base grows, the financial support available for the University grows, also.

The foundation's dedication to fiduciary responsibility is outlined in a formal investment policy. More specifically, this policy calls for the foundation to protect the value of its assets against inflation and obtain maximum income. As such, a balanced package of investment options is employed, including stocks, corporate and government bonds, and real estate. This investment approach attempts to balance the University's needs for current income with estimated future needs.

This united effort of friends of the University is helping to meet the changing requirements of education and to enrich higher education to the ultimate benefit of the people of Arizona.

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Appointed
Danny Siciliano ............................................ May, 1991
Donald J. Pitl ............................................ January, 1994
Esther N. Capin, M.Ed. .................................. January, 1994
Andrew D. Hurwitz ...................................... January, 1996
Douglas J. Wall ............................................ January, 1996
Art Chapa, J.D. ............................................ January, 1998
Eddie Basha ................................................. January, 1998
John F. Munger, J.D. .................................... January, 2000
Rhian Evans ................................................ January, 2000

ADMINISTRATIVE OFFICERS
(Year of first University appointment in parentheses after each name)
Henry Koffler (1982-91) ....................................... President Emeritus 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
John P. Schofer (1960-85) ....... President Emeritus of the University; B.S., 1955, Polytechnic Institute of Brooklyn; Ph.D., 1958, University of Illinois

Richard M. Edwards (1959-83) Vice President Emeritus for Student Relations; B.S. Ch.E., 1941, Purdue University; M.S. Ch.E., 1948, University of Washington; Ph.D. Ch.E., 1964, E. Chem., 1974, University of Arizona
Arno Richard Kassander (1954-82) Vice President Emeritus for Research; B.A., 1941, D.S.C., 1971, Amherst College; M.S., 1943, University of Oklahoma; Ph.D. College; Ed.D., 1965, University of Utah
Sherwood E. Carr (1954-83) ; Treasurer and Contracting Officer Emeritus; B.S., 1955, M.M.A., 1959, University of Arizona
Don C. Marchi (1966-81) Associate Vice President for Student Affairs; A.B.; 1967, Cornell College, M.S.Ed., 1969, Indiana University; Ph.D., 1977, University of North Carolina
Mary Jo Fox (1991) Assistant Vice President for Minority Student Affairs; B.S., 1968, Oklahoma State University; M.A., 1978, University of New Mexico; Ph.D., 1982, University of Arizona
Charles A. Geoffrey (1987) Associate Vice President for Research; Director of Research Communications; A.B.; 1966, University of Arizona
Martha W. Gilliland (1990) Assistant Vice President for Research; B.A., 1966, Catawba College; M.A., 1968, Rice University; Ph.D., 1973, University of Florida
Robert W. Hatch (1991) Deputy Vice President for Facilities; B.S., 1961, University of Rhode Island; M.S., 1973, University of Florida
Bert G. Landau (1985) Associate Vice President for Administration and Fiscal Control; B.A., 1966, Marshall University; M.A., 1974, University of Arizona
Jerome A. Lucido (1984) Assistant Vice President for Enrollment Services; B.S., 1973, Miami University; M.Ed., 1981, Kent State University
William R. Noyes (1968) Associate Vice President for Academic Affairs; B.A., 1962, Stanford University; M.A., 1963, School of Law & Diplomacy; Ph.D., 1968, University of California at Los Angeles
Julius Parker (1989) Associate Vice President for Administrative Services; B.S., 1955, Prairie View A & M University; M.P.A., 1973, Shippensburg State University
Nazarloo L. Papagnani (1990) Associate Vice President for Information and Computer Technology; B.S.M.E., 1967, University of Kansas; M.S.M.E., 1969, University of Missouri; Ph.D., 1983, Universite Libre de Bruxelles

J. Lyle Bootman (1978) Dean, College of Pharmacy; B.S., 1974, University of Arizona; M.S., 1976, Ph.D., 1978, University of Minnesota
James E. Dalen (1967) Dean, College of Health Sciences; B.S., 1955, Washington State University; M.A., 1956, University of Michigan; M.D., 1961, University of Washington; M.S., 1972, Harvard School of Public Health
Eugene G. Sander (1967) Vice Provost, College of Agriculture; B.S., 1957, University of Minnesota; M.S., 1959, Ph.D., 1963, Cornell University
Kenneth R. Smith (1980) Vice Provost, Professional Programs; B.A., 1964, University of Washington; Ph.D., 1968, Northwestern University
Sandra Lawson Taylor (1952) Vice President for Student Affairs; B.A., 1963, DePaul University; M.A., 1965, Bowling Green State University; Ph.D., 1969, Ohio University
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

State University; M.Arch., 1954, Massachusetts Institute of Technology.
Darrel S. Metcalfe (1956-82) Dean Emeritus, College of Agriculture; B.S., 1940, University of Wisconsin; M.S., 1942, Kansas State College; Ph.D., 1951, Iowa State College.
F. Robert Paulson (1964-86), Dean Emeritus, College of Education; B.S., 1947, Utah State University; M.A., 1962, University of Utah.
Herbert D. Rhodes (1943-77), Dean Emeritus, Graduate College; B.S., 1935, M.S., 1936, Arizona University; Ph.D., 1939, University of Illinois.
Eugene J. Grunder, Dean Emeritus, College of Agriculture; B.S., 1957, University of Minnesota; M.S., 1959, Ph.D., 1965, Cornell University.


Gladys S. Sorensen (1958-88), Dean Emerita, College of Nursing; B.S., 1945, University of Nebraska; M.S., 1951, University of Colorado; Ed.D., 1965, Columbia University
Robert S. Sveb (1942-44, 1946-83), Dean Emeritus of Student Affairs; B.A., 1942, M.A., 1950, University of Arizona
John L. Taylor (1991), Dean, Education; B.S., 1971, San Jose State University; M.A., 1972, Ph.D., 1976, Stanford University
David R. Duggar (1983-84), Dean Emeritus of Admissions and Records; B.A., 1943, M.A., 1951, University of Arizona
Karen S. Anderson (1982), Director, Women's Studies and the Southwest Institute for Research on Women; B.S., 1969, University of Kansas; Ph.D., 1975, University of Washington
Phyllis B. Bannister (1964), Director, Office of Student Financial Aid; B.A., 1974, M.P.A., 1975, University of Oklahoma
Peter Berghoff (1978), Director, Art Museum; B.A., 1964, M.A., 1968, University of Maryland; Ph.D., 1972, University of Michigan
Donald L. Burgess (1984), Director, Media Services; B.A., 1959, University of Nebraska; M.S., 1960, Syracuse University
Robert E. Burke (1984), Director, Printing and Publishing Support Services; B.A., 1960, University of Arizona
Terecasa H. S. (1982), Associate to the President of the University; B.A., 1952, Ph.D., 1967, University of Birmingham
Alpert, Joseph S. (1992), Head of the Department of Internal Medicine; Professor of Internal Medicine; B.A., 1963, Yale University; M.D., 1969, Harvard Medical School
Altmann, Ellen (1979), Professor of Library Science; A.B., 1957, Duquesne University; M.L.S., 1965, Northwestern State University; Ph.D., 1971, Rutgers University
Alscher, D. Robert (1963), Associate Professor of Geography and Regional Development; B.A., 1957, Harpur College; M.A., 1959, Ph.D., 1966, University of Illinois
Alves, John L. (1974), Assistant Agent in Home Economics; B.S., 1977, M.S., 1982, California State University at Chico
Ames, Wiliam S. (1972), Associate Dean of the College of Education; Professor of Teaching and Teacher Education; B.S., 1961, M.S., 1962, University of Maine; Ed.D., 1965, University of Missouri
Ampel, Neil M. (1985), Associate Professor of Interdisciplinary Studies; B.S., 1980, Teshreen University; M.S., 1986, Ph.D., 1989, University of Arizona
Ampel, Nicholas (1968), Associate Professor of Management Information Systems; B.S.E.E., 1957, Syracuse University; B.S., 1965, Brown University; M.S., 1960, Ph.D., 1963, University of Rochester
Appleton, Christopher P. (1988), Associate Professor of Internal Medicine; B.A., 1975, Stanford University; M.D., 1979, University of Washington at Seattle
Aquino, Mark (1987), Associate Professor of Psychology; B.S., 1983, Ph.D., 1989, Duke University
Arad, Yaron (1966), Associate Professor of English; B.S., 1963, Northeastern University; M.F.A., 1967, University of Arizona
Anderson, Karen S. (1992), Director of Women's Studies and the Southwest Institute for Research in the Humanities; Institute for Research on Women; Associate Professor of History; B.S., 1969, University of Kansas; Ph.D., 1975, University of Washington
Anderson, Rachael K. (1991), Director of the Arizona Health Sciences Center Library; Librarian; A.B., 1959 Barnard College; M.S., 1960, Columbia University
Anderson, Robert M. (1979-86), Associate Professor Emeritus of Surgery; M.D., 1946, Marquette University School of Medicine
Anderson, Ruth M. (1965-81), Lecturer Emerita in Speech and Hearing Science; B.M., 1937, M.A., 1947, University of Illinois
Andersen, Waldo K. (1966-86), Professor Emeritus of Higher Education; A.B., 1945, Ottawa University; M.Ed., 1953, University of South Dakota; Ph.D., 1963, University of Wisconsin
Andrews, Gregory R. (1979), Head of the Department of Computer Science; Professor of Computer Science; B.S., 1969, Stanford University; Ph.D., 1974, University of Washington
Angel, J. Roger P. (1973), Regents Professor and Professor of Astronomy, and Optical Sciences; Astronomer in the Steward Observatory; B.A., 1963, St. Peters College; M.S., 1966, California Institute of Technology; Ph.D., 1967, Oxford University
Angeline, Jay B. Jr. (1967), Professor of Anatomy; Adjunct Lecturer in Neurology; B.A., 1949, Williams College; M.A., 1952, Ph.D., 1956, Cornell University
Angus, Robert C. (1959), Professor of Agricultural and Resource Economics; B.S., 1950, Cornell University; M.S., 1954, Ph.D., 1960, Pennsylvania State University
Annovitz, Lawrence E. (1988), Assistant Professor of Geosciences; B.S./M.A., 1980, University of Arizona; M.S., 1982, Ph.D., 1987, University of Michigan
Anthony, James R. (1952-88), Professor Emeritus of Music; B.S., 1948, M.A., 1949, Columbia University; Diplome, 1951, Sorbonne, Universite de Paris; Ph.D., 1964, University of Southern California
Antila, Shirin D. (1980), Associate Professor of Special Education and Rehabilitation; B.A., 1971, University of Calcutta; M.Ed., 1973, Ph.D., 1974, University of Pittsburgh
Antin, Parker B. (1992), Assistant Professor of Animal Science; B.S., 1977, Union College; Ph.D., 1981, University of Pennsylvania School of Medicine
Antrim, William H. (1968-83), Lecturer Emeritus in Business and Career Education; B.S., 1950, Syracuse University; M.Ed., 1966, University of Arizona
Aposhan, H. Vasken (1975), Professor of Molecular and Cellular Biology, and Pharmacology; B.S., 1965, Brown University; M.S., 1960, Ph.D., 1963, University of Rochester
Atwood, Barbara A. (1986), Professor of Exercise and Sport Sciences; B.S., 1959, Trenton State College; M.S., 1963, Ph.D., 1970, University of Wisconsin
Austin, J. Norman (1980), Professor of Classics; B.A., 1958, University of Toronto; M.A., 1960, Ph.D., 1965, University of California
Austin, Anne E. (1969), Professor of Exercise and Sport Sciences; B.S., 1959, Trenton State College; M.S., 1963, Ph.D., 1970, University of Arizona
Atwater, Anne E. (1969), Professor of Teaching and Student Affairs; A.B. 1967, Cornell College; M.S. 1973, University of Arizona
Atwood, J. Norman (1980), Professor of Classics; B.A., 1958, University of Toronto; M.A., 1960, Ph.D., 1965, University of California
Avron, Francisco (1962), Assistant Foreign Collections Librarian; Associate Librarian in the Law Library; B.A., 1972, M.L.S., 1976, University of Arizona
Ax, Lawrence (1950), Head of the Department of Animal Science; Professor of Animal Science, and Obstetrics and Gynecology; B.S., 1973, M.S., 1974, Ph.D., 1978, University of Illinois
Ayer, Harry W. (1964), Specialist in Agricultural and Resource Economics; Adjunct Professor of Agricultural and Resource Economics; B.S., 1963, Iowa State University; M.S., 1968, Ph.D., 1970, Purdue University
Babcock, Barbara A. (1980), Professor of English, Director of Comparative Cultural and Literary Studies; B.A., 1965, Northwestern University; M.A., 1967, Ph.D., 1979, University of Chicago
Bader, Terry A. (1986), Associate Professor of Nursing; B.S.N., 1975, M.S., 1979, Arizona State University; Ph.D., 1986, University of Arizona
Bagnara, Joseph T. (1956-92), Professor Emeritus of Anatomy; B.A., 1952, University of Rochester; Ph.D., 1956, State University of Iowa
Bailey, William E. (1961), Lecturer Emeritus in Communications; B.S., 1965, Northwestern University
Bailey, Mary L. (1989), Assistant Professor of Computer Science; B.A., 1977, Vanderbilt University; M.A., 1979, M.S., 1986, Ph.D., 1989, University of Washington
Baker, Andrew D. (1989), Head of the Department of Accounting; Professor of Accounting, and Management Information Systems; B.S., 1984, M.S., 1986, University of Minnesota; Ph.D., 1971, Ohio State University
Baker, Daniel E. (1979-92), Professor Emeritus of Computer Science; B.A., 1953, University of Arizona; Ph.D., 1960, University of California at Berkeley
Baker, Mary L. (1989), Assistant Professor of Computer Science; B.A., 1977, Vanderbilt University; M.A., 1979, M.S., 1986, Ph.D., 1989, University of Washington
Bailey, William E. (1961), Lecturer in Communications; B.S., 1960, M.A., 1961, University of Illinois; Ph.D., 1975, Northwestern University
Baker, Boyd B. (1970), Associate Professor of Exercise and Sport Sciences; B.E., 1960, M.Ed.,
1965, Western Washington State College; Ed.D., 1970, University of Oregon
Baker, Paul B. (1986), Associate Specialist in the Cooperative Extension Service; Associate Research Scientist in Entomology; B.S., 1971, University of Delaware; M.S., 1976, Ph.D., 1979, University of Maryland
Baker, Robert L. (1958-89), Associate Professor Emeritus of Systems and Industrial Engineering; B.S., 1958, Arizona State University; M.S., 1967, Ph.D., 1968, Texas A and M University
Baker, Susan G. (1990), Assistant Professor in the Faculty of the University of Arkansas; M.A., 1979, University of Arizona
Baker, Susan G. (1990), Assistant Professor of Geosciences; B.S., 1982, University of Washington; M.S., 1984, Ph.D., 1988, University of Texas at Austin
Balduin, Ann L. (1991), Assistant Professor of Physiology; B.S., 1975, University of Bristol; M.S., 1976, Ph.D., 1979, University of London
Balduin, Carlene M. (1976), Head Map Collection Librarian; Librarian in the University Library; B.A., 1970, California State University at Sacramento; M.L.S., 1973, University of Chicago
Balduin, Suzanne at University of California at Berkeley; Ph.D., 1984, California Institute of Technology
Banfield, Colin R. (1976), Associate Head of the Department of Geosciences; B.S., 1981, M.A. 1984, Ph.D., 1988, State University of New York at Albany
Bales, Robert E. (1984), Associate Professor of Hydrology and Water Resources; B.S., 1974, Purdue University; M.S., 1975, University of California at Berkeley; Ph.D., 1984, California Institute of Technology
Banfield, Colin R. (1976), Associate Head of the Department of Geology; Associate Professor of Geology; B.S., 1966, M.D., 1971, Royal College of Surgeons, Ireland
Banister, Lyle D. (1953-80), Director Emeritus of the Tree Ring Laboratory; Professor Emeritus of dendrochronology; B.A., 1948, Yale University; M.A., 1953, Ph.D., 1960, University of Arizona
Barbee, Robert A. (1969), Professor of Internal Medicine; B.S., 1976, University of California; Ph.D., 1981, University of Chicago
Barrett, Bruce W. (1970), Professor of Physics; B.S., 1961, University of Kansas; M.S., 1964, Ph.D., 1967, Stanford University
Barrett, N. Dean (1967), Vice Dean of the College of Business and Public Administration; Professor of Accounting; B.S., 1952, Arkansas Agriculture and Mechanical College; M.A., 1954, University of Chicago
Barrow, Leo L. (1961), Professor of Spanish and Portuguese; B.A., 1952, University of New Mexico; M.A., 1953, Middlebury College; Ph.D., 1961, University of Illinois
Bassford, Tamsen L. (1989), Assistant Professor of Biology; B.A., 1982, Hamshire College; Ph.D., 1986, Massachusetts Institute of Technology
Barret, Paul G. (1965), Professor Emeritus of Plant Science; B.S., 1957, M.A., 1959, Colorado State College; Ph.D., 1964, Vanderbilt University
Bartlett, Peter H. (1966), Professor of Physics; B.S., 1961, California Institute of Technology; M.A., 1964, University of California
Barrett, Robert B. (1968), Vice Dean of the College of Medicine; B.A., 1968, M.D., 1971, University of Illinois
Barrett, Bruce R. (1970), Professor of Physics; B.S., 1961, University of Kansas; M.S., 1964, Ph.D., 1967, Stanford University
Bartels, Paul G. (1965), Professor Emeritus of Plant Science; B.S., 1957, M.A., 1959, Colorado State College; Ph.D., 1964, Vanderbilt University
Bartlett, Mark D. (1990), Associate Professor of Geosciences; B.S., 1977, M.S., 1978, Virginia Polytechnic Institute and State University; Ph.D., 1981, University of Chicago
Bashkin, John R. (1982), Associate Professor Emeritus of Psychology; B.S., 1944, Brooklyn College; Ph.D., 1950, University of Wisconsin
Bartlett, Mark D. (1990), Associate Professor of Geosciences; B.S., 1977, M.S., 1978, Virginia Polytechnic Institute and State University; Ph.D., 1981, University of Chicago
Bassford, Tamsen L. (1989), Assistant Professor of Biological Sciences; B.S., 1977, M.S., 1980, California Polytechnic State University; Ph.D., 1983, University of California
Baten, Herman E. (1946-80), Professor Emeritus of Geosciences; A.B., 1946, A.B., 1951, University of Illinois at Urbana-Champaign
Beck, Jonathan (1983), Head of the Department of French; Professor of French and Italian; B.A., 1970, Columbia University; M.A., 1971, Ph.D., 1974, Harvard University
Beck, John S. (1990), Assistant Professor of Geoscience; B.A., 1989, Harvard University of Utah; Ph.D., 1987, University of Michigan
Becker, Judith V. (1991), Professor of Psychiatry, and Psychology; B.A., 1966, Gonzaga University; M.S., 1968, Washington State University; Ph.D., 1975, University of Southern Mississippi
Becker, Stewart (1947-67), Professor Emeritus of Electrical Engineering; A.B., 1926, Princeton University
Beigel, Allan (1970), Vice President for Institutional Planning; Professor of Psychiatry, and Psychology; B.A., 1961, Harvard College, M.D., 1965, Albert Einstein College of Medicine
Bell, Iris R. (1990), Assistant Professor of Psychiatry, and Psychology; A.B., 1972, Harvard University; Ph.D., 1977, M.D., 1980, Stanford University
Bell, Robert R. (1979), Curator of Collections in the Arizona State Museum; Adjunct Lecturer in Anthropology; B.A., 1966, M.A., 1971, University of Arizona
Bell, Loyd V. III (1985), Associate Director of Admissions; B.S., 1967, M.A., 1968, East Tennessee State University
Benson, Bryant (1973), Professor of Anatomy; B.S., 1967, University of California at Los Angeles; Ph.D., 1972, University of Wisconsin
Benson, Bryant (1973), Professor of Anatomy; B.S., 1967, University of California at Los Angeles; Ph.D., 1972, University of Wisconsin
Benson, Bruce (1964), Associate Professor of Anatomy; A.B., 1963, Harvard College; A.M., 1964, Stanford University
Bennett, John R. (1946), Professor of Educational Psychology; B.A., 1963, University of California at Los Angeles; Ph.D., 1964, Vanderbilt University
Benson, Clark T. (1972), Professor of Mathematics; B.S., 1961, California Institute of Technology; Ph.D., 1965, Cornell University
Benson, John W. Jr. (1992), Instructor in Military Science Tactics; B.S., 1979, Northern Illinois University
Benz, Willy (1991), Associate Professor of Astronomy, Arizona Research Laboratories, and Planetary Science; Associate Astronomer in the Stewart Observatory; Bachalureat, 1975, Gymnase Cantonal de Neuchatel; Diploma of Physics, 1979, Universite de Neuchatel; Ph.D., 1984, Universite de Geneve
Bergan, John R. (1966), Professor of Educational Psychology; A.B., 1953, Kalamazoo College; M.A., 1956, Wayne State University; Ph.D., 1963, University of Michigan
Bergersen, Albert J. (1973), Professor of Sociology; B.A., 1964, University of California at Santa Barbara; M.A., 1967, Stanford University
Berkhour, Carl T. (1982), Associate Professor of English; B.A., 1966, Benedictine College; M.A., 1968, Marquette University; Ph.D., 1975, University of Notre Dame
Bermingham, Peter (1978), Director of the Museum of Art, Adjunct Professor of Art; B.A., 1964, M.A., 1968, University of Maryland; Ph.D. 1972, University of Michigan
Bernardi, Rosemarie T. (1988), Associate Professor of Art; B.F.A., 1974, St. Mary's College; M.F.A., 1977, University of Cincinnati


Bernhard, Victor M. (1984), Professor of Surgery; B.S., 1947, M.D., 1951, Northwestern University

Bernstein, Alan E. (1982), Associate Professor of History; B.A., 1961, Wesleyan University; M.A., 1963, Ph.D., 1972, Columbia University

Bergen, Billy (1980), Professor of History; B.A., 1959, Barnard College; M.A., 1961, Radcliffe College; Ph.D., 1968, Harvard University

Bernstein, Harris (1968), Professor of Microbiology and Immunology; B.S., 1956, Purdue University; Ph.D., 1961, California Institute of Technology

Berry, James W. (1956-90), Professor Emeritus of Nutrition and Food Science; B.A., 1949, Augustana College; Ph.D., 1953, University of Illinois

Berry, Larry C. (1992), Assistant Professor of English; B.A., 1982, Antioch College; M.A., 1987, Ph.D., 1992, University of California at Berkeley

Besse, Paul M. (1957-89), Associate Professor Emeritus of Plant Science; B.S., 1949, M.S., 1951, University of Wisconsin; Ph.D., 1957, Michigan State University

Bettan, Eric A. (1988), Assistant Professor of Astrophysics in the Institute of Atmospheric Physics; B.Sc., 1974, B.Sc., 1975, University of Natal; Ph.D., 1982, University of Witwatersrand

Bhaya, Sherrill L. (1989), Associate Specialist in Family Life Extension; Associate Research Scientist in Family and Consumer Resources; B.S., 1968, M.A., 1974, Syracuse University; Ph.D., 1987, University of Arizona

Bickel, William S. (1965), Professor of Physics; B.S., 1938, M.S., 1939, University of Wisconsin; Ph.D., 1942, University of California

Bicknell, Edward J. (1972), Specialist in Veterinary Medicine; B.S., 1946, M.D., 1951, Harvard University

Bloom, Paul (1990), Assistant Professor of Internal Medicine; Research Associate in Respiratory Sciences; B.A., 1967, Williams College; M.D., 1971, Jefferson Medical College

Bloom, John (1982), Associate Professor of Internal Medicine; Research Associate in Respiratory Sciences; B.A., 1935, Cornell University; M.D., 1937, Columbia University

Bogart, Fred O. (1946-75), Professor Emeritus of Anatomy; A.B., 1942, M.D., 1946, University of Chicago; M.S., 1953, University of Iowa; Ph.D., 1957, University of California

Boe, John M. (1979), Professor of Music; B.M., 1948, University of Colorado; Ph.D., 1968, Northwestern University

Boles, Jon Goodman (1978), Associate Professor of Art; B.F.A., 1973, Colorado State University

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