WHO TO CONTACT AT THE UNIVERSITY OF ARIZONA

Arizona is on Mountain Standard Time all year.

Admissions
Undergraduate — Nugent Building, Main Floor ........................................ (520) 621-3237
Graduate — Administration Building, 3rd Floor ........................................ (520) 621-3132
Law — College of Law, Room 112 .......................................................... (520) 621-3477
Foreign Student — Nugent Building, Main Floor .................................. (520) 621-3111

Bookstores
ASUA Bookstore, west end of the Student Union, the UA Mall ............... (520) 621-2426
Medical Bookstore, AHSC, Room 1116 ............................................... (520) 626-6669

Business Office
Administration Building, Room 208 ..................................................... (520) 621-3232

Dean of Students
Old Main, Room 203 ........................................................................... (520) 621-7057

Center for Disability Related Resources
Second and Cherry Streets .................................................................. (520) 621-3268

Financial Aid
Administration Building, Room 203 ................................................... (520) 621-1858

Libraries
Main Library, Cherry Avenue and the UA Mall .................................... (520) 621-6441
Science-Engineering Library, the UA Mall ........................................ (520) 621-6384
Medical Library, 1501 N. Campbell .................................................... (520) 626-6241

Office of the Registrar
Residency Classification, Administration Building, Room 210 .......... (520) 621-3636
Student Information, Administration Building, Room 210 ............ (520) 621-7809
Transcripts, Administration Building, Room 210 ........................... (520) 621-3212

Residence Life (Housing)
A.L. Slonaker Building ...................................................................... (520) 621-6500

Student Health Services
Cherry Avenue and the UA Mall ....................................................... (520) 621-6490

Student Union
On the UA Mall .................................................................................. (520) 621-7755

Summer Session Office
Main Gate Center, 88 N. Euclid ......................................................... (520) 624-8632

Transcripts
Administration Building, Room 305 ................................................... (520) 621-3212

Veterans’ Services
Student Union, Room 353 ................................................................ (520) 621-9501

Visitor Center
Cherry Avenue and the UA Mall ......................................................... (520) 621-5130

Statement of Mailing Privilege
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Announcements in this catalog concerning regulations, fees, curricula, or other matters are subject to change without notice.
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 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.
## First Semester 1995-96 1996-97

<table>
<thead>
<tr>
<th>Event</th>
<th>1995-96 Dates</th>
<th>1996-97 Dates</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. 1 Th</td>
<td>Aug. 1 Th</td>
</tr>
<tr>
<td>Degrees awarded as of this date for students completing requirements at close of summer session</td>
<td>Aug. 10 Th</td>
<td>Aug. 8 Th</td>
</tr>
<tr>
<td>Residence halls open</td>
<td>Aug. 20 Su</td>
<td>Aug. 18 Su</td>
</tr>
<tr>
<td>New-student orientation program (last session)</td>
<td>Aug. 21-22 M-Tu</td>
<td>Aug. 19-20 M-Tu</td>
</tr>
<tr>
<td>Freshman Convocation</td>
<td>Aug. 23 W</td>
<td>Aug. 21 W</td>
</tr>
<tr>
<td>Classes begin</td>
<td>Aug. 24 Th</td>
<td>Aug. 22 Th</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>Aug. 31 Th</td>
<td>Aug. 29 Th</td>
</tr>
<tr>
<td>Labor Day—no classes</td>
<td>Sept. 4 M</td>
<td>Sept. 2 M</td>
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<tr>
<td>Last day for dropping courses with deletion of course enrollment from record</td>
<td>Sept. 20 W</td>
<td>Sept. 18 W</td>
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<tr>
<td>Labor Day—no classes</td>
<td>Sept. 4 M</td>
<td>Sept. 2 M</td>
</tr>
<tr>
<td>Veterans' Day—no classes</td>
<td>Nov. 1 W</td>
<td>Oct. 30 W</td>
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<tr>
<td>Honors Convocations—no classes (3:00-5:00 p.m.)</td>
<td>Oct. 20 F</td>
<td>Oct. 4 F</td>
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<tr>
<td>Thanksgiving recess</td>
<td>Nov. 23-26 Th-Su</td>
<td>Nov. 28-Dec. 1 Th-Su</td>
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<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 F</td>
<td>Dec. 2 M</td>
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<tr>
<td>Classes and laboratory sessions end</td>
<td>Dec. 11 M</td>
<td>Dec. 9 M</td>
</tr>
<tr>
<td>Semester examinations begin</td>
<td>Dec. 13 W</td>
<td>Dec. 11 W</td>
</tr>
<tr>
<td>Semester examinations end</td>
<td>Dec. 20 W</td>
<td>Dec. 18 W</td>
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<td>Residence halls close</td>
<td>Dec. 21 Th</td>
<td>Dec. 19 Th</td>
</tr>
<tr>
<td>Winter Commencement</td>
<td>Dec. 21 Th</td>
<td>Dec. 19 Th</td>
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<table>
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<th>Event</th>
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<tbody>
<tr>
<td>Residence halls open</td>
<td>Jan. 7 Su</td>
<td>Jan. 12 Su</td>
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<tr>
<td>New student orientation program (last session)</td>
<td>Jan. 8-9 M-Tu</td>
<td>Jan. 13-14, M-Tu</td>
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<tr>
<td>Classes begin</td>
<td>Jan. 11 Th</td>
<td>Jan. 15 W</td>
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<tr>
<td>M.L. King Holiday—no classes</td>
<td>Jan. 15 M</td>
<td>Jan. 20 M</td>
</tr>
<tr>
<td>Last day of registration for credit</td>
<td>Jan. 19 F</td>
<td>Jan. 23 Th</td>
</tr>
<tr>
<td>Last day for dropping courses with deletion of course enrollment from record</td>
<td>Feb. 7 W</td>
<td>Feb. 11 Tu</td>
</tr>
<tr>
<td>Spring recess</td>
<td>Mar. 9-17 Sa-Su</td>
<td>Mar. 15-23 Sa-Su</td>
</tr>
<tr>
<td>Last day for dropping courses</td>
<td>Mar. 27 W</td>
<td>Apr. 1 Tu</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 1 W</td>
<td>May 1 Th</td>
</tr>
<tr>
<td>Class and laboratory sessions end</td>
<td>May 1 W</td>
<td>May 7 W</td>
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<tr>
<td>Semester examinations begin</td>
<td>May 3 F</td>
<td>May 9 F</td>
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<tr>
<td>Semester examinations end</td>
<td>May 10 F</td>
<td>May 16 F</td>
</tr>
<tr>
<td>Residence halls close</td>
<td>May 11 Sa</td>
<td>May 17 Sa</td>
</tr>
<tr>
<td>Spring Commencement</td>
<td>May 11 Sa</td>
<td>May 17 Sa</td>
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## Summer Session 1996 1997

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<tr>
<td>Presession classes begin</td>
<td>May 13 M</td>
<td>May 19 M</td>
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<td>Last day of registration for credit for Presession</td>
<td>May 14 Tu</td>
<td>May 20 Tu</td>
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<tr>
<td>Classes of Presession end</td>
<td>June 1 Sa</td>
<td>June 7 Sa</td>
</tr>
<tr>
<td>First Summer Session classes begin</td>
<td>June 3 M</td>
<td>June 9 M</td>
</tr>
<tr>
<td>Last day of registration for credit for first session</td>
<td>June 5 W</td>
<td>June 11 W</td>
</tr>
<tr>
<td>Classes of first session end</td>
<td>July 3 W</td>
<td>July 10 Th</td>
</tr>
<tr>
<td>Independence Day—no classes</td>
<td>July 4 Th</td>
<td>July 4 F</td>
</tr>
<tr>
<td>Second Summer Session classes begin</td>
<td>July 8 M</td>
<td>July 14 M</td>
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<tr>
<td>Last day of registration for credit for second session</td>
<td>July 10 W</td>
<td>July 16 W</td>
</tr>
<tr>
<td>Classes of second session end</td>
<td>Aug. 7 W</td>
<td>Aug. 13 W</td>
</tr>
</tbody>
</table>
GUIDE TO READING THE CATALOG

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 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 1994-95 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 examination policies, absence policy, as well as information on the choice of catalog, 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 locate 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.

**Capstone Experience:** Many departments offer a senior-level course which includes a thesis or project that synthesizes the learning accumulated in the major. Such courses may be offered under the house number and title of 498: Senior Capstone or another number as selected by the offering department. For further information consult your advisor or the department office of your major.

**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 to 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. Undergraduate minors usually require approximately 30 units of credit although they may require as few as 15 or as many as 40 units of credit.

**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.

**First Year Colloquia:** Many departments have or are developing introductory colloquia to give students insight into concepts and practices which typify the discipline in which the course is offered. Typically these courses introduce students to the methods and standards of the discipline for discovering new knowledge, the values which characterize the field of study, advances in the field, impact on society, and career opportunities. These colloquia, which are listed in the Departments and Courses of Instruction section of this catalog, are usually offered under the 195 number for one unit of credit. For further information, consult the department office of the discipline in which you have an interest.

**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.

**Independent/Individual Studies:** The University offers qualified undergraduate students the opportunity to work independently outside the traditional classroom through preceptorships, internships, practica, and independent studies. These courses allow a student to work with a faculty member who has agreed to supervise such work. There are limitations to the types of grading available for such courses, and departments may limit the number of credits of such work that may be applied toward the completion of a degree. See the catalog section on University-Wide “House Numbered” Courses for additional information.

**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.

**University Credit:** University credit is the term used to designate all credit awarded by The University of Arizona with the exception of correspondence credit and Special Examination for Credit. Several University graduation requirements may be fulfilled only through the satisfactory completion of courses awarding University credit.
# ABBREVIATION GUIDE

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

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<thead>
<tr>
<th>Abbreviation</th>
<th>Discipline</th>
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<td>AAS</td>
<td>African American studies</td>
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<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>AGTM</td>
<td>agricultural technology management</td>
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<tr>
<td>AINS</td>
<td>American Indian studies</td>
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<tr>
<td>A ME</td>
<td>aerospace and mechanical engineering</td>
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<tr>
<td>ANES</td>
<td>anesthesiology</td>
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<td>animal sciences</td>
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<td>ANTH</td>
<td>anthropology</td>
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<td>APPL</td>
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A Brief History

In 1885—nearly three decades before Arizona became a state—the thirteenth territorial legislature approved $25,000 for building The University of Arizona in Tucson. The first classes convened in 1891, when 32 students and six teachers met in the original building now known as Old Main.

The University has developed in accordance with the Act of Congress of July 2, 1862, known as the Morrill Act. This legislation created the land-grant colleges and enabled the institution to obtain federal funds for its original schools of agriculture and mines.

In its early days, there were more students in the preparatory department than in the University proper, and the number of University graduates was never more than ten a year. Then came a decade of rapid expansion. The territory became a state, high schools multiplied, and the preparatory department was closed. In 1915, the University was reorganized as three colleges—the College of Letters, Arts, and Sciences (later Liberal Arts); the College of Mines and Engineering; and the College of Agriculture. The Arizona Bureau of Mines was established the same year.

In 1922, the College of Education was organized, and in 1925 offerings in law, originally established in 1915, were organized under the College of Law. The School of Business and Public Administration, established within the College of Letters, Arts, and Sciences in 1934, was reorganized as a separate college in 1944. In 1934 the Department of Home Economics was enlarged to a school within the College of Agriculture. In 1934 the College of Fine Arts, including the School of Music, and the Graduate College were established. In 1940 the Board of Regents reorganized the College of Mines and Engineering into two separate colleges. In 1967 the School of Earth Sciences was organized within the College of Mines, and became the College of Earth Sciences in 1971. In 1947 the School of Pharmacy was organized within the College of Liberal Arts, and was given separate status as the College of Pharmacy in 1949. The Board of Regents in 1956 authorized the establishment of the School of Nursing as a division of the College of Liberal Arts, and in 1964 the school became the College of Nursing. The Department of Architecture in the College of Fine Arts, authorized in 1958, became the College of Architecture in 1964. The Board of Regents authorized the College of Medicine in 1961. In 1974 the School of Renewable Natural Resources was approved as a new unit of the College of Agriculture. The School of Health-Related Professions was authorized by the Board of Regents in 1977. In 1982 the College of Liberal Arts and the College of Fine Arts were reorganized into the College of Arts and Sciences, which includes the Faculty of Fine Arts, the Faculty of Humanities, the Faculty of Science, and the Faculty of Social and Behavioral Sciences. In 1984, the departments that constituted the former College of Earth Sciences were reorganized to become part of the College of Arts and Sciences and the College of Engineering, and the School of Home Economics was renamed the School of Family and Consumer Resources. In 1985, the College of Mines combined with the College of Engineering to become the College of Engineering and Mines.

The 40-acre campus of the 1890s, then some miles outside Tucson, has grown to 345 acres and 155 buildings. Its stated purpose remains: "to provide the inhabitants of this state with the means of acquiring a thorough knowledge of the various branches of literature, science, and the arts," and, insofar as possible, to provide a technical education adapted to the development of the resources peculiar to Arizona. The University is maintained by funds appropriated by the State of Arizona and the United States government, and by fees and collections including private grants from many sources.

THE ORGANIZATION OF ACADEMIC RESPONSIBILITIES OF THE UNIVERSITY

The responsibility for administering the state's public universities resides with the Arizona Board of Regents. The President of the University is appointed by the Arizona Board of Regents and serves as the University's chief executive officer. The Senior Vice President for Academic Affairs and Provost is the University's chief academic officer and the Senior Vice President for Business Affairs is the University's chief fiscal and operations officer. Two vice presidents and five vice provosts report to the Senior Vice President for Academic Affairs and Provost. They are the Vice President for Research; Vice President for Student Affairs; Vice Provost for Academic Affairs; Vice Provost, College of Agriculture; Vice Provost, College of Engineering and Mines; Vice Provost for Health Sciences; and Vice Provost for Undergraduate Programs.

Eleven colleges comprise the academic divisions of the University. Colleges have principal responsibility for determining degree requirements, including the general education program required for each degree. The eleven colleges are the College of Agriculture, the College of Architecture, the College of Arts and Sciences, the College of Business and Public Administration, the College of Education, the College of Engineering and Mines, the College of Law, the College of Medicine, the College of Nursing, the College of Pharmacy, and the Graduate College. Arts and Sciences is divided into Science, Fine Arts, Humanities, and Social and Behavioral Sciences. Each college and each division within Arts and Sciences is administered by a dean who has responsibility for academic programs and policies.

Within colleges are schools, departments, divisions, or committees which have direct responsibility for course offerings and for determination of requirements for majors. The academic programs offered by the University through its various units are listed in the chart which follows in this section of the catalog. Course offerings are listed according to the offering department in the Departments and Courses of Instruction section of this catalog.

ACADEMIC DIVISIONS

More detailed information may be found under listings for the specific college or department.

COLLEGE OF AGRICULTURE—Schools: Family and Consumer Resources (with divisions in Family Studies; Retailing and Consumer Studies); Renewable Natural Resources (with programs in Landscape Architecture; Range Management; Watershed Management; Wildlife and Fisheries Science). Departments: Agricultural and Biosystems Engineering; Agricultural and Resource Economics; Agricultural Education; Animal Sciences; Entomology; Nutritional Sciences; Plant Pathology; Plant Sciences; Soil and Water Science; Undergraduate Program in Microbiology; Veterinary Science. University Departments: Biochemistry; Molecular and Cellular Biology.
COLLEGE OF ARCHITECTURE

COLLEGE OF ARTS AND SCIENCES—Schools: Music; Library Science. Departments: 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 Studies; 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: Biochemistry; Microbiology and Immunology; Molecular and Cellular Biology. Committees: 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; Public Administration and Policy. Departments: Accounting; Economics; Finance; Management and Policy; Management Information Systems; Marketing.

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

COLLEGE OF ENGINEERING AND MINES—Departments: Aerospace and Mechanical Engineering; Chemical and Environmental 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: Biomedical Engineering.

COLLEGE OF LAW

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

COLLEGE OF NURSING

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

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

GRADUATE COLLEGE—Committees: American Indian Studies; Applied Mathematics; Arid Lands Resource Sciences; Biophysics; Cancer Biology; Cognitive Science; Comparative Cultural and Literary Studies; Epidemiology; Genetics; Gerontological Studies; Global Change; Insect Science; Latin American 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.

EXTENDED UNIVERSITY AND THE SUMMER SESSION

THE UNIVERSITY LIBRARIES
# Academic Programs at the University of Arizona

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1. Juris Doctor
2. Doctor of Medicine

*Doctor of Pharmacy

*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 (520) 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 alter 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, in the opinion of the appropriate administrative officer and the President, would not be mutually beneficial to both the student and 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
(520) 621-7783

Admission Application Fee
Arizona residents do not pay an application fee. Nonresidents of Arizona and students from foreign countries are charged a $35.00 application fee. This payment must be in the form of a check or money order made payable to The University of Arizona and must be submitted with the application for admission. Applications are not reviewed unless accompanied by this nonrefundable fee. This fee is subject to change; consult your application for the correct amount.

Deadlines for Application
As deadlines may change for applications for admission, prospective students should contact the Office of Admissions and New Student Enrollment for updated information. The current deadlines for application are:

Freshman Application/Notification Time Lines
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 Deadline:
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: May 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 residents than for nonresidents. 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 international 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 recom-
mended 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 when 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. 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 1 for the first summer session, and June 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 meet minimum admission requirements as established by the Arizona Board of Regents yet not be accepted for admission.

**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 insurmountable program such as Fall Transition, special advising and freshman support groups, tutoring and study skills workshops, 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 between the upper 26 to 50 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 930 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 26 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 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 often include some emphasis on grammar or composition may not be substituted for a regular English course.

**MATHEMATICS**—3 units. Algebra I; plane geometry; Algebra II.

**SOCIAL STUDIES**—2 units. One unit in American history and an additional unit in another social science field such as world history, economics, sociology, geography, government, psychology, or anthropology.

**LABORATORY SCIENCE**—2 units. One unit from any 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 fourth year of math; a third year of laboratory science and social studies; and other electives in music, art, drama, speech, or any other college preparatory subjects commonly offered for credit by secondary schools. A minimum of five units of additional course work is desirable.

**ADMISSION WITH DEFICIENCIES**

Applicants who meet the general aptitude requirements but who have not completed all of the competency requirements may be admitted with deficiencies. Applicants who lack no more than two units of the required course work
may be admitted in this manner. There may be no more than one deficiency in any area, and deficiencies in both math and science are not allowed. 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.

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. Decision will be made based upon the space available in the college selected and evidence of the student's potential for success.

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

ADMISSION TO PARTICULAR COLLEGES AND SCHOOLS

Agriculture
Applicants are expected to present credit in mathematics and laboratory science as follows: one unit of algebra I, one unit of algebra II, one unit of plane geometry, and one unit of physics, chemistry or biological science with a lab. Students are strongly advised to include among their electives additional courses in mathematics such as trigonometry, advanced algebra or solid geometry.

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<th>SAT &amp; ACHIEVEMENT SCORES</th>
<th>ACT SCORES</th>
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<td>(3 units)</td>
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<td>or one transferable 3-credit algebra course</td>
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Test scores may be used to satisfy only one laboratory science unit.
Students are strongly encouraged to have their own microcomputer. To be compatible with College of Agriculture Computer laboratories, students should have a Windows-based, 486 or higher speed processor, with word-processing, spreadsheet, and communications software.

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; computer drafting and modeling; one or more studio art courses; and two or more years of foreign language. (Spanish is preferred, as the college offers an exchange program in Mexico.)

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 consideration 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 College of Education entrance requirements. 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 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 2.50 in all previous university studies. Applicants must be ranked in the upper 25 percent of the high school graduating class; or have achieved a grade-point average of 3.0 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 1050 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 2.250 grade-point average on all college 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.

Nursing
Admission to the College of Nursing requires the completion of three semesters of a specified prenursing curriculum and formal application to the college. See the College of Nursing section of this catalog for further information.

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
(520) 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 if they have attended college. 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.

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 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, no more than 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 colleges.

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 units 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 transferable courses 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 lower-division core requirements 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 academic unit which offers the degree being sought. 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 INTERNATIONAL STUDENTS

Students with non-immigrant visas should request application materials from the Office of Admissions and New Student Enrollment, Foreign Credentials, Robert L. Nugent Building. A $35.00 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. International students are expected to have above-average grades, proficiency in the English language, and adequate financial resources for each year of attendance.

International 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. The results of national exams must be submitted directly from the examining board.

All 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 information, write: TOEFL Publications, Box 6154, Princeton, New Jersey 08541-6154. Results of the TOEFL are valid for two years. Applicants should request that TOEFL (Box 6153, Princeton, New Jersey 08541-6153) send their scores to The University of Arizona (UA code number 4832). The scores must be received before the application for admission can be considered. Newly admitted international 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, Building 24. For students seeking academic admission a statement of academic admisibility 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, located in Old Main, Room 223, for registration information.

Non-immigrants 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 through an embassy or other agent in the United States; otherwise, the students must pay their own fees at registration.

Having provided the first year's expenses and having earned superior grades during at least one year of study at the University, international students may be considered for one of the very few, highly competitive international 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.

There are three mandatory health requirements for all international students and scholars.

1) All international students are required by University regulations to have current health insurance. All non-sponsored students and scholars are required to purchase The University of Arizona's supplemental health insurance. Sponsor insurance must be approved by the Student Health Service. If the student is on a J-1 visa, all accompanying family members must also be enrolled in the University's supplemental health insurance plan. (Contact the Student Health Service Insurance Office for application forms.)

2) All international students must participate in a tuberculosis screening program. The tuberculosis screening test must be conducted by the University Student Health Service before class registration. Proof of screening by any other organization is not acceptable.

3) All students born after December 31, 1956, must provide documentation of adequate measles and rubella immunity before registering for classes at The University of Arizona. Documentation must show proof of vaccination for measles and rubella since 1980.

Information about insurance, TB screening and immunization requirements 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, Building 24. To take the International TOEFL, contact the Testing Office 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, (520) 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 (520) 621-6454.

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

Students attending under the Veterans’ Administration Vocational Rehabilitation Program must contact their vocational rehabilitation specialists prior to registration. This contact can be made through the 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 international students (non-immigrants), should contact the Office of Admissions and New Student Enrollment 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 reenroll 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 readmission.

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 state from which the legislature appropriates funds comprising the major source of support for Arizona’s universities.

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 at least one year immediately prior to the last day of 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 provided that the student can prove financial independence for the last two years.

   There are certain exceptions to 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 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. All evidence is weighed under the presumption that a non-resident student’s presence in Arizona is primarily for educational purposes and that decisions of an individual to establish domicile are generally made after completion of an education and not before. 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 residency classification officer in Room 210, 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 or petition must be completed and filed prior to any decision concerning domicile. The affidavit is required upon original registration or after an absence of one or more semesters. A student desiring a change in classification must complete and file an Application to Change-Domicile Classification with all supporting documentation necessary to provide a basis for in-state classification.

   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 residency 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**

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.

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 available at one of the three state universities which are not available at their own institution. Any undergraduate student with a 2.5000 grade-point average or any graduate student with a 3.0000 grade-point average enrolled at Arizona State University, Northern Arizona University, or The University of Arizona may be designated a Traveling Scholar by prior mutual agreement of the appropriate academic authorities at both the sponsoring and the hosting institution. Additional information and the application form may be obtained from the Office of the Registrar.

WICHE-PROFESSIONAL STUDENT EXCHANGE PROGRAM

Financial assistance is available to Arizona residents wishing to pursue careers in Osteopathy, Dentistry, Veterinary Medicine, Optometry, and Occupational Therapy through the Western Interstate Commission for Higher Education (WICHE) Professional Student Exchange Program.

The Arizona Board of Regents WICHE Program enables Arizona students to enroll in certain professional programs in other states since these educational opportunities are not available in Arizona. The State pays a support fee to the school receiving the student to help cover the cost of education. The student pays the resident tuition fee at a public institution or the difference between the WICHE support fee and the standard tuition at a private school.

To qualify for the program, applicants must be Arizona residents for five years prior to commencement of training, and have maintained average grades. All participants are required to practice in Arizona one year for each year of support, or repay the State one-half of all funds expended on their behalf plus 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, introduction to campus facilities and services as well as course registration. Detailed information regarding the programs is sent to new students in their admission certificate packets.

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 end of the first week after the start of classes. 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 present), legal problems, or some other academic commitment which precluded enrolling prior to the 21st day (study abroad, co-op in absentia registration). See the calendar for the academic year in the front of this catalog.

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 the Registrar 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 PAYMENT AND LATE REGISTRATION FEES—A student who fails to complete payment of all fees prior to the due date for any semester or term will be assessed a non-refundable late payment fee. Students who fail to register prior to the first day of class will be assessed an additional late registration 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 make 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 instructors approve.

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 University of Arizona’s policy for implementation of the act is available in the Offices of the Registrar and the Dean of Students.

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 student graduates or date of last enrollment. After three (3) years, it is assumed that the student
accepts the accuracy of his/her academic record and supporting source documents are destroyed. Students are strongly advised to check carefully their academic records each semester. Discrepancies in the academic record should be reported to the Registrar immediately.

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.

As of the first day of classes and through the last day of registration for credit, as stated in the Academic Calendar, a student may not add a course without the permission and the signature of the instructor of the course.

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. After the tenth week of classes, changes from credit to audit will be permitted only with 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. Students' payments will be applied in chronological order to charges on their accounts. 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 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 1995-96 and 1996-97 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 1994-95 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.

LATE PAYMENT AND LATE REGISTRATION FEES—A student who fails to complete payment of all fees prior to the due date for any semester or term will be assessed an escalating non-refundable late payment fee. Students who fail to register prior to the first day of class will be assessed an additional late registration fee.

EXPENSES AND FEES PER SEMESTER FOR 1994-95 ACADEMIC YEAR

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<th>Recreation Center Fee</th>
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1 Expenses and fees for 1995-96 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 were approved at the time of the printing of this catalog.

### SPECIAL COURSE FEES

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OTHER FEES RELATED TO REGISTRATION AND SPECIAL SERVICES

ENGLISH PLACEMENT EXAMINATION FEE—All entering students without previous college-level composition courses are required to take the First-Year 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 $47 each for the Subject examinations and $47 each for each General examination.

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

PHOTO I.D. 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 University of Arizona academic record (transcript) from the Office of the Registrar. The fee for regular transcript service is $4 per copy. The fee for immediate service or special handling is $6 per copy. An unofficial copy of the transcript costs $1. These fees are applicable whether the transcript request has been made in person, through the mail or by faxing. Fax fees are $6.00 for the transcript, plus a faxing fee of $3.00 for the first page and $2.00 for each additional page.

Fax transcripts are not official. Unofficial transcripts are not sent through the mail. Transcripts will not be issued for students whose records indicate indebtedness to the University.

BREAKAGE DEPOSIT—A breakage deposit may be 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 LESSON 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.

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, students can pay the $17.50 fee each semester, which qualifies a guest to receive the discount ticket rates.

MEAL PLAN (FOOD SERVICE)—The University of Arizona's food services are provided by the Student Union. Eating on campus restaurants, and over 200 food and beverage vending machines. In addition to the convenience of not having to carry cash, students who participate in the All Aboard Meal Plan are not charged tax on their food purchases. This constitutes a substantial savings on the actual cost of meals. The average female student spends $700-$900 per semester; the average male student spends $900-$1200 per semester.

In addition to the All Aboard Meal Plan, students can establish a Pocket Money account that offers the same cash fee convenience. Students with Pocket Money accounts are able to access the services of the Fast Copy Center, Gallagher Theatre (movies), University Photo Service, Sam's Place (game room), Student Recreation Center Pro Shop, as well as paying for Residence Hall In-room Phone charges.

All Aboard and Pocket Money accounts are pre-paid (debit card) systems. Students access their accounts by presenting their student identification card. A minimum payment of $25.00 is required to open an account. Money deposited in an All Aboard account are restricted to the purchase of food and beverages.

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.

REFUND SCHEDULE

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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

Residential hall room rates vary according to the type of facility. Currently, rates range from approximately $1,500 to $2,500 for an academic year. Exact rates are set by the Arizona Board of Regents each academic year and are distributed to prospective students when admitted to the University. For a description of residence hall options see the "Housing Facilities" section of this catalog.

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, 1994-95

The Board of Regents reserves the right to change all fees and charges without notice, if necessary. Rates for 1995-96 and 1996-97 were not available at the time of printing of the catalog.

Arizona Residents:

<table>
<thead>
<tr>
<th>Expense</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration fee</td>
<td>$1894.00</td>
</tr>
<tr>
<td>Residence halls, average rate</td>
<td>$2150.00</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>Total minimum annual expense</td>
<td>$6644.00</td>
</tr>
</tbody>
</table>

Nonresidents:

<table>
<thead>
<tr>
<th>Expense</th>
<th>Fee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Registration fee &amp; tuition</td>
<td>$7500.00</td>
</tr>
<tr>
<td>Residence halls, average rate</td>
<td>$2150.00</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>Total minimum annual expense</td>
<td>$12250.00</td>
</tr>
</tbody>
</table>

All students should add to this list incidental personal expenses as needed. The residence hall reservation deposit is $150 ($100 refundable).

All fees 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.

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 30 hours per week in an on-campus or off-campus placement.

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

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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. If you are transferring from another institution and applying for financial aid, you must also submit a Financial Aid Transcript.
FEDERAL PERKINS LOANS—The Federal Perkins Loan allows students to borrow for undergraduate or graduate education at five percent interest. The amount of the loan is determined on the basis of financial need and repayment begins six months after the borrower is no longer enrolled in school. Loan recipients are required to sign promissory notes agreeing to honor the terms and conditions of their loans. Various deferment provisions for community service, unemployment, or economic hardship are available.

PARENT LOANS FOR STUDENTS—The federal PLUS program is available to undergraduate students. The interest rate (capped at 9%) is variable and begins 60 days after the loan is taken. Students whose families show no financial need can participate in these programs. A separate application is required.

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

INSTITUTIONAL STUDENT AID

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 must be repaid within the semester or session borrowed. The loans are usually for a period of 45 days or until the last day of class, which ever comes first. At the start of a semester the period is usually shortened to provide maximum assistance. Deferments 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 at (520) 621-1858.
SCHOLARSHIP REQUIREMENTS

Minimum Grade-Point Average Required

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

<table>
<thead>
<tr>
<th>Total units completed at UA and accepted in transfer</th>
<th>Minimum grade-point average based upon University Credit at University of Arizona</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fewer than 14 units</td>
<td>.1750</td>
</tr>
<tr>
<td>From 14 through 26 units</td>
<td>.1840</td>
</tr>
<tr>
<td>27 or more units</td>
<td>.2000</td>
</tr>
<tr>
<td>Graduate students (any student registered in the Graduate College), work carried for graduate credit only</td>
<td>.3000</td>
</tr>
</tbody>
</table>

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

Good Standing

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

University Credit

University Credit is the term used to identify all credit offered by The University of Arizona with the exception of correspondence credit and credit by examination (whether or not for grade). Only the grades of courses taken for University Credit and by Special Examination for Grade are used in calculating the grade-point average.

Definition of Unit of Credit

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

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

Since it would be virtually impossible for a student to complete satisfactorily 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 University of Arizona continuously nourishes the quest for excellence in higher education, recognizing that the excitement that accompanies discovery can be ever fulfilling.

The University Honors Center provides students with a unique opportunity to join this pursuit in a personal and stimulating atmosphere. Honors students participate in a personalized educational setting that focuses on small classes, usually with no more than 15 students. Honors faculty emphasize the development of analytic abilities, verbal skills, writing, and problem solving. Course offerings include Honors seminars, colloquia, introductory departmental courses, and independent studies. Ample opportunities exist for personalized research and laboratory work. In addition, students can experience an exciting array of special offerings: a program of faculty-student dialogues; peer mentoring sessions for incoming freshmen; study abroad opportunities; Honors Forum Luncheons; and summer research grants. In most instances, a student's experience culminates with the completion of an Honors Thesis during the senior year.

Participation in Honors affords students a number of special privileges. Honors students have extended library benefits, Honors computer labs, special Honors academic advising, and early registration for lower division students. For those who choose to live on campus, members of the Honors Center are eligible to reside in one of two residence halls reserved exclusively for Honors students (Yuma Hall and Yavapai Hall).

Admission to Honors is limited to students who have distinguished themselves academically.Incoming freshman must rank in the top 5% of their class or achieve a composite ACT score of 30 or a combined SAT score of 1300. Transfer students must have a cumulative 3.5 grade point average on a 4.0 scale.

Participation in Honors encourages students to extend the boundaries of their minds beyond the usual scope of university experience and to discover new facets of their talents and abilities. The Center provides opportunities which enhance the development of the "whole" person—individual who is sensitive, humane, knowledgeable, inquisitive, and who seeks a clearer understanding of the past, present, and future. For additional information regarding this exciting program, contact 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. 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 for a 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.

**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 3.4999 to 3.2500; **cum laude**, to candidates whose average is 3.2499 to 3.0000. In computing these averages, only work carrying University credit and applicable to the Juris Doctor degree is considered. To be eligible for distinction at graduation, Juris Doctor degree candidates must have completed at least 40 units of such work.

**Graduation with Honors**

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

**Other Awards and Honors**

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

**ACADEMIC PROGRESS, PROBATION AND DISQUALIFICATION**

**Academic Progress**

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

**Academic Warning Status**

Freshman students who have completed fewer than 14 units at the University with a University of Arizona cumulative grade-point average between 1.750 and 2.000, or who have completed from 14 through 26 units at the University with a University of Arizona cumulative grade-point average of between 1.840 and 2.000 will be on academic warning status. Academic warning status invokes no academic penalties and will not be indicated on the student's permanent record. 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, 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.

CLASS INFORMATION POLICY

To assist students in achieving course goals, faculty teaching undergraduate courses shall communicate the following information to students during the first week of class: the faculty member's name, office hours, office phone number, number of examinations and papers, grade and absence policy, and the materials needed for the class. In carrying out this requirement, faculty are strongly encouraged to distribute this information in writing through an information sheet or syllabus.

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, 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>1-25</td>
<td>26-57</td>
<td>58-90</td>
<td>91+</td>
</tr>
<tr>
<td>Architecture</td>
<td>1-29</td>
<td>30-60</td>
<td>61-94</td>
<td>95+</td>
</tr>
<tr>
<td>Arts &amp; Sciences</td>
<td>1-24</td>
<td>25-55</td>
<td>56-86</td>
<td>87+</td>
</tr>
<tr>
<td>B.S. in Geos.</td>
<td>1-27</td>
<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
<td>56-86</td>
<td>87+</td>
</tr>
<tr>
<td>Engineering &amp; Mines</td>
<td>1-27</td>
<td>28-62</td>
<td>63-97</td>
<td>98+</td>
</tr>
<tr>
<td>Health-Related Professions</td>
<td></td>
<td>33-67</td>
<td>56-86</td>
<td>87+</td>
</tr>
<tr>
<td>Nursing</td>
<td></td>
<td>33-67</td>
<td>68-101</td>
<td>102+</td>
</tr>
<tr>
<td>Law</td>
<td>1-30</td>
<td>31-58</td>
<td>59-85</td>
<td></td>
</tr>
</tbody>
</table>

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 with in a specific time frame. 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* - Average  
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 

*Includes calculation of the grade-point average.

All medical students are graded on a Superior/Pass 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. Students must re-enroll for these courses each semester. 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. Time-limit for completion of such work for full credit for the master's degree is six years; for the doctoral degree, ten years.

The grade of K is assigned for all supplementary registration (930) at the time of enrollment and will remain permanently on the student's academic record.

For any course, other than the 900 series, that requires more than one semester for completion, the grade of K is awarded by the Office of the Registrar at the end of the semester and carried to the next semester.

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 may be awarded to students not passing at the time of withdrawal. Both grades show 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

Within one (1) year of the awarding of the 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.

Academic Renewal

Under certain circumstances an undergraduate student may apply to the Office of 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.

To qualify for academic renewal, the following conditions must be met:

1. At the time the request 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 request, 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.
3. If more than one semester or term is to be disregarded, these shall be consecutive, completed within a maximum of two calendar years, and 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 student satisfies the conditions under this policy, the Office of the Registrar will annotate the student's permanent academic record to indicate that no work taken during the disregarded semester(s) or term(s), even if satisfactory, may apply toward graduation. 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.

Grade Appeal

A student who feels that a grade has been unfairly awarded may appeal. Before a student begins the appeal process, s/he should make a serious effort to resolve the problem by discussing the concerns with the course instructor, stating the reasons for questioning the grade. If the instructor is a graduate student and this interview does not resolve the difficulty, the student should discuss the problem with the person in charge of the course.

The grade appeal process per se begins with the student going to the college dean's office to receive direction and any requisite forms. The student must attest that s/he has informed the instructor that s/he intends to file a grade appeal. This step must be taken within the first five weeks 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 appeal 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 deadlines for the steps in a grade appeal, but only in extraordinary circumstances 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.

Having carefully formulated the nature of the appeal in writing, the student shall present the written appeal to the instructor. The student shall also present the written appeal to the department office for verification of the date of contact. These steps must also be taken within the first five weeks of classes of the first regular semester after the semester or summer terms in which the grade was awarded. If the instructor or the person in charge of the course is unavailable when the student initially attempts to make contact, the student shall request the department head or his or her representative to verify the date of contact. Within two weeks from the date of receipt of the student's written statement, the instructor and/or the person in charge of the course shall respond in writing, explaining the grading procedures and how the grade in question was determined as well as other issues raised in the student's statement.

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

If the student wishes to pursue the matter further or if the department head does not act within the two-week period, the student shall 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, one selected from the faculty of the department of the instructor concerned, two from the faculty of another closely related department or college, and two students provided by the student council of the college concerned. If the college does not have a student council, the ASUA shall appoint the student members, selecting full-time upper-division undergraduate students for a grade appeal by an undergraduate student or two full-time graduate students for a grade appeal by a graduate student. All student members must be 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 issues, 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. The department head, the instructor, and the student shall be notified in writing of the outcome of the dean's judgement.

The student may request written verification of receipt of his or her letters of appeal from instructor, department head, and dean.

Summary of Grade Appeal Process

Step 1: Student informs instructor of his/her intent to file a grade appeal.

Step 2: Student obtains direction and any requisite forms from dean's office.

Step 3: Student submits written statement to course instructor and instructor's department.

Step 4: Instructor responds in writing to student's statement.

Step 5: Student submits written statement and instructor's written response to department head.

Step 6: Department head responds in writing to student and instructor.

Step 7: Student submits written statement and written responses from the instructor and department head to college dean.

Step 8: College dean convenes committee which hears the grade appeal.

Step 9: Grade appeal committee provides copies of its recommendations to the student, instructor, department head, and college dean.

Step 10: College dean rules on the appeal and notifies the student, instructor, and department head, in writing of his/her ruling.
Maximum Time Table for Grade Appeal

<table>
<thead>
<tr>
<th>Prior to week 5</th>
<th>Steps 1, 2, and 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prior to week 7</td>
<td>Step 4</td>
</tr>
<tr>
<td>Prior to week 8</td>
<td>Step 5</td>
</tr>
<tr>
<td>Prior to week 10</td>
<td>Step 6</td>
</tr>
<tr>
<td>Prior to week 11</td>
<td>Step 7</td>
</tr>
<tr>
<td>Prior to week 15</td>
<td>Steps 8, 9, and 10</td>
</tr>
</tbody>
</table>

Repeating a Course

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

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

2. First and Second Attempt Averaging: Undergraduate students may repeat only once any course in which they have received original grades of C or D. Grade-point average will be computed by 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: Undergraduates who have not received a bachelor’s degree from the University may repeat only once courses in which they received grades of C, D, or E. Three courses not to exceed a maximum of 10 units may be replaced. Students must file a request in the Registrar’s Office within the first four weeks of the semester or the first week of a summer term, Prerequisite or Winter Session. Grades earned in the first and second attempt will remain on the academic record, but the grade earned in the second attempt will be used in the grade-point average, even if lower than the first attempt. Grades of (O) or (W) will count as an attempt, but will not replace the original grade. A repeated course will replace only one previous grade. Units earned will not be affected by this policy, but duplicate units cannot apply towards a degree program. Credit by Exam, Grade by Exam, Correspondence Courses and courses originally taken for Pass/Fail are not allowed to be repeated.

Pass-Fail Option

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

Undergraduate students may elect to take courses under the pass-fail option only after they have attained sophomore standing and only if they have earned grade-point averages of 2.000 or better.

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

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

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

The pass-fail option is not generally available to graduate students. The only exceptions to this procription are: (a) admission deficiencies which the student has prior specific, written approval to take on a P/F basis (only the department head or the departmental graduate advisor may give such approval); second, to enhance understanding of the reciprocal influences of Western and non-Western cultures; third, to provide a basis for an examination of values; fourth, to develop analytic, synthetic, linguistic and computational skills useful for lifelong learning; and finally, to provide a common foundation for wide-ranging dialogue peers on issues of significance. Taken together, the experiences of general education encourage the student to develop a critical and inquiring attitude, an appreciation of complexity and ambiguity, a tolerance for and empathy with persons of different backgrounds or values and a deepened sense of one’s own self. In short, the goal of the general education program is to prepare students to respond more fully and effectively to an increasingly complex world.

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, intel-
ligent writing is a skill required of all university graduates. First-year 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 verbal 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 103H; 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, or a score of 5, 6, or 7 on the International Baccalaureate examination 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 below). Students may take the exam after they have satisfied the first-year composition requirement and accumulated at least 40 but less than 75 units toward their degree. Students who have accumulated more than 75 units should take the Upper-Division Writing-Proficiency Examination as soon as possible. Students register for the exam with the University Composition Board (Modern Languages 380). Students must have taken the Upper-Division Writing-Proficiency Examination before they apply for Bachelor's Degree Candidacy will be accepted.

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

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 Department and Courses of Instruction section of this catalog. Prerequisite to a writing-emphasis course is satisfactory performance on the Upper-Division Writing-Proficiency Examination or, in the case of students whose papers are evaluated as unsatisfactory on the examination, further developmental work in writing, as prescribed by an academic advisor.

**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, takes-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 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:

### AP Exams & Grades

<table>
<thead>
<tr>
<th>UA Courses</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AMERICAN HISTORY</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>HIST 106 &amp; 107</td>
</tr>
<tr>
<td>1, 2 or 3</td>
<td>None</td>
</tr>
<tr>
<td><strong>ART (STUDIO)</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>None</td>
</tr>
<tr>
<td><strong>ART HISTORY</strong></td>
<td></td>
</tr>
<tr>
<td>3, 4 or 5</td>
<td>ARH 117 &amp; 118</td>
</tr>
<tr>
<td>1, 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>BIOLOGY</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>ECOL lower division</td>
</tr>
<tr>
<td>3</td>
<td>ECOL lower division</td>
</tr>
<tr>
<td><strong>CHEMISTRY</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>CHEM 103a</td>
</tr>
<tr>
<td>3</td>
<td>CHEM 103a &amp; 104a</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>COMPUTER SCIENCE A</strong></td>
<td></td>
</tr>
<tr>
<td>3, 4 or 5</td>
<td>CS lower division</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>COMPUTER SCIENCE AB</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CS 227</td>
</tr>
<tr>
<td>3 or 4</td>
<td>CS lower division</td>
</tr>
<tr>
<td><strong>ECONOMICS-MICROECONOMICS</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>ECON 201a</td>
</tr>
<tr>
<td>1, 2 or 3</td>
<td>None</td>
</tr>
<tr>
<td><strong>MACROECONOMICS</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>ECON 201b</td>
</tr>
<tr>
<td>1, 2 or 3</td>
<td>None</td>
</tr>
<tr>
<td><strong>ENGLISH LITERATURE/COMPOSITION</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>English Comp. lower division</td>
</tr>
<tr>
<td>1, 2 or 3</td>
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</tr>
<tr>
<td><strong>ENGLISH LANGUAGE/COMPOSITION</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>English Comp. lower division</td>
</tr>
<tr>
<td>1, 2 or 3</td>
<td>None</td>
</tr>
<tr>
<td><strong>GERMAN</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>GER 101, 102, 201, 202, 315a-315b</td>
</tr>
<tr>
<td>3 or 4</td>
<td>GER 101, 102, 201, 202</td>
</tr>
<tr>
<td>2</td>
<td>GER 101, 102</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td><strong>LATIN: VERGIL</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>LAT 202</td>
</tr>
<tr>
<td>3</td>
<td>Advanced Placement: Automatic satisfaction of the foreign language requirement</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>MATHEMATICS AB</strong></td>
<td></td>
</tr>
<tr>
<td>3, 4 or 5</td>
<td>MATH 125a or 123</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>MATHEMATICS BC</strong></td>
<td></td>
</tr>
<tr>
<td>3, 4 or 5</td>
<td>MATH 125a-125b</td>
</tr>
<tr>
<td>2</td>
<td>MATH 125a</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td><strong>MUSIC LITERATURE</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>MUS 201, 202, 301a</td>
</tr>
<tr>
<td>4</td>
<td>MUS 101</td>
</tr>
<tr>
<td>3</td>
<td>MUS 107</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>MUSIC THEORY</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>MUS 201, 202, 301a</td>
</tr>
<tr>
<td>3 or 4</td>
<td>MUS 101, 102</td>
</tr>
<tr>
<td>2</td>
<td>MUS 100</td>
</tr>
<tr>
<td>1</td>
<td>None</td>
</tr>
<tr>
<td><strong>POLITICAL SCIENCE</strong></td>
<td></td>
</tr>
<tr>
<td>A maximum of 9 units can be earned by AP exams.</td>
<td></td>
</tr>
<tr>
<td><strong>AMERICAN GOVERNMENT AND POLITICS</strong></td>
<td></td>
</tr>
<tr>
<td>3, 4 or 5</td>
<td>POL 102</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
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<tr>
<td><strong>COMPARATIVE GOVERNMENT AND POLITICS</strong></td>
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</tr>
<tr>
<td>3, 4 or 5</td>
<td>POL 110</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>PHYSICS B</strong></td>
<td></td>
</tr>
<tr>
<td>3, 4 or 5</td>
<td>PHYS 201a-201b</td>
</tr>
<tr>
<td>1 or 2</td>
<td>None</td>
</tr>
<tr>
<td><strong>PHYSICS C - Electricity and Magnetism</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>PHYS 116</td>
</tr>
<tr>
<td>1, 2 or 3</td>
<td>None</td>
</tr>
<tr>
<td><strong>PHYSICS C - Mechanics</strong></td>
<td></td>
</tr>
<tr>
<td>4 or 5</td>
<td>PHYS 201</td>
</tr>
<tr>
<td>1, 2 or 3</td>
<td>None</td>
</tr>
<tr>
<td><strong>SPANISH LANGUAGE</strong></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SPAN 101, 102, 105, 201, 202, 301a-301b</td>
</tr>
<tr>
<td>4</td>
<td>SPAN 201, 202, 301a</td>
</tr>
<tr>
<td>3</td>
<td>SPAN 201, 202</td>
</tr>
</tbody>
</table>
The University of Arizona accepts for college credit both the General and the Subject examinations of the CLEP, providing satisfactory scores are attained. Scores of 500 or better on the General examinations will entitle the student, upon registration at the University, to 6 units of credit in each of the following General examinations: (1) English Composition; (2) Mathematics; (3) Natural Sciences; (4) Social Sciences-History; and to four units of credit for Humanities.

From 3 to 16 units of credit, depending upon the examination, may be earned by scores of 50 or better on most subject examinations (41 for College French, 40 for College German, and 41 for College Spanish). The number of units of credit earned is listed in parentheses following the corresponding test indicated below.

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

Other examinations will be added as they become available.

Note: A maximum of 6 semester hours of general elective credit will be allowed for completion of one or more of the following: Subject Examination in Freshman College Composition, General Examination in English Composition. Whether this credit will satisfy the University Freshman English requirement is determined by the Director of Composition following an 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 405b; 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, 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 or credit by examination. Other courses generally have been excluded from this option; at department discretion, however, any course may be made available for grade by examination or credit by examination.

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

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

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

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

The Dean of the Graduate College will not approve a petition unless the senior has a grade average of 3.000 or better on all work already completed in the University, is proceeding toward graduation as directly as possible, and does not propose a semester load to exceed 16 units. Under such a petition, seniors may enroll in 500-level courses. Courses numbered at the 600, 700, and 900 levels are not open to undergraduates.

ABSENCES — ADMINISTRATIVE DROP
Students are expected to be regular and punctual in class attendance. The Uni-
versity 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 taken by 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.

**SCHOLASTIC WORK—CODE OF ACADEMIC 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 an 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 his/her 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 of 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 detailed outline of procedures, see the complete Code of Academic Integrity. Copies are available in the Dean of Students Office.

**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 readmissions approved by the Student Health Service.

**Retroactive Withdrawal**

Under appropriate circumstances a student may petition for withdrawal after completion of classes for a term. If the student has experienced severe physical or psychological stress of such nature as to prevent satisfactory completion of course work in the semester or term in question, the student may petition for retroactive withdrawal for all courses taken that semester or term. This petition must be accompanied by adequate documentation 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 at any public Arizona community college or university may graduate according to the requirements of the catalog in effect at the time of initial enrollment or according to the requirements identified in any single catalog in effect during subsequent terms of continuous enrollment. This determination of continuous enrollment applies to students when they enroll at one of the public community colleges or universities in Arizona, as well as to students who transfer between public institutions in the state of Arizona.

1. A semester will be counted toward continuous enrollment when a student earns at least one credit hour. Summer terms/sessions are included in the determination of consecutive semesters for continuous enrollment. Enrollment in one or more summer terms/sessions is considered the equivalent of a semester for the purpose of this policy. Noncredit courses, audited courses, or courses from which the student
withdrews before completion do not count toward the determination of continuous enrollment for catalog choice purposes.

2. Students who fail to meet the minimum enrollment standard as defined in paragraph 1 during three or more consecutive semesters at any public Arizona community college or university are no longer considered continuously enrolled and must meet requirements of the public Arizona community college or university catalog in effect at the time they are readmitted or of a subsequent catalog after readmission; while they remain continuously enrolled.

3. First-time students or noncontinuous students reapplying for admission to an Arizona public community college or university during a summer term must follow the requirements of the catalog in effect the following fall semester or any subsequent catalog as long as they are continuously enrolled.

4. Students transferring between the Arizona public higher education institutions are subject to the admission requirements of the receiving institution, must fulfill the residency requirements of the institution awarding the degree, and are responsible for completing all curricular and academic requirements of the degree-granting institution.

**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. Courses or degree requirements which are more than eight years old are applicable toward completion of a degree at the discretion of the student's major department. Accreditation may limit the applicability of courses or degree requirements to less than eight years. Departments may approve, disapprove, or request that the students revalidate the substance of such courses. Students whose programs include courses that will be more than 8 years old at the expected time of graduation should consult with their major department at the earliest possible time, to determine acceptability of such courses.

**Graduation Average**

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

**Major Average**

Majors for undergraduate degrees 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**

The University of Arizona recognizes both breadth and depth of knowledge as important characteristics of a baccalaureate degree. To insure depth of study beyond introductory levels, the University has a general policy requiring students to complete a minimum of 42 units of upper-division course work for graduation. This requirement applies to students graduating under the 1991-93 catalog or any subsequent catalog. The special requirements of some academic programs may necessitate an exception to this requirement. At the time of the printing of this catalog, some degree programs were in the process of requesting an exception to require fewer than 42 units of upper-division credit. For current information, students should consult their advisors, the department which offers their major, or the *On Course! Academic Program Requirements Report* for their major to determine if their degree program may require fewer than 42 units of upper-division credit.

**Correspondence And Credit By Examination Credit Maximums**

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

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**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>

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.

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.

After the application has been filed, the applicant becomes responsible for completing all degree program requirements by the last day of final exams in the semester or term in which the degree is to be awarded. The applicant is also responsible for providing all documentation relating to the completion of his/her degree program to the Undergraduate Degree Certification Office within 30 calendar days thereafter.
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 earn 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>
</tr>
</thead>
<tbody>
<tr>
<td>College of Agriculture</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Science in Agriculture</td>
<td>130</td>
</tr>
<tr>
<td>Bachelor of Science in Environmental Science</td>
<td>130</td>
</tr>
<tr>
<td>Bachelor of Science in Family and Consumer Resources</td>
<td>130</td>
</tr>
<tr>
<td>Bachelor of Science in Renewable Natural Resources</td>
<td>130</td>
</tr>
<tr>
<td>College of Architecture</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Architecture</td>
<td>166</td>
</tr>
<tr>
<td>College of Arts and Sciences</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Fine Arts</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Arts in Art</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Arts in Media Arts</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Arts in Music</td>
<td>128</td>
</tr>
<tr>
<td>Bachelor of Arts in Theatre Arts</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Fine Arts</td>
<td>125</td>
</tr>
<tr>
<td>with major in Art Education</td>
<td>127</td>
</tr>
<tr>
<td>with a major in Dance</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Music</td>
<td></td>
</tr>
<tr>
<td>with major in Performance (Guitar)</td>
<td>130</td>
</tr>
<tr>
<td>with major in Performance (Keyboard)</td>
<td>131</td>
</tr>
<tr>
<td>with major in Performance (String Instrument)</td>
<td>130</td>
</tr>
<tr>
<td>with major in Performance (Harp)</td>
<td>129</td>
</tr>
<tr>
<td>with major in Performance (Voice)</td>
<td>130</td>
</tr>
<tr>
<td>with major in Performance (Wind Instrument)</td>
<td>130</td>
</tr>
<tr>
<td>with major in Jazz Studies</td>
<td>128</td>
</tr>
<tr>
<td>with major in Music Education (Choral)</td>
<td>132</td>
</tr>
<tr>
<td>with major in Music Education (Instrumental)</td>
<td>133</td>
</tr>
<tr>
<td>with major in Composition</td>
<td>132</td>
</tr>
<tr>
<td>Faculty of Humanities</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
</tr>
<tr>
<td>Faculty of Science</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Science</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Science in Geosciences</td>
<td>131</td>
</tr>
<tr>
<td>Bachelor of Science in Speech and Hearing Sciences</td>
<td>125</td>
</tr>
<tr>
<td>Faculty of Social and Behavioral Sciences</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Arts</td>
<td>125</td>
</tr>
<tr>
<td>Bachelor of Science</td>
<td>125</td>
</tr>
<tr>
<td>College of Business and Public Administration</td>
<td></td>
</tr>
<tr>
<td>Bachelor of Science in Nursing</td>
<td>129</td>
</tr>
</tbody>
</table>

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.

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 2.000 in the major field if prior permission is obtained from the major professor and the academic dean.

Clearance Of Accounts

Degree candidates are required to clear any indebtedness to the University before completion of degree requirements will be officially certified or the diploma released.
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
(520) 621-3611

Architecture
Office of the Dean
Architecture 104
(520) 621-6751

Business and Public Administration
Undergraduate Programs
McClelland Hall 103
(520) 621-2505

Education
Office of Student and Career Services
Education 247
(520) 621-7865

Engineering and Mines
Office of Academic Affairs
Harshbarger 134
(520) 621-6032

Fine Arts
Office of the Dean
Music 113
(520) 621-1301

Health-Related Professions
Office of the Director
Gittings 101
(520) 621-6989

Humanities, Science, Social and Behavioral Sciences, Pre-Law and Pre-Med
Office of Academic Services
Modern Languages 347
(520) 621-3336

College of Nursing
Office of Nursing Affairs
Nursing 103
(520) 626-6161

College of Pharmacy
Office of the Dean
Pharmacy 344
(520) 626-1427

For undeclared and undecided students, the Advising Center for Exploratory Students (ACES) offers special assistance in finding a major. It is located in Modern Languages 347; the phone number is (520) 621-7763.

DEAN OF STUDENTS OFFICE—STUDENT LIFE
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 Department of Student Programs including Greek Life, Campus Activities, Leadership Development, and Center for Off-Campus Students; Student Publications; ASUA Bookstore; Student Union; Residence Life; Minority Resource Centers including African American Student Affairs, Asian Pacific American Student Affairs, Hispanic/Chicano Student Affairs, and Native American Student Affairs; and Military Science units including Army ROTC, Naval ROTC and Air Force ROTC.

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

UNIVERSITY LEARNING CENTER
The University Learning Center (ULC) is located in Old Chemistry 214. The mission of the ULC is to provide direct learning assistance support to students which will contribute to their integration into the academic community and to their successful achievement as effective and independent learners. The ULC serves all UA students. Special emphasis is directed to students who are in their first year of undergraduate University study, or who are first generation, ethnic minority, economically disadvantaged, or conditionally admitted.

Learning Assistance
Many students who meet University admissions standards find it difficult to make a smooth academic transition from high school to college. 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:

1. assessment of study and learning skills;
2. academic counseling by appointment;
3. free non-credit study skills workshops on topics such as time management, note taking, effective text reading, exam preparation, etc.;
4. a 3-unit Learning Strategies course (LRC 197a) which focuses on learning and enhancing learning potential; and
5. fee-based test preparation courses for graduate placement exams.

TUTORING SERVICES—Services include:
1. the Guide to Free Tutoring, a listing of free tutoring available across campus;
2. Tutor Share, low-cost small group tutoring;
3. Private Tutor Index, a listing of qualified UA students who offer private tutoring for an hourly fee; and
4. Large Group Review sessions in high risk courses.

TESTING OFFICE—The Testing Office provides most out-of-class testing services needed by students at the UA, including:
1. Math Readiness Testing for entering students;
2. College Level Examination Program (CLEP)—earn credits by exam in 38 subject areas;
3. Vocational interest testing to help students plan their majors; and
4. National and state qualifying exams (GRE, LSAT, GMAT, MCAT, ACT, etc.) as well as prep courses for some of these exams.

First Year Programs

THE FIRST YEAR STUDENT CENTER—The First Year Student Center is designed as a one-stop center for students' academic and advising needs. Integrated services include free tutoring, academic advising, academic counseling, major and career exploration, and information on student programs and services.

THE FALL TRANSITION PROGRAM—The Fall Transition Program (FTP) is designed to assist new UA freshmen with the transition from high school to college and takes place during the students' first fall semester. Enrollment is open to all UA freshmen on a space available basis. Students accepted into FTP enroll in the Learning Strategies course (LRC 197a), and are assigned a student mentor who will be a resource for information, University procedures, and student issues.

Minority Student Services

Students who are ethnic minority or who qualify for need-based financial aid may receive regular, ongoing peer advising to assist in making the transition to college life. Minority Student Services also provides student advocacy and referral, scholarship information, newsletters and various sponsored activities.

MATH AND SCIENCE LEARNING CENTER—The center offers free tutoring services both in scheduled groups as well as drop-in tutoring for students in lower division math and science courses. Located in: Nugent 5, 621-1126.

THE MERITS PROGRAM—The Merits Program is a two-semester incentive program for first-year students who are provided support and encouragement to excel academically. By participating in various activities, students earn points towards consideration for book scholarship.

THE STUDENT ENCOURAGEMENT PROGRAM—The aim of the Student Encouragement Program (SEP) is to support students in their transitional freshman year. The goals of the program are achieved through weekly workshops, individual meetings with a peer advisor, critical thinking workshops, cultural activities, and visits to community businesses. SEP, which is funded through a federal grant, serves students who are first generation and/or low income (as stipulated by federal guidelines).

THE NEW START SUMMER BRIDGE PROGRAM—The New Start Summer Bridge Program, a program for first-time UA freshmen, focuses on the transition from a familiar high school environment to the University. This program provides academic courses and activities which introduce students to the college experience. Included in the six-week program: a comprehensive orientation to the UA, academic coursework, registration for the fall semester, academic skills-building workshops, personal development and leadership.

For more information contact the University Learning Center at (520) 621-1206.

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, Director's Office (621-2588)

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. Old Main, Room 111 (621-4224)

The Job Center has hundreds of part-time and seasonal opportunities for students, their spouses, and alumni. Over 1400 employers list on- and off-campus positions annually. Old Main, Room 104 (621-4606)

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. Old Main, Room 104 (621-5800)

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. Old Main, Room 156 (621-4517)

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, Room 111 (621-4224)

MINORITY STUDENT RESOURCE CENTERS

The Minority Student Resource Centers serve to provide support, advocacy and programming designed to enhance the persistence and graduation of minority students. The Resource Centers are part of Student Life, Dean of Students Office. Descriptions of each office are as follows:

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.

ASIAN PACIFIC AMERICAN STUDENT AFFAIRS—The mission of the Office of Asian Pacific American Student Affairs is to develop and maintain a campus environment that is conducive to an appreciation of diversity and cultural harmony. In addition to providing cultural programs and resources for the campus and community, academic and student support services are provided to enable students to feel comfortable exploring their personal development while feeling a sense of belonging. The office staff provides campus leadership and advocacy for Asian Pacific American student issues, plans and implements programs and encourages leadership and identity development in students through ongoing opportunities for involvement in campus and community affairs. The Asian Pacific American Student Center is located in the Martin Luther King, Jr. Building, Room 320. For more information call 621-3481.
CHICANO/HISPANO STUDENT AFFAIRS—Numerous academic support services and programs are available for Chicano/Hispano students through the Office of the Assistant Dean for Chicano/Hispano Student Affairs. These services include advocacy, counseling, referral, information on Chicano/Hispano related clubs, organizations and activities, and other assistance. The Assistant Dean's Office is located at Bear Down 103, (520) 621-5627.

The Chicano/Hispano 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.

NATIVE AMERICAN STUDENT AFFAIRS—The Native American Resource Center (NARC) serves approximately 500 Native American undergraduate students who are representative of over 50 different tribes throughout the United States. The overall mission of the NARC is to provide retention services and referrals to appropriate services and programs on and off campus.

The center provides student/faculty interactions, tribal leaders speaker series, academic and professional development workshops, Native American English composition and Learning Strategies courses, O'odham Ki' wing in Graham-Greenlee Hall, and many social activities. Other services include personal and academic counseling; information on internships/jobs/scholarships; providing 30-day emergency loans; student message board; computers, typewriters; phone availability; fax services and subscriptions to various tribal newspapers.

The Native American Resource Center is located in the Nugent Building, Room 203. For more information call 621-3835.

SPECIALIZED SUPPORT SERVICES

Advising Center for Exploratory Students (ACES)
The Advising Center for Exploratory Students (ACES) is a University-wide support unit created to offer major exploration guidance to the 3,000-5,000 undecided students at The University of Arizona. ACES systematically assists the student in self exploration and in the selection of a major. ACES offers self-assessment tools, one-on-one academic counseling, academic advising and referrals to various campus resources that provide the student support in selection of a major. The ACES Mentor Program matches each interested student with a faculty, administrative or staff mentor. The Mentor Program involves the student directly with the University community. Mentors are matched with students based on common interests, hobbies or career paths. For students in academic difficulty, ACES presents probationary workshops which offer strategies to help students raise their grade point averages and reach academic good standing. For additional information, see "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 academic 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 2302 E. Speedway Blvd., Suite 202.

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 is located at 2302 E. Speedway Blvd., Suite 202.

Center for International Students and Scholars
The Center for International Students and Scholars provides specialized services for international students and scholars at The University of Arizona. These services include personal counseling and advising; screening and referral to academic departments and support services on campus; orientation programs each semester for newly-arriving international students and scholars; assistance in complying with federal, state, and local laws and regulations affecting non-immigrant students and scholars; liaison and support to over 45 sponsoring agencies and governments in the United States and abroad; supporting numerous international student clubs and organizations; 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 Center for International Students and Scholars is located at 915 North Tyndall Avenue. The center may be reached by telephone at (520) 621-4627 or by fax at (520) 621-4069.

Center for Disability Related Resources (CeDRR)
The mission of the center is to equalize educational opportunities for students and provide support services for faculty and staff with disabilities. The program of services and resources is designed to promote full inclusion and participation in the educational experience and campus life. Services of the center are available for students, faculty and staff who have physical, visual, hearing, learning (basic services) and hidden disabilities. Major programs and services provided by the center are academic accommodations, physical support services, a technology center (computer lab), Disability Resource Clearinghouse, adaptive athletics/recreation, counseling and advocacy, testing services, interpreting, advocacy and referral. The primary service center and administrative offices are located at the SW corner of 2nd Street and Cherry Avenue. Phone: (520) 621-3268 (V/TDD)

Strategic Alternative Learning Techniques (S.A.L.T.) Center
The S.A.L.T. Center provides services designed to maximize the educational experience of students with specific learning disabilities and attention deficit disorders. This department provides educational support services using specially trained professional staff to guide stu-
students, instruct learning and compensatory strategies, and monitor academic progress. A computer resource lab allows students to work independently or with their S.A.L.T. tutor in an environment designed to meet the students’ specific learning needs. Content area tutors support student learning by using methods consistent with each student’s learning strengths. Additional S.A.L.T. services include specialized instruction in written expression, career exploration and guidance, peer mentoring, and computer-based tutorials in writing and math.

Admission to the S.A.L.T. Center is competitive and by application only. A fee is charged for all S.A.L.T. services. For further information regarding admission to the S.A.L.T. Center, call 621-8493.

Center for Off-Campus Students

This center provides advocacy and programs for traditional-age commuter students, undergraduates 25 years or older and veteran students. Services focus on promoting student success. Academic, social, cultural, and recreational programs are sponsored by students for students. The center, as a part of the Department of Student Programs, is a bridge linking off-campus students to the many on-campus student service resources. Location: Student Union 353.

Veteran Services

This office provides certification of enrollment for benefits to the Department of Veteran Affairs. It also assists with the Veteran Workstudy Program and provides tutorial assistance. Location: Administration Bldg. 210.

Office of Child Care Initiatives

Child care for students who are also parents is a need that the University is seriously addressing. Students may count on assistance with locating and selecting a child care arrangement including referrals to centers and family child care providers. Because the cost of care is a serious issue for students on limited budgets, the Office of Child Care makes every attempt to know of financial assistance programs specific to child care, including centers that offer sliding fees and state funded subsidies. Information, resources, and referral contacts may be given over the phone at 621-5844; however, visitors are welcome in the office which is located in the Student Union, Room 300.

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. International students must also obtain a tuberculosis skin test at the Student Health Center on campus before registering for classes for the first time.

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.

COUNSELING & PSYCHOLOGICAL SERVICES (CAPS)—The Counseling & Psychological Services 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. CAPS offers short-term individual, couple, and group therapy, as well as skill-building workshops to promote positive, active mental health.

HEALTH PROMOTION & PREVENTIVE SERVICES—The Health Promotion & Preventive Services section of the Student Health Service is located in Old Main at the center of campus. 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 Center in the Student Recreation Center. Drop-in services include body composition, fitness and nutrition analysis, cholesterol screening and blood pressure checks. Stop by our office or the Student Health Center main lobby for a copy of the calendar 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. Another option is Campus Care, a plan which covers most charges (exclusive of prescriptions) within the Student Health Service.

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

These 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 Educational 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
The University Library system contains the Speech-Language and Hearing Clinics. For information regarding fees, consult 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 621-1826 for Speech.

THE UNIVERSITY LIBRARIES

The University Library system contains almost 7,000,000 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 Americana, Arizoniana, 20th century photography, history of science, science fiction, and 18th- and 19th-century British and American literature. The library is a member of the Center for Research Libraries and the Association of Research Libraries and is a member of the AMIGOS Bibliographic Network. Through AMIGOS and other agencies materials may be borrowed for student and faculty research. The Library offers reference services, online searching of computerized databases, and bibliographic course-related instruction. SABIO, the library's information system, includes an on-line catalog, commercial databases, and access to the Internet.

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 Reserve Book Room, and the Newspapers and Microforms Collection; the Science-Engineering Library; and the following branch collections: the Oriental Studies Collection, Special Collections, 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 Stewart Observatory Library, the Herbarium, and the Lunar and Planetary Sciences Library, have been established to serve special research needs.

MAIN REFERENCE—Houses reference materials for the social sciences, fine arts, humanities, business and government documents. Several SABIO terminals, CD-ROM stations and image stations are available. General reference questions can be answered.

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 federal government maps, houses a fully cataloged collection of nearly 300,000 maps on every subject.

CURRENT PERIODICALS/RESERVE BOOK ROOM—Displays current issues of the 4,000-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, 1,500,000 microforms, and displays current issues of its 4,000-plus periodicals.

MUSIC LIBRARY—Maintains the library's collection of approximately 50,000 music-related books, 230 periodicals, 70,000 scores, 15,000 pieces of sheet music and 25,000 recordings. Music material from the Arizona and Sonora geographical area is represented. Other significant items include: The Hill & Phillips collection containing over 125,000 titles of historical popular sheet music dating back to the early 1800's.

CENTER FOR CREATIVE PHOTOGRAPHY—The center is a world-class museum and research center devoted to photography as an art form. The research center features nearly 150 photographer's archives including personal papers, negatives, contact sheets, and artifacts, which are available to researchers by appointment. In addition to 17,000 books, the library has over 80 current periodicals and 500 videotapes.

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

SPECIAL COLLECTIONS—Houses the library's collections of Arizoniana and Southwestern Americana, special sub-ject 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; includes over 160,000 items.

LAW LIBRARY—Houses over 340,000 volumes and volume equivalents. It provides a research collection of all state and federal jurisdictions in the United States, as well as extensive holdings of legal periodicals, treatises and loose-leaf services. The library recently became a selective depository for United States government publications related to law. There is a large collection of English and British Commonwealth materials, and a growing collection of foreign and international legal materials, with a special emphasis on Mexican and Latin American law.

HEALTH SCIENCES LIBRARY—This specialized library, which serves the University Hospital as well as the colleges of Medicine, Nursing and Pharmacy, contains almost 190,000 volumes and receives approximately 3,000 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, desert architecture, and design communications. Includes over 10,000 monograph titles and 300 serial titles.

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
Seventeen residence halls are clustered in three separate residential communities on campus and offer a variety of living options to approximately 4,800 students. The options include both single-sex halls and co-ed halls; various locations; a range of rental rates and a variety of architectural styles.

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

Eight residence halls are accessible for wheelchairs and have other special equipment for disabled students. Most halls are wheelchair accessible into the lobby/lounge area and main floor areas.

RESIDENCE HALL AGREEMENT AND OCCUPANY 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 years and the summer sessions.

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

The University reserves the right to change the residence of any student, or to deny or cancel accommodations in cases where such action is deemed desirable.

Students are required to vacate their rooms and check out of the hall within 24 hours after their last final exam, withdrawal, suspension, academic disqualification or dismissal from the hall.

RESIDENCE HALL RESERVATION—In order to apply for a residence hall room, the student must first be officially admitted to the University. Accompanying the notification of admission is the Residence Hall License Agreement, Terms and Conditions of that Agreement and description with rental rates of the halls. Students desiring a reservation should complete the application/agreement form and return it with the required deposit to the Department of Residence Life. Do not send cash. The University cannot be responsible for any cash deposits sent through the mail. Make checks payable to The University of Arizona.

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 reservation and forfeiture of deposit.

The University does not require freshmen to live in Residence Halls and does not guarantee residence accommodations for freshman students. Demand may exceed available space; therefore, immediate application upon admission is encouraged. Priority for assignment is based on the date the Residence Hall Agreement and deposit are received by the Department of Residence Life.

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

Christopher City Apartments
The University of Arizona operates the Christopher City Apartments for students with families, single students, University faculty and staff, and is an excellent alternative for year-round graduate students. The 360 apartments are conveniently located in northeast Tucson about a 15-minute drive from campus. Most apartments offer a breathtaking view of the nearby Santa Catalina Mountains.

The city bus system provides a direct line between campus and Christopher City that runs frequently. Bus passes are available by month or by semester at discounted rates. Recreational and educational sites are in nearby state parks. Grocery stores, postal services, a public park, a YMCA and the elementary school are some of the services located within a one and one-half mile radius of the complex. Children attend schools in Tucson Unified School District.

Christopher City is a unique and diverse community of cultures that provides family support and a peaceful environment. The complex features a state-licensed cooperative preschool for children ages 2-5. An on-site staff is available to assist residents. Ample parking, 24-hour laundry facilities, and spacious grounds are enjoyed by all residents. The community center is the focus of activities for residents and includes meeting rooms, study rooms, a weights room, a lounge/game room, and a 70-foot pool and wading pool.

All apartments are single-story with a patio and garden area. Apartments include window coverage, electric appliances, garbage disposal, and carpeting. Furnished or unfurnished apartments are available. Monthly rental rates include the cost of air conditioning, heat, and water. Pets are not permitted in the complex.

For current rates, an application or further information about Christopher City, please contact: Christopher City Apartments, 3401 N. Columbus Blvd., Tucson, Arizona, 85712, (520) 327-5918. Fax: (520) 322-5881.

Housing Off the Campus
Listings of off-campus housing are available in the Center for Off-Campus Students/Department of Student Programs; Student Union 353. A Renter’s Handbook for students is available. It contains information about Tucson, utilities, apartment listings, and legal resources. A roommate listing service and weekly housing list are also provided. Call 621-7597 for information.

Change of Address
It is the student's responsibility to keep the University informed at all times of his or her current local and permanent

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address. Change-of-address forms are available in the Office of the Registrar.

**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 initiating 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](#) or other applicable regulations when subsequently generated.

**Use of Narcotic Drugs**

The University provides information required under the Drug Free Schools and Communities Act of 1989. This information appears each semester in the [Schedule of Classes](#). The use by a student, or the sale, possession, or giving as a gift by him or her of narcotic drugs, sedatives, stimulants, psychotherapeutic drugs, psychodelic agents of any variety, prescription drugs other than 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, or egress; injury to person or persons; seizure or exercise of unpermitted control of properties of the institution; trespass; conduct harmful, obstructive, or disruptive to, or which interferes with, the educational process, institutional functions, contractual arrangements, or the public peace and tranquility; conduct likely to foment uproar or violence; or the incitement, support, encouragement, aid, or abetment of any or all of the foregoing.

Access to, enjoyment of, and presence upon or within the areas aforesaid are conditioned upon compliance with the foregoing ordinance and regulation. Any and all persons not in compliance with the foregoing, or in threatened or actual violation thereof, will be denied entry to or upon such areas, or will be evicted therefrom, as the case may be. More specific details regarding conduct appropriate to a university campus are found in the separately published [Student Code of Conduct](#) or other applicable regulations when subsequently generated.

**CAMPUS LIFE**

**Parking and Transportation**

Parking and Transportation Services (PTS) is committed to helping the University community by offering a comprehensive program of transportation services. PTS strongly encourages the use of transportation alternatives, such as buses and bicycles, to preserve the campus environment 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  
The University of Arizona  
1508 E. Sixth Street  
Building 98  
Tucson, Arizona 85721  
(520) 621-3550

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

**City Buses**—The bus pass program is designed to encourage public transit instead of automobile usage. Parking and Transportation Services offers special discounted bus passes from August to June (some restrictions apply and depend on funding availability). Take advantage of this inexpensive and convenient alternative to parking problems.

**Motorcycles/Mopeds/Motorbikes**—Parking and Transportation encourages you to use this mode of transportation by providing convenient parking locations around campus. Parking permits are required.

**Motorized Vehicles**—Campus parking is limited. Students are permitted to bring motor vehicles to the University but parking is not guaranteed. It is strongly recommended that vehicles not be brought to campus unless a parking permit has been assigned. Since campus parking permits are limited,
new students are encouraged to contact the permit section of Parking and Transportation Services as soon as they have received notification of admission. Failure to do so may result in a delay in obtaining a permit for campus parking lots. (Preference in assignments is given to continuing permit holders. Remaining permits are issued to new students and employees on a first come, first served basis.) There are several categories of parking permits offered on this campus. Fees vary based on the level of service.

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

RIDESHARING—Save money on maintenance and gasoline costs and reduce parking demand by carpooling. The University provides access to a carpool match list to team you up with others who live near you. Call (520) 621-1800 for more information.

SHUTTLE SERVICE FROM DESIGNATED PARKING LOTS—The University offers a free campus shuttle as a direct link from many of the outlying parking areas on to campus. Ask for a free shuttle guide.

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

Co-curricular Policy
Co-curricular activities shall be activities which relate directly to and encompass membership in the University recognized student organizations and groups and special events and projects. Intercollegiate athletics for men (NCAA & PAC 10 and Intercollegiate Athletic Association) shall be governed by their own individual standards for eligibility and participation.

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

All elected or appointed officers of these activities to be eligible to hold these leadership positions must at the time of their election or appointment meet the minimum cumulative grade point average of 2.0; graduate students, work carried for graduate credit only, cumulative 3.0. Monitoring of academic eligibility of presidents is calculated by the Dean of Students Office and the Department of Student Programs: each president is responsible for monitoring eligibility of other organization officers. To participate in co-curricular activities, students must be enrolled in the University for a minimum of seven (7) units throughout their term of office.

When a student continues in office from one semester to the next, the student must have successfully completed a minimum of seven (7) units the previous semester. Graduate students must be enrolled in the University for a minimum of three (3) units throughout their term of office, and must have successfully completed three (3) units in the previous semester to continue in office from one semester to the next. For 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.

RULES OF PROCEDURE—Whenever an irregularity arises relating to a student's eligibility to participate or hold an office in a co-curricular activity, the Dean of Students shall inform the student and faculty advisor in writing of the nature of the irregularity. Appeals based on exceptional circumstances may be made to the Co-Curricular Activities Review Committee. The committee will review written statements of the exception and forward recommendations to the Vice President for Student Affairs for final action.

MEMBERSHIP AND SELECTION—The Review Committee shall be composed of:

1. Three student members appointed by the President of ASUA by the beginning of the second semester of each academic year.
2. Three faculty members appointed by the Dean of Students by the beginning of the second semester of each academic year. The Associate Dean of Students shall serve as the designated chairperson.

3. All committee members shall serve a term of one year from the appointed date.

For further information contact the Dean of Students (621-7059).

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

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

Scholarships awarded to properly qualified students who participate in athletics are administered by a committee of the Office of Student Financial Aid under standards applying to all such awards. All funds for the support of the athletic program, regardless of source, are 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 and the ASUA Supreme Court. ASUA provides a number of services to the student body through such programs as Legal Services, 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, 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 servicing students, ASUA organizes a number of activities throughout the year by a variety of ASUA programs including Speaker’s Board and Spring Fling.

ASUA also acts to improve the lives of students and the quality of education on the 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, and the Federal Relations Office.

Furthermore the ASUA president, with the confirmation of the ASUA, Undergraduate Senate and Graduate Professional Student Council, 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.

Department of Student Programs

Many activities are available outside of the classroom. Students can learn about these co-curricular activities at the Department of Student Programs located in Student Union 101 and 353. The Department of Student Programs recognizes over 280 student clubs and organizations, provides leadership programs, campus activities through the University Activities Board, an off-campus housing program, coordinates the Center for Service Learning and the Center for Off-Campus Students, and information on fraternities & sororities.

The department also coordinates Family Weekend, Wildcat Welcome, Wildcat Camp, the Bear Down Club, and the Student Leadership Development Program which includes peer leadership activities, retreats, skill building workshops and academic course work.

The department provides students one place to stop for endless opportunities for involvement at The University of Arizona. For additional information, please stop by Student Union 101 or call 621-8046.

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 Epsilon Rho, Alpha Kappa Lambda, Alpha Phi Alpha, Alpha Tau Omega, Beta Theta Pi, Delta Chi, Delta Tau Delta, Kappa Alpha Order, Kappa Alpha Psi, Kappa Sigma, Lambda Chi Alpha, Omega Delta Phi, Phi Delta Sigma, Phi Delta Theta, 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, Phi 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 Eta Sigma - Freshman Men
- Phi Kappa Phi - All Colleges
- Pi Delta Phi - French
- Pi Lambda Theta - Education
- Pi Omega Pi - Business Education
- Pi Sigma Alpha - Political Science
- Sigma Delta Pi - Spanish
- Sigma Theta Tau
- Tau Beta Pi - Engineering

PROFESSIONAL ORGANIZATIONS

- Agricultural Business Club
- Alpha Epsilon Delta - Premedical
- Alpha Kappa Psi - BPA
- Alpha Tau Alpha - Agricultural Education
- American Home Economics Association
- American Institute of Architects
- American Institute of Chemical Engineers
- American Institute of Industrial Engineers
- American Institute of Mining, Metallurgical and Petroleum Engineers

American Marketing Association
American Medical Student Association
American Nuclear Society
American Pharmaceutical Association
American Society of Agricultural Engineers
American Civil Engineers
American Society of Interior Designers
American Society of Landscape Architects
American Society of Mechanical Engineers
American Water Resources Association
Angel Flight
Animal Sciences Graduate Students
Anthropology Club
Arizona Association of Student Nurses
Arnold Air Society
Associated Students of Agricultural Engineering and Agricultural Mechanics
Audio Engineers Society
BPA Student Council
Black Engineering Science Students Today
College of Agriculture Student Council
Coordinated Council of Nursing Students
Fashions Dimensions Club
Featherless Bipeds (Philosophy)
Food Science Club
Higher Education Students Organization
History Graduate Association
Kappa Beta Pi - Law, Women’s Association
Kappa Psi - Pharmacy
Lambda Alpha Beta
Library Students Association
Linguistics Circle
MBA Student Association
Management Information Systems Association
Minority Pre-Law Association
Movimiento Estudiantil Chicano de Aztlan (M.E.Ch.A.)
Muslim Student Association
Natural Resources Student Association
Personal Club
Phi Alpha Theta
Phi Beta Lambda
Phi Chi Theta
Phi Delta Chi - Pharmacy
Phi Delta Phi - Law, Men
Phi Delta Theta
Phi 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
Phi Lambda Phrateres
Preludes - Freshman
Primus - Freshman
Sophos - Sophomores
Spires - Sophomores
Student Alumni Association
Wranglers - Undergraduates

Religious Activities
Organizations on the campus which are designed to foster the spiritual, intellectual, and social interest of various religious faiths or denominations are: Ambassadors for Christ, American Baptist Campus Ministry, Arizona Student Pagans, Baha’i 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, Episcopal 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 Satsang, 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 discounts are available for students.

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. Admission is free. (For further information, see the Divisions of Research and Special Public Service section.)

ARIZONA STATE MUSEUM—Chartered in 1893 and housing one of the finest collections of prehistoric, historic and contemporary Southwestern Indian material in the world. The Paths of Life exhibit explores the cultures, beliefs and histories of ten Native American groups in Arizona and northern Mexico. Library, research facilities, gift shop, Guided tours for school groups by appointment. Exhibits occupy two buildings. Free admission.

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 Arizona Repertory Theatre Series as an extension of its professional theatre training programs in acting, design/technology and musical theatre. Each year the Arizona Repertory Theatre Series presents a season of five or six demanding plays selected from classical and musical theatre repertoires. 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.

Theatre Arts also produces The Contemporary Theatre Series, which includes workshop productions, new play development, readings, a one-act Festival and fully-mounted contemporary plays. 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 Crowder Hall and Holsclaw 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 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 185,000 square feet of indoor and outdoor space including two gymnasias, an indoor jogging track, 7,000 square-foot weight room, two 3,000 square-foot aerobics/multipurpose rooms, 14 racquetball courts, 2 squash courts, 2 sand volleyball courts, an olympic-sized outdoor swimming pool, juice bar, and wellness center. The center is open from 6:00 a.m. to midnight Monday through Friday, 8:00 a.m. to 8:00 p.m. Saturday, and 10 a.m. to 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 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, 29 sports for women, and 8 coeducational activities.

The Outdoor Adventures Program offers a wide variety of recreational trips such as cross-country skiing, hiking, biking, cave exploring, scuba diving, sea kayaking, and more. 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 10 for women: baseball (M), basketball (M/W), cross country (M/W), football (M), golf (M/W), gymnastics (W), soccer (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 1993-94 NACDA Sears Directors' Cup competitive analysis, The University of Arizona was ranked 6th 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.
Agriculture
The College of Agriculture provides professional education for a wide range of career opportunities in agriculture, natural resources, and in family and consumer resources. The various curricula offer professional preparation for careers in agriculture, government, public service agencies, 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 Retailing and Consumer Studies. 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 department 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, the Bachelor of Science in Environmental Science, 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 also offered through Arts and Sciences (see Arts and Sciences section of this catalog). Each student is assigned a faculty advisor who provides undergraduate guidance and counseling.

The College of Agriculture provides an undergraduate option in Agricultural Operations and Systems Management in Yuma. This program is jointly offered through The University of Arizona, Northern Arizona University, and Arizona Western College. Contact the Office of Academic Programs, College of Agriculture, for information.

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>Major</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agricultural and Resource Economics</td>
</tr>
<tr>
<td>Agricultural Education</td>
</tr>
<tr>
<td>Agricultural Technology Management</td>
</tr>
<tr>
<td>Animal Sciences</td>
</tr>
<tr>
<td>Biochemistry</td>
</tr>
<tr>
<td>Environmental Sciences</td>
</tr>
<tr>
<td>Microbiology</td>
</tr>
<tr>
<td>Nutritional Sciences</td>
</tr>
<tr>
<td>Plant Sciences</td>
</tr>
<tr>
<td>Range Management</td>
</tr>
<tr>
<td>Retailing &amp; Consumer Studies</td>
</tr>
</tbody>
</table>

**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 units of course work must be University Credit.

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

- Agricultural and Resource Economics
- Nutritional Sciences
- Economics
- 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 Arts and Sciences.

Students interested in minors in business and public administration may select a structured minor in general business administration, finance, marketing, human resource 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 Science
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 (Science, Arts and Sciences). The microbiology program offers undergraduates a core curriculum complemented by specialty areas such as the applied sciences in agriculture, biotechnology, allied health, and medicine. For further details, consult Microbiology: Undergraduate Program in the Department of Veterinary Science.

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

GENERAL CURRICULUM
All undergraduate students in the College of Agriculture are required to complete a 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 2.000 on all work undertaken in the major field of study.

Students are strongly encouraged to have their own microcomputer. To be compatible with College of Agriculture Computer Laboratories, students should have a Windows-based, 486 or higher speed processor, with wordprocessing, spreadsheet and communications software.

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 Arts and Sciences and Agriculture. Students are required to select course work in a minimum of five study areas from the following groups: (A) Western Civilization; (B) Biological and Life Sciences; (C) Physical and Environmental Sciences; (D) Individuals, Societies, and Institutions; (E) Non-Western Civilization; and (F) Arts, Literature and Language. These course requirements may be fulfilled during any semester of the undergraduate years. Students need to consult with their school and department academic advisors for specific course sequences to fulfill requirements in each study area.

A. Western Civilization (6 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 (7 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 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

<table>
<thead>
<tr>
<th>GROUP</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Basic Skills and Proficiencies</td>
<td>6-9</td>
</tr>
<tr>
<td>First-Year Composition</td>
<td>6</td>
</tr>
<tr>
<td>Communication</td>
<td>3</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 Examination</td>
<td>18-21</td>
</tr>
<tr>
<td>II. Study Areas</td>
<td>28</td>
</tr>
<tr>
<td>A. Western Civilization</td>
<td>6</td>
</tr>
<tr>
<td>B. Biological and Life Sciences</td>
<td>7</td>
</tr>
<tr>
<td>C. Physical and Environmental Sciences</td>
<td>8</td>
</tr>
<tr>
<td>D. Individuals, Societies and Institutions</td>
<td>6</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>
</tbody>
</table>

1Approved courses listed on the Curriculum Guidesheet and on course listing. Consult an academic advisor for specific course requirements.

2Approved courses listed on the Curriculum Guidesheet and on course listing. Consult an academic advisor for specific course requirements.

3Students are required to complete a minimum of five study areas.

4Students are required to complete one course that includes lab work.

5Students are required to complete a writing-empasis 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 scholar- ship 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 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), retailing and consumer studies, home economics education, and family and consumer resources.

The Family Studies Division 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, and human development.

The Retailing and Consumer Studies Division is committed to excellence in education by preparing students to serve consumers in a culturally diverse society through careers in a global retailing industry. Our students are actively recruited by successful retail firms across the nation.

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.

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

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

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

Family and Consumer Resources Organizations

Family and Consumer Resource Student organizations are the U A Retailing Association, The Southwest Retail Center Student Advisory Board, Future Focus 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; Rangeland and Forest 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. The landscape architecture major is being phased out and is not available to new students. 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). A student transferring into a baccalaureate degree program in Renewable Resources shall meet all degree requirements listed for the major. Transfer credits may be applied or rejected at the discretion of the program faculty.

General Requirements

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

<table>
<thead>
<tr>
<th>GROUP</th>
<th>B.S.</th>
<th>UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>I. Basic Skills and Proficiencies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>First-Year Composition</td>
<td>6-9</td>
<td></td>
</tr>
<tr>
<td>COMM 100, 102</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>COMM Elec. (oral or written)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Mathematics or Statistics</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Computer Science Elective</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Upper-Division Writing Proficiency Exam</td>
<td></td>
<td></td>
</tr>
<tr>
<td>II. Study Areas (Complete five of six areas)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Western Civilization</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Biological and Life Sciences (incl. lab)</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Physical and Environmental Sciences</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Individuals, Societies and Institutions</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Non-Western Civilization</td>
<td>3</td>
<td></td>
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<tr>
<td>Arts, Literature and Language</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>III. Major and College</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Major &amp; RNR subjects</td>
<td>42</td>
<td></td>
</tr>
<tr>
<td>SW 200, 201</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>IV. Electives</td>
<td>0-34</td>
<td></td>
</tr>
<tr>
<td>Total Required for Graduation</td>
<td>130</td>
<td></td>
</tr>
</tbody>
</table>

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

The mathematics or statistics requirement may be fulfilled by STAT 160, 163, 263, 275, or by any mathematics department course except 116, 202, or 405. MATH 116, 202, or 405 may be listed in Group IV.

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

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

Students in RNR 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.

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 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.

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 a general education curriculum supported by University electives. The first year is preprofessional. The professional years are composed of two parts: a two-year core (the second and third years) and the fourth and fifth years, which provide opportunities for design studio options, foreign studies and a senior project. Fourth- and fifth-year design studio options are offered in desert architecture, historic preservation, community design, computer-aided design, building design, design competitions and energy-conscious design. Offerings vary each year according to faculty availability. New options may be introduced.

The College also offers a program of study leading to the Master of Architecture degree. Areas of particular emphasis in the graduate program are desert architecture (including technological and cultural aspects of sustainability) and design communication (including verbal, graphic and multi-media studies). 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 shown in following chart:

- Algebra I
- Plane Geometry
- Algebra II
- American History and Social Studies
- Physics or Chemistry
- Laboratory Science
- Electives

Subject High School Units
---
English 4
Algebra I 1
Plane Geometry 1
Algebra II 1
American History and Social Studies 2
Physics or Chemistry 1
Laboratory Science 1
Electives 4

*Physics and Chemistry preferred.

PROFESSIONAL PHASE (SECOND-FIFTH YEARS)—Admission to the professional phase is highly competitive. The number of students admitted is limited by the resources of the college. Selections are made only once a 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 "archfolio" 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. (Twelve of these 36 units must be in upper-division courses.)
**COMPUTER REQUIREMENT**—Professional Phase students are required to purchase laptop computers. Contact the College of Architecture for information and specifications.

**TRANSFER STUDENTS**—Applicants who are applying for transfer from other colleges or Universities must present the same high school units as required for admission to the preprofessional year and also must meet the general University and college admission requirements as stated in this catalog. Except in cases of exceptional merit, transfer credit for professional year and also must meet the general University requirements. Students transferring from other colleges or Universities must present the College of Architecture for information and specifications.

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 domestic graduate students must apply directly to the College of Architecture. Prospective international graduate students must apply directly to the Graduate College. For graduate standing admission requirements, refer to the Graduate Catalog.

### Advancement

For advancement in any particular course sequence in the professional phase, individual course prerequisites must have been satisfied, and a cumulative grade-point average of 2.000 or better must have been maintained for the preceding academic year. For advancement to the final year, the student must have completed all requirements in the lower years.

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

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td><strong>Second Semester</strong></td>
</tr>
<tr>
<td>Subject</td>
<td>Units</td>
</tr>
<tr>
<td>ENGL 101</td>
<td>3</td>
</tr>
<tr>
<td>MATH 117R/S</td>
<td>3</td>
</tr>
<tr>
<td>MATH 118</td>
<td>2</td>
</tr>
<tr>
<td>ARCH 118 or 112</td>
<td>3</td>
</tr>
<tr>
<td>Elective or ARCH 114</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td>14 or 13</td>
</tr>
</tbody>
</table>

**Professional Phase Required Curriculum (Recommended Sequence)**

<table>
<thead>
<tr>
<th>First Year</th>
<th>Second Year</th>
<th>Third Year</th>
<th>Fourth Year</th>
<th>Fifth Year</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Semester</strong></td>
<td><strong>Second Semester</strong></td>
<td><strong>First Semester</strong></td>
<td><strong>Second Semester</strong></td>
<td><strong>First Semester</strong></td>
</tr>
<tr>
<td>Subject</td>
<td>Units</td>
<td>Subject</td>
<td>Units</td>
<td>Subject</td>
</tr>
<tr>
<td>ARCH 201</td>
<td>6</td>
<td>ARCH 202</td>
<td>6</td>
<td>ARCH 301</td>
</tr>
<tr>
<td>ARCH 212</td>
<td>3</td>
<td>ARCH 222</td>
<td>3</td>
<td>ARCH 318</td>
</tr>
<tr>
<td>ARCH 226</td>
<td>2</td>
<td>ARCH 227</td>
<td>2</td>
<td>ARCH 336</td>
</tr>
<tr>
<td>Elective or ARCH 270</td>
<td>3</td>
<td>ARCH 236</td>
<td>3</td>
<td>Arch Hist. Option</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td></td>
<td>Total</td>
<td>16</td>
</tr>
<tr>
<td><strong>First Semester</strong></td>
<td><strong>Second Semester</strong></td>
<td><strong>First Semester</strong></td>
<td><strong>Second Semester</strong></td>
<td><strong>First Semester</strong></td>
</tr>
<tr>
<td>Subject</td>
<td>Units</td>
<td>Subject</td>
<td>Units</td>
<td>Subject</td>
</tr>
<tr>
<td>ARCH 324</td>
<td>4</td>
<td>Elective</td>
<td>3</td>
<td>Elective</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>Total</td>
<td>18</td>
<td>Total</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 4 general areas of knowledge (Fine Arts, Humanities, Science, Business) plus open and architecture electives. Twelve of these 36 units must be in upper-division courses. Refer to the Elective Group List, available from the college, for guidance.

Architectural History Options include the following: ARCH 404, 414, 424, 434, 464, 466 and selected courses from other colleges. Contact the College of Architecture for a list of the approved courses.

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

The four-year preprofessional degree, where offered, is not accredited by the 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 is affiliated with the Association of Collegiate Schools of Architecture and recognizes a 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 AIA Arizona, 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 advisors maintain regular office hours and students are encouraged to review their progress and problems with their advisors.
The Chemistry/Biology Sciences Teaching Laboratory & Classroom Building, completed in 1992, is the newest facility dedicated exclusively to teaching in the arts and sciences.
As the most comprehensive academic division of The University of Arizona, Arts and Sciences subsumes four units: Fine Arts, Humanities, Science, and Social and Behavioral Sciences. All B.A. and B.S. students in these four units share a single general education program. Arts and Sciences also includes the Office of Academic Services that offers academic advising.

**FINE ARTS**

Music Building, Room 113  
(520) 621-1301

Professional programs offered in 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 Fine Arts, independent artists and scholars revitalize their skills and generate innovative methods and aesthetic concepts. 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.)
- 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  
- Dancers’ Consortium  
- Kappa Kappa Psi—Band Fraternity for Men  
- Music Educators National Conference—Student Chapter  
- Music Teachers National Association—Student Chapter  
- National Association of Television Arts and Sciences—Student Chapter  
- 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

**HUMANITIES**

Modern Languages Building, Room 345  
(520) 621-1044

The humanities sustain the ongoing conversations of different cultures. Humanities offers programs dedicated to literature, 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. Humanities is composed of seven departments of language and literatures, as well as several interdisciplinary programs, and offers degrees in more than 13 languages. It also supports special emphases in creative writing, English as 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 Studies, Russian and Slavic Languages, Spanish and Portuguese

**COMMITTEES:** African American Studies*, Religious Studies, Critical Languages, Russian and Soviet Studies

**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.)***
- Italian (B.A.)
- Latin (B.A.)**
- Portuguese (B.A.)
- Religious Studies (B.A.)
- Russian (B.A.)
- Russian and Soviet Studies (B.A.)
- Spanish (B.A.)

*A minor only is available in African American Studies  
**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

**SCIENCE**

Gould-Simpson Building, Room 1025  
(520) 621-4090

Science conducts programs of education and research in fields of study spanning the biological, mathematical and physical sciences. The emphases are on teaching a fundamental under-
Comprehensive educational programs in most Science departments encompass both undergraduate and graduate education. Most departments offer degrees at the Bachelor’s, Master’s, and Doctoral levels. At all levels, there is emphasis on including students—undergraduate and graduate students—as participants in ongoing research programs, exploring the frontiers of human knowledge; highly motivated students, who believe that they can gain from such intensive research experiences, are strongly encouraged to participate.

Science undergraduate education seeks to graduate students fully prepared to take on the most challenging and productive roles at the forefront of technical industry and business, or—for the many who choose it—to continue their educations in the best and most challenging graduate programs. Science departments also offer a comprehensive selection of introductory and advanced courses in science and mathematics for those students needing such courses in support of technical educations being pursued in other parts of the University. The science faculty also teaches a large number of specially designed general education courses aimed at fostering a broad understanding of scientific knowledge and its relationship to other human endeavors.

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

INSTITUTES/RESEARCH UNITS: Institute of Atmospheric Physics, Lunar & Planetary Laboratory, Multiple Mirror Telescope Observatory, Steward Observatory, Laboratory of Tree-Ring Research

CENTERS: Flandrau Science Center and Planetarium

MAJORS AND DEGREES:
- Astronomy (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

ASSOCIATIONS:
- Sigma Pi Sigma—Physics
- Sigma Xi—Scientific Research
- Society for Earth Sciences Students—Geosciences
- Society of Physics Students—Physics
- Society of Women Engineers Student Chapter—Statistics
- Tau Beta Pi—Engineering

SOCIAL AND BEHAVIORAL SCIENCES

Douglass Building, Room 200W
(520) 621-1112

Social and Behavioral Sciences offers a selective suite of distinguished educational, research, and applied programs focusing on the understanding of human beings, the groups they form, and the societies and cultures they create. The departments and programs within Social and Behavioral Sciences provide not only disciplinary degrees but also various interdisciplinary majors and minors. The unit promotes fundamental research in individual behavior, cultural expression, social organization, theory and values as well as public and private policy. The strength of this unit in the traditional academic disciplines is enriched by programs extending across Social and Behavioral Sciences and beyond its boundaries. Building on its academic expertise and excellent teaching programs, Social and Behavioral Sciences actively contribute to the cultural, social, and economic development of the regional and global community.

SCHOOL: School of Library Science

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

COMMITTEES: Judaic Studies, Women’s Studies

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.)
- 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.)
- 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

**OFFICE OF ACADEMIC SERVICES**

Modern Languages Building, Room 347
(520) 621-3336

The Office of Academic Services (OAS) provides academic advising for students in Humanities, Science, and Social and Behavioral Sciences. In addition, the OAS serves all students in the University who wish to explore majors offered by these units, those interested in the professions of law and medicine and those interested in an interdisciplinary studies major. The professional advising staff includes nine full-time advisors, one part-time advisor, the director of the Advising Center for Exploratory Students (ACES), the coordinator of advising and the assistant dean of Arts and Sciences.

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

The OAS provides advising concerning:
- *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*
- *Re-admission*
- *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 (3:30 - 6:00 pm) appointments."

**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**

**3/2 Program**

This is a cooperative academic plan developed by 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 prerequisite courses, and the requirements of the major field of study. The Graduate Management Admissions Test (GMAT) is taken, and application to the 3/2 Program is made during the second semester of the junior year. Qualified students are accepted for the senior year with continued study in 30 units of designated MBA courses. The 30 MBA units are used within the undergraduate degree program as the minor, as elective units or as excess units. Upon completion of all degree requirements, the baccalaureate degree is awarded. Admission to the Graduate College to complete the MBA is based upon compliance with Graduate College requirements and procedures, and a minimum grade-point average of 3.00 in the 30 units of completed MBA classes.

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

**Prelaw Program**

A broad liberal education is considered an excellent preparation for a career in law. Recommended courses are those that strengthen communication, analytical and research skills, along with courses that provide an understanding of social, political and economic institutions. Legal internships are available 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 that 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 score on the Law School Admissions Test (LSAT), 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, the LSAT, visits of law school representatives and the prelaw student associations, Phi Alpha Delta and Minority Prelaw Students Association.
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 offer major exploration guidance to the 3,000-5,000 undecided students at The University of Arizona. ACES systematically assists the student in self exploration and in the selection of his/her major. ACES offers self assessment tools, one-on-one academic counseling, academic advising and referrals to various campus resources that provide the student support in selection of a major.

DEVELOPMENTAL ADVISING—ACES' developmental advising program is a process that 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 academic 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—The ACES Mentor Program matches each interested student with a faculty, administrative or staff mentor. The Mentor Program involves the student directly with the University community. Mentors are matched with students based on common interests, hobbies or career paths. ACES mentors are able to assist students in the transition from high school to college; self, major and career exploration; learning about the community and campus; becoming aware of University policies and procedures; and utilizing University resources.

STUDENTS IN ACADEMIC DIFFICULTY—For students in academic difficulty, ACES presents probationary workshops that offer strategies to help students raise their grade point averages and reach academic good standing. The Peer Encouragement Program (PEP) is a follow-up program to the workshops. PEP peer advisors are available to help students monitor their academic progress and refer them to appropriate campus resources for additional assistance.

PEER ADVISING PROGRAM—ACES' peer advisors are trained to help students with their major exploration. Peer advisors staff the ACES office daily to help undecided students as mentors, as major exploration advisors and as friends and role models. They are the main component of the ACES' intrusive advising system. The peers make phone calls to ACES' students to inform them of the Major Exploration Program, invite students in for an intake interview, guide undecided students through the major exploration process, and troubleshoot the emotional well-being and adjustment of new freshmen during their first semester. Peers also present workshops on major exploration during the semester in residence halls, Greek houses, minority student centers and other campus programs as requested. Peer advisors are available in the ACES office daily. Students should call 621-7763 or stop by the ACES office in Modern Languages 347 to make an appointment. For further information, telephone or write to:

Advising Center for Exploratory Students Modern Languages Building, Room 347 University of Arizona Tucson, Arizona 85721 (520) 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, 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); and 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, 3.0. Improved performance, 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 the 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 preparation for professional school. 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. Applicants may request an interview and a composite recommendation form the Prehealth Professions Committee, composed of University faculty, staff and administrators. The Committee recommendation, 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 premed 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 Art, Bachelor of Arts in Music, Bachelor of Arts in Media Arts, Bachelor of Arts in Theatre Arts, Bachelor of Science in Geosciences, and Bachelor of Science in Speech and Hearing Sciences.

The 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 Arts and Sciences 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 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 Policies and Graduation Requirements section of this catalog).
10. A minimum of 90 units in Arts and Sciences courses (up to 30 units of economics may be included).

Requirements for the B.F.A. include:

1. 125 - 129 units, depending on major area of study.
2. The general education requirements.
3. Courses to complete a major (no minor is required).
4. 30 units of University Credit (for definition see the Academic 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 of this catalog).
10. All other college and University requirements for graduation.

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-unit rule are freshman composition, the first year (elementary) of a foreign language (see departmental headings for exceptions) and courses cross-listed with a second academic department if the latter is the home department.

The Department of English offers majors in English and creative writing, allowing a student to major in one or double major within 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 to 133 units, depending on emphasis area chosen by the student.
2. The general education requirements.
3. Courses to complete a major.
4. 30 units of University Credit (for definition see the Academic Policies and Graduation Requirements section of this catalog), including 18 of the last 30 units offered toward the degree.
5. Any University Credit requirements of the specific major.
6. 2,000 grade-point average in the major and for all University Credit course work.
7. 42 upper-division units.
8. All other University, college and School of Music requirements for graduation.

Requirements for the B.M. include:

1. 125 to 133 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 18 of the last 30 units offered toward the degree.
5. Any University Credit requirements of the specific major.
6. 2,000 grade-point average in the major and for all University Credit course work.
7. 42 upper-division units.
8. All other University, college and School of Music requirements for graduation.

(For explanation of University graduation requirements, see the Academic Policies and Graduation Requirements section of this catalog.)
The Major

THE MAJOR FOR HUMANITIES, SCIENCE, AND SOCIAL AND BEHAVIORAL SCIENCES—The undergraduate academic programs listed above as majors and degrees under these units 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.

Each department provides an advisor to help its majors select courses in the major and in a minor.

THE MAJOR FOR FINE ARTS—Fine Arts requires students to declare a degree program at the time of application for admission to the University or upon entrance into Fine Arts. 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 113.

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 2.00 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, 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 are to be taken outside the major department. The general education requirements are counted toward these 45 outside units. Students majoring in art education, theatre education or music education must complete at least 35 units applicable to the degree with a grade-point average of 2.50 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.)

The B.F.A. degree with a major in general fine arts studies combines general education requirements with concentrated study and participation in selected fine arts fields. For information regarding the specific requirements for this major, please refer to the General Education section below. Students pursuing this degree must take at least 45 units outside Fine Arts.

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 MAJOR FOR ARTS AND SCIENCES—The Interdisciplinary Studies major (IDS) is offered within Arts and Sciences for the Bachelor of Arts degree. It permits a student to combine three disciplines into a coherent and intellectually challenging major. Designing the major requires that the student: (1) construct the program of study with the aid of an OAS advisor and a committee constructed from a faculty member in each of the three disciplines chosen; (2) prepare a written proposal; and (3) have the final proposal and program accepted by the committee. Each change in proposal must also be approved by the faculty committee and the OAS advisor.

Requirements include:

1. All general education requirements
2. 24 units within each of three subject areas
3. 125 total units for the B.A. Degree
4. 42 upper-division units
5. 12 upper-division units in each subject area
6. 90 units in Arts and Sciences courses
7. 12 University units in each subject area
8. A 2.0 GPA in each subject area and cumulatively

Entry to the interdisciplinary studies major follows the completion of 30 units. Application for the degree must be filed by no later than the end of the fourth week of the semester preceding the semester of graduation. For the purpose of this degree, an August graduation will be treated as a May graduation.

Subject areas I and II must be in a single program or majors in which a Bachelor of Arts or a Bachelor of Science degree is offered, or in the structured program of an academic committee within one of the four units in Arts and Sciences (i.e. Fine Arts, Humanities, Science and Social and Behavioral Sciences).

Subject area III may include courses from these four units or from another UA college. Courses in area III must be selected from no more than two related academic disciplines (divided equally) or from an approved combination of courses united by a common theme. In a foreign language, only upper division course work may be used in split area III program. Certain courses may not be used in any IDS area: freshman composition, courses below MATH 124, military or naval science, activity courses in exercise and sport sciences and first year courses in foreign languages and American Sign Language. 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).

DOUBLE MAJOR—A student may create a double major by satisfying all of the requirements for the major in two departments within Arts and Sciences. Both majors must lead to the same degree—B.A., B.S., B.F.A. or B.M. A minor will be allowed. A double major is available within the Department of English in English and creative writing. It is essential to maintain contact with the advisor in each department to ensure that all requirements are being met. Both majors are declared on the Change of Major form and when filing for degree candidacy. The minimum units required for graduation are 125, with at least 15 units in each major taken as University Credit course work. The student must earn whatever number of units is required by a selected major. Those students interested in the double major with a B.A. or B.S. degree should meet with an advisor in the Office of Academic Services; those students interested in the double major with a B.F.A or B.M. degree should go to the Fine Arts Dean's office.
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 sport 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 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.

Fine Arts Studies

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

Second Degree

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

Those students interested in a second degree that is a B.A. or B.S. should meet with an advisor in the Office of Academic Services. Those students interested in a second degree that is a B.F.A. or B.M. should meet with an advisor in the Fine Arts Dean’s office.

GENERAL EDUCATION

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

The General Education Program for B.A. and B.S. students in 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, so 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.

I. BASIC PROFICIENCIES

A. Composition 6 units
B. Mathematics 3 units
C. Second Language

II. STUDY AREAS

A. Traditions and Cultures 9 units
B. Biological and Physical Sciences 8 units
C. Individuals, Societies and Institutions 9 units
D. The Arts and Literature 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.
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 Arts and Sciences for all B.A. or B.S. students.
- 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

Courses included in the Basic Proficiency group will ensure that you acquire intellectual tools and skills fundamental both to University study and to successful daily living. Effective use of written English, a command of mathematical theory and practice adequate to contemporary life, and a working knowledge of a second language involve not only vital skills, but constitute, in and of themselves, rigorous intellectual endeavors.

Mastery of them is the foundation for the General Education Program; therefore students should arrange to complete the basic proficiencies as early as possible. The composition and mathematics requirements should be satisfied during the first year of an undergraduate program. The second language requirement should be begun no later than the first year and completed no later than the end of the second year.

The student must take and abide by the results of any mandatory examinations (placement-proficiency) given by the appropriate department prior to enrollment in any of the proficiency courses. In addition, the student may satisfy any of the three proficiency requirements by any examinations authorized by the departments for these courses.

A. English Composition

All freshmen must enroll in one of the following sequences:
1. English 100 (exposition, review of syntax and usage), English 101 (exposition, emphasis on essays) and English 102 (critical papers on selected subjects);
2. English 101 and English 102;
3. English 103H (honors) and English 104H (honors).

Placement is based on scores resulting from the UA Freshman Composition Placement Exam, and the English section of the ACT or the Test of Standard Written English portion of the SAT.

B. Mathematics

College Algebra (MATH 117R or 117S), or any three-unit Mathematics course numbered above 117R or 117S is required of all students. Entry-level mathematics students will be advised to choose one of three strands according to their interests, preparation and intended major. The three strands are:

G (General Knowledge): This strand involves a general understanding and appreciation of how mathematics is used to solve problems in everyday life, as for example, the mathematics of voting and elections or of networks and paths.

M (Moderate Knowledge): This strand involves reasonable facility with algebra and algebraic functions, graphs and simple modeling.

S (Substantial Knowledge): This strand involves skill and facility with calculus.

All strands presume that students will have completed the high school mathematics required for entry to the University.

Choice of a strand entails certain course choices. The G-strand includes a single class — MATH 122 (Mathematics in Modern Society). NOTE: This choice does not prepare a student for any further mathematically-based work; it is a terminal course. The S-strand begins at one of two calculus I options — MATH 124 (Calculus with Applications) or MATH 125a (Calculus). Students then may continue on to 125b, 223 or beyond. Those who are not ready to start the S-strand will be required to take preparatory work. The M-strand is for students who require mathematical facility at the level of at least MATH 117S or R (College Algebra) or MATH 121 (Collegiate Algebra). Further mathematical work may include MATH 119 (Finite Mathematics), MATH 123 (Elements of Calculus), or a statistics class from outside the Mathematics Department.

Each major will indicate the mathematics strand that is most appropriate for their students. Because the S-strand presumes the M-strand and the M-strand presumes the G-strand, students will retain the most flexibility in their major choice by aiming for the most mathematical knowledge. A student who chooses to meet the general education mathematics requirement with the G-strand, for instance, will have the most restricted set of major choices available.

The Math Readiness Test is required of all students prior to enrolling in any math course numbered below 125b. Test scores are valid for one year. (See Academic Policies and Graduation Requirements.)

C. Second Language

All students must be proficient in a second language at the fourth semester level. You may demonstrate proficiency in one of the following ways.
1. Successful completion of a fourth semester course taught in the language;
2. Successful completion of the second semester of an intensive language course;
3. Through an examination administered by the appropriate UA language unit.

Students whose first language is not English may satisfy this requirement by examination in that language. They may not, however, receive University Credit for their proficiency. A student who is interested in demonstrating native proficiency should contact the Office of Academic Services for advice as to how to proceed.

American Sign Language satisfies the second language requirement. The sign language course sequence includes SER 370a, 370b, 431a and 431b.

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

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.

II. STUDY AREAS

The Study Area courses encourage the investigation of relations among and between disciplines. In seeking to identify
similarities and differences in subject matter, methods, aims and results of the various approaches to knowledge, the student will explore the extent to which different modes and forms of knowledge can be integrated, and the ways in which they resist integration. All students should also be able to better understand the segregative boundaries that exist in human society, particularly those that 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; openmindedness; 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.

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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 Rural 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
HIST 270 . . . Modern East Asia (EAS 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 145 . . . Popular Culture in Japan
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 . . . Ancient Civilizations of the Near East (ANTH/HIST 171)
NES 172 . . . Islamic Civilization: Traditional and Modern Middle East (ANTH/HIST 172)
NES 434 . . . Islamic Thought
POL 477a-b . . . History of the Middle East
POL 441 . . . The Arab-Israeli Conflict (NES 441)

Comparative Focus
ANTH 315 . . . World Ethnography
AR H 112 . . . Art in Non-Western Society
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
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 includes ecology and evolutionary biology, microbiology, molecular and cellular biology) or one two-semester sequence in the physical sciences (which includes astronomy, atmospheric sciences, chemistry, GEOG 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 (GEOG 171/171L)
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 105R/105L. . . . Introductory Botany/Laboratory
ECOL 182. . . . . . . . . . . . . Introductory Biology II (BIOC/MCB/MIC 182)
ECOL 206. . . . . . . . . . . . . Environmental Biology
ENTO 175. . . . . . . . . . . . . Biology of Insect Life
EXSS 120. . . . . . . . . . . . . Human Biology: The Facts of Life (MCB 120)
GEOG 103a/104a. . . . Physical Geography/Laboratory
GEOG 103b/104b. . . . Physical Geography/Laboratory
GEOS 101/103. . . . . . . Introduction to Physical Geology/Laboratory
GEOS 102/104. . . . . . . Historical Geology/Laboratory
GEOS 107a/107b. . . . . . Introduction to Global Change (HWR 107a-107b)
GEOS 110/103. . . . . . . Introduction to Environmental Geology/Introduction to Geosciences Laboratory
GEOS 112/103. . . . . . . Introduction to Oceanography/Introduction to Geosciences Laboratory
HWR 101a/101b. . . . Water and the Environment
MSE 257/258. . . . . Materials Science of Art and Archaeological Objects/Laboratory (ANTH/ENGR 257/258)
MIC 205. . . . . . . . . . . . . Microbiology
PHYS 102/181. . . . . . . . . Introductory Physics I/Introductory Laboratory I
PHYS 103/182. . . . . . . . . Introductory Physics II/Introductory Laboratory II
PHYS 101. . . . . . . . . . . . . Physics in the Modern World
PHYS 141. . . . . . . . . . . . . Introductory Mechanics
PHYS 151/152. . . . . . . . Introduction to Mechanics/Introduction to Thermodynamics and Relativity
PHYS 251/252. . . . . . . . Introduction to Electricity and Magnetism/Introduction to Optics and Quantum Theory
PHYS 241. . . . . . . . . . . . . Introductory Electricity and Magnetism
PTYS 106. . . . . . . . . . . . . Survey of the Solar System
PLS 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 analysis 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
*AINS 450 . . . . American Indian Women (WS 450)
ANTH 101 . . . . Introduction to Biological Anthropology and Archaeology
ANTH 102 . . . . Introduction to Cultural Anthropology and Linguistic Anthropology
ANTH 110 . . . . Exploring Archaeology
ANTH 249 . . . . Technology and the Growth of Civilizations (HIST 249)
*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 (MSE/ENGR 479)
*ANTH 490 . . . . Women in Middle Eastern Society (NES/WS 490)

ASTR 320 . . . . Philosophy and History of Astronomical Thought
ATMO 336 . . . . Weather, Climate and Society
CLAS 305 . . . . Greek and Roman Religion (RELI 305)
CLAS 306 . . . . The Transformation of a 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)
GEOS 346/346H . . . . Mineral and Energy Resources
*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 374 . . . . The Holocaust
*HIST 489 . . . . Women in East Asia (EAS/WS 489)
*HUM 260 . . . . Intercultural Perspectives
*JPN 402 . . . . Gender and Language in Japan (ANTH/LING 402)

JOUR 151 . . . . News in Mass Communications
JOUR 439 . . . . Ethics and the News Media (PHIL 439)
JOUR 470 . . . . The Press and Society (M LE 470)
LING 101 . . . . Introduction to Language
*LING 210 . . . . Native Languages of North America (AINS 210)
*LING 320 . . . . Language and Social Issues
*LING 425 . . . . Language Variation
*MAS 161 . . . . Chicanos in American Society (SOC 161)
*MAS 180a-b . . . . Introduction to Mexican-American Studies
MCB 404 . . . . Contemporary Biology in Human Affairs
M NE 120 . . . . Mineral Resources, Geotechnology and the Environment
MSE 486 . . . . Technology and Western Society
NEE 109 . . . . History of Science and Technology
NURS 487 . . . . Poverty and Health
PA 206 . . . . Introduction to Public Administration and Policy (POL 206)
*PA 221 . . . . Social Welfare Policy
PA 241 . . . . Criminal Justice Administration
PHIL 111 . . . . Introduction to Philosophy
PHIL 113 . . . . Introduction to Moral and Social Philosophy
PHIL 145 . . . . Science, Technology and Human Values
PHIL 233 . . . . Philosophy of Religion (RELI 233)
PHIL 245 . . . . Existential Problems
PHIL 260 . . . . Ancient Philosophy (CLAS 260)
PHIL 262 . . . . Modern Philosophy
PHIL 305 . . . . Introduction to the Philosophy of Science
PHIL 350 . . . . Minds, Brains and Computers (PSYC 350)
POL 242 . . . . Western European Political Systems
POL 247 . . . . Introduction to Latin American Politics
POL 250 . . . . Contemporary International Politics
POL 321 . . . . Ancient and Medieval Political Theory
POL 322 . . . . Early Modern Political Theory
*POL 330 . . . . Minority Groups and American Politics (AAS/MAS 330)
*POL 332 . . . . Politics of the Mexican-American Community (MAS 332)
*POL 334 . . . . Politics and American Indians
POL 423 . . . . Recent Political Thought
POL 426 . . . . American Political Thought
POL 437 . . . . Democracies, Emerging and Evolving
POL 447 . . . . Latin American Political Development
POL 448 . . . . Government and Politics of Mexico (MAS 448)

PSYC 101 . . . . Introduction to Psychology
*PSYC 216 . . . . Psychology of Gender
PSYC 360 . . . . Social Psychology
*PSYC 376 . . . . Gender and Psychopathology
PSYC 384 . . . . Health Psychology
*RELI 225 . . . . Introduction to Women and Religion (WS 225)
SOC 101 . . . . Introduction to Sociology
*SOC 150 . . . . Sociology of Women (WS 150)
*SOC 160 . . . . Minority Relations and Urban Society (AAS/MAS 160)
SOC 313 . . . . Collective Behavior and Social Movements
*SOC 324 . . . . Sociology of Sexuality
*SOC 450 . . . . Social Stratification (ANTH 450)
*SOC 467 . . . . Race and Ethnic Relations
SW 450 . . . . Anticipating the Future: Focus on Environment
*WS 100 . . . . Introduction to Women's Studies
*WS 200 . . . . Women and Western Culture

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**

- ARE 130 . Appreciating the Visual Arts
- ARH 110 . Art in Society
- ARH 112 . Art in Non-Western Society
- ART 101 . Drawing
- ART 102 . Color and Design
- ART 103 . Vision, Voice and Ideology
- ART 104 . Three Dimensional Design
- DUC 100 . Looking at Dance
- DUC 112a . Beginning Ballet (1 unit)
- DUC 112b . Ballet: Limited Experience (1 unit)
- DUC 112c . Intermediate Ballet (1 unit)
- DUC 143 . Improvisation Instruction (1 unit)
- DUC 152a . Beginning Modern Dance (1 unit)
- DUC 152b . Modern Dance Limited Experience (1 unit)
- DUC 152c . Intermediate Modern Dance (2 units)
- DUC 175 . Theater Dance (1 unit)
- DUC 201a . Beginning Alignment Floor Barre (1 unit)
- DUC 240a, b . Ballet Technique I (2 units, 2 units)
- DUC 241a, b . Dance Technique I: Performance Foundations (2 units, 2 units)
- DUC 244a, b, c, d . Jazz Dance Technique (2 units, 2 units, 2 units, 2 units)
- DUC 259 . History of Dance
- DUC 343a, b, c, d . Dance Ensemble (2 units, 2 units, 2 units, 2 units)
- DUC 370 . Human Movement in the Arts
- *ENGL 449b . Folklore: Forms of Nonverbal Folklore (AINS/ANTH 449b)
- HUM 295q . 10Q4 Creativity (ENGL 295q)
- M AR 200 . Fundamentals of Theory and Aesthetics in Media Arts
- M AR 336 . History of Japanese Film
- MUS 100 . Basic Musicianship
- MUS 101a . Exploring Music through Piano for the General Student
- MUS 107 . Survey of Music I
- MUS 108 . Survey of Music II
- MUS 120a . Musical Skills and Structure I
- MUS 200b, f, s . Large Conducted Ensembles (1 unit)
- MUS 201a-j . Coached Ensembles (1 unit)
- MUS 202a, b, f, g . Small Conducted Ensembles (1 unit)
- MUS 331 . Jazz History
- MUS 337 . Survey of Mexican Folk Music
- MUS 360 . Music Fundamentals through Experience
- MUS 400b-s . Large Conducted Ensembles (1 unit)
- MUS 401a-d, f, g . Coached Ensembles (1 unit)
- MUS 402a-d, f, g . Small Conducted Ensembles (1 unit)
- MUS 428 . American Pop Music: Sinatra Era
- MUS 444 . Arab and Asian Music
- TAR 100 . Acting for General College Students
- TAR 103 . Theatre Appreciation
- TAR 238 . Modern Drama through Performance
- TAR 336 . Introduction to Shakespeare through Performance

**Literature**

- *CHN 429 . Chinese American Literature 1960-Present
- CLAS 342 . Homer
- CLAS 346 . Classical Greek Tragedy
- CLAS 348 . Myth and Archetype (RELI 348)
- ENGL 250 . Critical Themes in Western Literature
- ENGL 260 . Major British Writers
- ENGL 261 . Modern Literature
- ENGL 265 . Major American Writers
- ENGL 267 . World Literature
- ENGL 270 . Approaches to Literature
- ENGL 300 . Literature and Film
- ENGL 310 . Studies in Literary Genre
- ENGL 320a-320b . Literature of the Bible
- ENGL 331 . Shakespeare’s Major Plays
- ENGL 380 . Literary Analysis
- ENGL 416 . Advanced Literary Analysis
- ENGL 419b . Non-fiction Prose: Other Prose Forms
- ENGL 424 . Studies in Southwest Literature (AINS 424)
- ENGL 426 . English Medieval Literature
- ENGL 431a-b . Shakespeare
- ENGL 444 . Milton
- *ENGL 449a . Verbal Folklore (AINS/ANTH 449a)
- ENGL 458a . The English Novel
- ENGL 465 . Victorian Literature
- *ENGL 477 . American Indian Literature (AINS 477)
- FREN 282 . The French Novel and Society
- FREN 283 . Existentialism and the Absurd: The French Foundations
- FREN 284 . French Theatre in Translation
- GER 272 . Staging Twentieth Century Germany
- GER 275 . Creative Minds: The German National Heritage
- GER 276 . Challenges to Traditions
- GER 277 .Eroticism and Love in the Middle Ages
- GER 278 . Medieval Answers to Modern Questions
- GER 325 . History of German Cinema
- *GER 373 . Women’s Fiction in Twentieth Century Germany (W S 373)
- GER 375 . Love, Madness and Decay in fin-de-Siecle Vienna
- *HUM 340 . The Humanities and Medicine
- *HUM 370 . Nobel Laureates of Literature
- *HUM 420 . From Orality to Literature: Storytelling in Contemporary Literature
- *HUM 454 . Irish Revolutionary Literature
- ITAL 350a . The Middle Ages: Italian Literature in Translation
- ITAL 350b . The Renaissance: Italian Literature in Translation
- ITAL 350c . Italian Theater : Literature in Translation
- ITAL 350d . The Novel: Italian Literature in Translation
- ITAL 450c . Italian Cinema and Literature
- JPN 310 . Japanese Literature and War
- PHIL 238 . Philosophy in Literature
- PRS 450 . Contemporary Persian Literature in English Translation
- RUSS 250a-b . Russian Humanities in Translation
- RUSS 330 . Russian Literature from the Beginnings to 1850
- RUSS 340 . Nineteenth Century Russian Literature (in English)
- RUSS 350 . Twentieth Century Russian Literature (in English)
- SPAN 435 . Cervantes’ Don Quixote
- SPAN 445 . Novel of the Mexican Revolution
- TAR 238 . Modern Drama Through Performance
- TAR 336 . Introduction to Shakespeare through Performance

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 identi-
Arts and Sciences 67

fied by the suffix H when listed in the semester schedule of classes. The following General Education Courses are regularly available for honors credit.

Mathematics

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>MATH 124</td>
<td>Calculus with Applications</td>
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<td>MATH 125 a-b</td>
<td>Calculus</td>
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English Composition

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<tr>
<td>ENGL 104H</td>
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<td>ENGL 109H</td>
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Second Language

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<td>FREN 201</td>
<td>Intermediate French</td>
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<tr>
<td>FREN 202</td>
<td>Intermediate French</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>
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<tr>
<td>SPAN 102</td>
<td>Second Semester Spanish</td>
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<tr>
<td>SPAN 201</td>
<td>Second Year Spanish</td>
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<td>SPAN 202</td>
<td>Second Year Spanish</td>
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Study Area A - Traditions and Cultures

<table>
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<th>List 1</th>
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<tr>
<td>ANTH 206</td>
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<tr>
<td>FA 207</td>
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<td>ENGL 251a-b</td>
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<td>HIST 102</td>
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<td>HUM 250a-b</td>
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Study Area B - Biological and Physical Sciences

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<th>Course Code</th>
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<tr>
<td>ASTR 101L</td>
<td>Essentials of Astronomy Laboratory</td>
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<tr>
<td>CHEM 105a-b</td>
<td>Honors Fundamentals of Chemistry</td>
</tr>
<tr>
<td>ECOL 182</td>
<td>Introductory Biology II</td>
</tr>
<tr>
<td>GEOS 101/103</td>
<td>Introduction to Physical Geology / Introduction to Geosciences Laboratory</td>
</tr>
<tr>
<td>GEOS 102/104</td>
<td>Introduction to Historical Geology / Laboratory</td>
</tr>
<tr>
<td>PHYS 141</td>
<td>Introductory Mechanics</td>
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<td>PHYS 241</td>
<td>Introductory Electricity and Magnetism</td>
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<td>PLS 100/101</td>
<td>Plant Science / Laboratory</td>
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</table>

Study Area C - Individuals, Societies and Institutions

<table>
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<th>Course Code</th>
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<tr>
<td>ANTH 101</td>
<td>Introduction to Biological Anthropology and Archaeology</td>
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<tr>
<td>ECON 200</td>
<td>Basic Economic Issues</td>
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<td>ECON 371</td>
<td>Economic Development</td>
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<tr>
<td>GEOG 102a</td>
<td>Human Geography</td>
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<tr>
<td>GEOS 346</td>
<td>Mineral and Energy Resources</td>
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<td>LING 101</td>
<td>Introduction to Language</td>
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<tr>
<td>PHIL 111</td>
<td>Introduction to Philosophy</td>
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<td>PHIL 113</td>
<td>Introduction to Moral and Social Philosophy</td>
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</table>

POL 250 .......Contemporary International Politics
PSYC 101 .......Introduction to Psychology
SOC 101 .......Introduction to Sociology

Study Area D - Arts and Literature

<table>
<thead>
<tr>
<th>Art</th>
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<tbody>
<tr>
<td>DNC 370</td>
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<td>M AR 336</td>
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<td>MUS 121a-b</td>
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<td>T AR 100</td>
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<td>T AR 238</td>
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<table>
<thead>
<tr>
<th>Literature</th>
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<tbody>
<tr>
<td>CLAS 342</td>
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</tbody>
</table>

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

General education requirements vary among the several degree programs in 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 cross listed from other home departments will be accepted in general education only if approval is granted by the dean prior to enrollment.

In extenuating circumstances, when students feel they need to include a course other than those listed, they should consult their departmental advisor.

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)

Bachelor of Music

(MAJORS IN PERFORMANCE, COMPOSITION AND JAZZ STUDIES)

I. Communication and Conceptualization (12 units)

A. Freshman Composition (6 units)

1. ENGL 100, 101 and 102.
2. ENGL 101 and 102.
3. ENGL 103H and 104H (Honors).

B. Mathematics (3 units)

Three units from MATH 117 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. Media arts majors are required to take COMM 100 and 102. Theatre production and 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.

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 follow-
ing courses: ARH 117, 118; DNC 259; MUS 107, 108; HUM 355; NES 140; PHIL 111, 113; TAR 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.

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

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, PLS 100.

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

C. Individuals, Societies and Institutions (6 units)

Courses to be selected from anthropology, economics, geography and regional development, (except GEOG 103a-103b and 104a-104b), history (except HIST 101, 102, 103), M AR 101, philosophy (except PHIL 111 and 113), political science, psychology, sociology, African American studies, American Indian studies, East Asian studies, Judaic studies, Near Eastern studies (except NES 140), religious studies, women’s studies (except WS 200).

D. Non-Western and Minority Studies (3 units)

Students are required to take at least one three-unit course focusing on gender, race, ethnicity or non-western civilization.

E. The Arts (6 units)

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

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

F. Department-Specified General Education Course Work Outside of the Major Department (9-15 units)

Musical theatre requirements (16 units)

Some area II-F courses specified by the departments can be used to satisfy requirements in other areas above. However, the student must take the minimum required units in each area.

1. Department of Art Requirements:

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

ANTH 430, DNC 100, 259; EXSS 201; JOUR 301; M AR 101, 200; MKTG 361; MUS 107, 108; PHIL 110, 111, 433; TAR 140a or 140b; WS 253a, 253b.

2. Committee on Dance Requirements:

MUS 107, 108; PHIL 110; TAR 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 or Performance (3)  

Bachelor of Fine Arts

(Majors in Art Education and Theatre Arts Education)

and Bachelor of Music

(Major in Music Education)

I. Communication and Conceptualization (12 units)

A. Freshman Composition (6 units)

Completion of one of the following sequences:

1. ENGL 101 and 102.
2. ENGL 101 and 102.
3. ENGL 103H and 104H (Honors).

B. Mathematics (3 units)

MATH 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; NES 140 or PHIL 111, 113, 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; PLS 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 is also required, although not included in total units required in study areas.
I. Communication and Conceptualization (12 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

(MAJOR IN 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 from MATH 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), MAR 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 100a-100b), 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

Contact the 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 Fine Arts Music Building, Room 113 or the advisor in the specific department.

To change from a major in Humanities, Science or Social and Behavioral Science to another within the same three units, 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 Humanities, Science, and Social and Behavioral Science. Students in these units 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 in the Office of Academic Services. In Fine Arts, correspondence courses are not counted in the 19-unit maximum.

Grade Appeal Procedures

Grade appeals in Fine Arts, Humanities, Science, and Social and Behavioral Sciences are heard in the offices of the respective deans.

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 must declare a major area of study at the 55-unit level. Students who transfer 55 units or more may remain as undeclared for one semester following admission.

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 preprofessional programs.

**Transfer Students from Arizona Community Colleges**

The University of Arizona has prepared transfer guides that 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 (TGECC).

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 [TGECC]") 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 in Arts and Sciences upon completion of the following college requirements.

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

II. 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 requirement for a course in non-Western civilization can be met within the transfer core curriculum as the required three units 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 1, Study Area A for the possibilities). The requirement 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, the student 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.)
The new Isabelle Harris Organ in Holsclaw Hall built by Schoenstein Organ Company as it appeared prior to dedication on October 30, 1994.

Ms. Harris is recognized for her generous gift which made construction of the organ possible.

Dr. Roy A. Johnson, Professor of Music, offers remarks prior to his concert dedicating the new organ.

Photos by Kirsten Cook
Photo courtesy UA College of Business and Public Administration.

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; 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 structures 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, or operations management. An International Business Certificate Program (competitive entry) 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 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 contact the Undergraduate Programs Office; McClelland Hall 103, to make an appointment for information and academic advising. Students with prior college-level work should bring transcripts.

Freshmen, sophomores and all general business administration majors receive academic advising 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 prior to 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 50% of the degree program in general education courses, including work in economics, mathematics, social science, statistics, 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 of 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
Ethics
International/Multi-cultural
Western and Non-western Civilization
Arts and/or Literature

*A minimum of 51 upper division units is required. This should be kept in mind in selecting general education courses.

Upper-Division Business Courses

The college accepts transfer credit in upper-division business 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 is required before permission to register is granted. Conditional permission 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 BPA. 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.
**2.750 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. a grade-point average based on all University Credit course work attempted at The University of Arizona of at least 2.000;
3. have credit for a minimum of 56 units, 12 of which must have been at The University of Arizona;
4. have an approved application on file for at least one regular semester; and
5. an approved application on file with the BPA Undergraduate Programs Office under the Advanced Standing Policy.

*2.750 required for students as of fall 1992; see BPA Undergraduate Programs Office for current requirement.

Exempt Programs

Exempt programs must have the approval of the Dean of the BPA College and the dean of the college which offers the degree program. Students who qualify under this provision will be permitted to take only required upper-division BPA courses which have been specifically approved and designated in their major field of study. Permission is granted on a semester-by-semester basis once eligibility has been established for the term. 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 the exempt 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

A. Communications

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tr>
<td>ENGL 101 or 103H</td>
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</tr>
<tr>
<td>ENGL 102 or 104H</td>
<td>3</td>
</tr>
<tr>
<td>Upper-Division Writing Proficiency Examination</td>
<td>3</td>
</tr>
<tr>
<td>COMM 412</td>
<td>3</td>
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</table>

B. Mathematics and Quantitative Methods

<table>
<thead>
<tr>
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<th>Units</th>
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</thead>
<tbody>
<tr>
<td>MATH 119^3</td>
<td>3</td>
</tr>
<tr>
<td>MATH 123^3</td>
<td>3</td>
</tr>
<tr>
<td>STAT 275^3</td>
<td>3</td>
</tr>
</tbody>
</table>

C. Language of Commerce/Pre-Professional Course Work

<table>
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<th>Course</th>
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<td>MIS 111</td>
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<td>ACCT 200</td>
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</tr>
<tr>
<td>ACCT 210</td>
<td>3</td>
</tr>
<tr>
<td>ECON 200</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, molecular and cellular biology, physics or planetary sciences.

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 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. .................. (6 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 (9 units) option selected from the set: ACCT 471, FIN 471, MAP 471, MIS 471, or MKTG 471. (Credit is allowed for only one policy course). .................. (24 units)

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

1Lower-division professional program requirements and prerequisites that must be completed by all B.S.B.A. degree candidates.
2Students earning an "unsatisfactory" result on the exam normally will be required to complete additional writing course work as specified by the college.
3College algebra or the equivalent is prerequisite for MATH 119 and 123, which are prerequisites for STAT 275.
4The International Business Certificate Program requires 16 units of the same foreign language and a regional study area must be identified for some general education requirements.
5Writing-Emphasis Course. The writing proficiency exam is a prerequisite.

B.S.B.A. Advanced Standing
Lower-Division Requirements
To attain advanced standing as a BPA student, the following lower-division program course requirements must be met: ENGL 101 or 103H, 102 or 104H; MATH 119, 123; MIS 111; ACCT 200, 210; ECON 200; STAT 275; and 6 to 8 units of biological and physical sciences. In addition, sufficient general education study area, lower-division pre-major and elective units to meet the minimum 56 required by the policy are necessary.

MAJOR FIELDS AVAILABLE

Students are asked to declare one of the major fields of business administration upon enrollment. Any subsequent change in major is accomplished by completing a change-of-major form available in 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 individual or independent study courses to any major.

To graduate the student must have a grade-point average of 2.00 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 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, FIN 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 in corporate financial management, investment analysis, security brokerage, and investment or commercial banking. Finance majors must take ACCT 310 and MAP 376 prior to beginning 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; ECON 418, 430, 442; FIN 313, 414, 444, 460; MAP 426; MIS 461.

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-credit 300- or 400-level course from each of the following seven areas: (1) accounting; (2) economics; (3) finance; (4) management and policy; (5) management information systems; (6) marketing (400-level courses only); and (7) public administration and policy.

General Business Administration/International Business Certificate Program
The International Business Certificate program is a competitive, restricted entry, senior year program. Students must apply and be accepted into the program in the spring term prior to entry, which occurs only in the fall term. Sixteen units of the same foreign language are required and a regional study area must be identified for the general education requirements. All students interested in this program should see an International Business advisor early in their freshman year. The Certificate Program consists of the following courses:

1. ECON 449 (fall semester, senior year)
2. MAP 435 (spring semester, senior year)
3. Select nine units (three courses) from the following: ECON 442, 443, 444; FIN 414; MIS 450; MKTG 456.

Human Resources Management
The major is designed for students who expect to hold positions in the management of human resources in large or small businesses. Flexibility in the requirements permits a major tailored to the student’s particular interests. Prospective majors are encouraged to choose electives in communication, psychology, or sociology. PSYC 101 should be taken in the freshman or sophomore year. MAP 376 must be completed before beginning major courses, and MAP 471 should be taken to fulfill the business policy requirement.

The major consists of fifteen units taken from the following: COMM 450, 462; ECON 382, 383, 386; MAP 330, 420, 430, 432, 435, 444, 450, 475, 480, 486; PSYC 300, 425, 449, 450; SOC 326, 422. A minimum of nine units must be completed in MAP courses.

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 beginning 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. An additional three units (one course) must be selected from the following: MIS 411, 421, 422, 450, 451, 453, 461, 480, and 497.

Materials describing career paths, recommended major courses, and suggested options for upper-division non-business 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 must complete any of the policy options; MKTG 471 is recommended.

1. All students in this major will complete MKTG 440 and 450.
2. An additional three units (one course) must be selected from the following: MKTG 401, 421, 422, 450, 451, 453, 461, 480, and 497.

Materials describing career paths, recommended major courses, and suggested options for upper-division non-business electives are available in the MIS office.

Operations Management
This major offers preparation for management careers in manufacturing and service operations. Emphasis is placed on operations 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 systems of any organization. All students planning to major in operations management must complete MIS 121 before beginning 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 422, 474, 475, 476, 478, 479, or 486.
   B. Two more courses may be taken from either those courses listed under “a” or MIS 331, 341, 421, 441; SIE 462.

**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 an extensive knowledge of mathematics. Students must complete MATH 119 and MATH 123 to be adequately prepared for STAT 275. In addition, students must complete PA 204 before being considered for advanced standing.

The B.S.P.A. degree requires a minimum of 125 units including all of the areas and requirements detailed below. A minimum of 54 units must be completed in course work offered by departments outside the BPA College. Additionally, a minimum of 51 units must be completed in upper-division courses numbered 300 or higher. A grade-point average of at least 2.0000 on all work undertaken for the degree program and in the major field is required for graduation.

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

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

**General Education Requirements**

<table>
<thead>
<tr>
<th>I. Basic Skills and Proficiencies</th>
<th>Units</th>
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<tbody>
<tr>
<td>A. Communications</td>
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<td>ENGL 101 or 103H</td>
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<td>ENGL 102 or 104H</td>
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<tr>
<td>Upper-Division Writing Proficiency Examination</td>
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<td>COMM 412</td>
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<tr>
<td>B. Mathematics and Quantitative Methods</td>
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<td>Math 119</td>
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<td>Math 123</td>
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<td>PA 204</td>
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<td>STAT 275</td>
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<td>C. Language of Commerce/Pre-Professional Course Work</td>
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<td>PA 206</td>
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<td>MIS 111</td>
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<td>ACCT 200</td>
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<td>ACCT 272</td>
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<td>ECON 200</td>
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**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, 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**
   All candidates for the degree must complete this set of professional courses.
   ECON 300 and 435; MAP 305; PA 405, 410, 470 and 480. (21 units)

**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

**Minimum Out-of-College Unit Requirement** 54
**Minimum Upper-Division Unit Requirement** 51

1. Lower-division professional program requirements and prerequisites that must be completed by all B.S.P.A. degree candidates.
2. Students earning an "unsatisfactory” result on the exam normally will be required to complete additional writing course work as specified by the college.
3. College algebra or the equivalent is prerequisite for MATH 119 and 123, which are prerequisites for STAT 275.
4. "To be completed prior to STAT 275.
5. Writing Emphasis course. The writing proficiency exam is a prerequisite.

**B.S.P.A. Advanced Standing Lower-Division Requirements**

To attain advanced standing as a BPA student, the following lower-division program course requirements must be met:
   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 individual or independent study courses 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, 481; 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. PA 241 is a prerequisite for all major course options.

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, 427, 461; 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 that 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.

The Center for the Management of Information (CMI)
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; 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; Pi Alpha Alpha, the National Honor Society for Public Affairs and Administration; Master of Public Administration Student Association; Society for Human Resource Management; Undergraduate Society for Criminal Justice Studies; Accounting Club; Advertising Club; Economics Club; Finance Management Association; American Production and Inventory Control Society; Minority Business Student Association; Native American Business Organization; and Master of Business Administration Student Association.

Outstanding student accomplishments are recognized each year through the presentation of a number of awards and honors.
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, Master of Education, Educational Specialist, Doctor of Education, and Doctor of Philosophy. At the time of catalog production, the Master of Teaching degree was 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 language, reading and culture; special education and rehabilitation; and teaching and teacher education. The Educational Specialist degree is offered with majors in 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 followings programs were under review: the foundations of education major for the Master of Arts and Doctor of Philosophy degrees; the educational administration major for the Doctor of Education and the Educational Specialist degrees; and the educational media major for the Master of Arts and Educational Specialist degrees. Prospective students should consult the Office of Student and Career 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.

General Education

The College of Education is an upper-division college, that is, it provides undergraduates with course work at the junior and senior level only. Undergraduates normally apply for admission to the college at the end of their sophomore year, after two years at a two or four-year institution as pre-education majors. If enrolled at The University of Arizona, pre-education students are administratively housed in Arts and Sciences; however, pre-education majors are advised in the Office of Student and Career Services in the College of Education. Upon formal admission to the College, students are assisted by a faculty advisor in the department appropriate to their chosen major assisted by the Office of Student and Career Services.

Pre-education students fulfill, with a few exceptions, the same general education requirements as in Arts and Sciences. Therefore, pre-education students should refer to the section in this catalog on General Education in Arts and Sciences to plan their freshman and sophomore course work.

REFINEMENTS TO GENERAL EDUCATION REQUIREMENTS

Undergraduate students in the College of Education select a major in either elementary education, secondary education, or special education and rehabilitation. Students should follow the course recommendations below according to the major selected. All students intending to seek admission to the College of Education are strongly encouraged to consult an academic advisor in the Office of Student and Career Services early in their college career.

Elementary Education

MATHEMATICS

Math 117 (College Algebra) or Math 122 (Math in Modern Society) or higher level math courses, are prerequisites to Math 301 (Understanding Elementary Math); which is a prerequisite to the methods of the teaching of math.

BIOLOGICAL AND PHYSICAL SCIENCES

Select one four-unit laboratory science from two of the following areas:

Life Science: Ecology and Evolutionary Biology, Microbiology, Molecular and Cellular Biology, Plant Science or Botany

Earth Science: Astronomy, Atmospheric Science, Geography and Regional Development, Geosciences, Planetary Sciences, Soil and Water Sciences, or Hydrology and Water Resources

Physical Science: Chemistry or Physics

INDIVIDUALS, SOCIETIES, AND INSTITUTIONS

The College of Education requires course work or examinations in U.S. and Arizona constitutions. This requirement may be met in one of three ways:

   POL 102, American National Government (U.S. constitution) and POL 130, American State and Local Government (Arizona constitution)

OR

   Successful completion of the two state examinations in U.S. and Arizona constitutions (The Office of Student and Career Services has information on these examinations).

OR

   Successful completion of Political Science 112 (National and State constitutions) transferred from Pima Community College.

Completion of POL 102 and POL 130 will also meet part of the ISI requirement for College of Education students. Students who have not met this requirement will not graduate or be eligible for teacher certification until this requirement has been met.

ARTS AND LITERATURE

A list of approved courses for the Fine Arts component of this requirement is available in the Office of Student and Career Services.
SECOND LANGUAGE
Any language is acceptable. However, due to the ethnic composition of Arizona schools, the College of Education shows preference to students with competency in Spanish or other languages of the Southwest.

Secondary Education

MATHEMATICS
The math requirements for students at the secondary level vary depending upon the major and minor chosen. Majors or minors in the sciences or math require substantial knowledge (calculus and higher) in math. Other majors and minors may only require a general knowledge of math (MATH 122). Students should check with the Office of Student and Career Services or the respective academic department for the math sequence best suited to their degree objective.

INDIVIDUALS, SOCIETIES, AND INSTITUTIONS
See Elementary refinements above.

SECOND LANGUAGE
See Elementary refinements above.

Special Education and Rehabilitation

MATHEMATICS
The general rehabilitation emphasis in Special Education and Rehabilitation requires knowledge of math in algebra and statistics. The general education requirement for math may be met with college algebra (MATH 171 or MATH 121) or higher. The major emphasis in Deaf Studies requires only a general knowledge of math; MATH 122 will meet the general education requirement for math for students in this area.

BIOLOGICAL AND PHYSICAL SCIENCES
Students intending to major in either program in SER must take EXSS 201 and 202 (4 units each), “Human Anatomy and Physiology”. This eight-unit sequence satisfies the University requirement for biological and physical sciences. Students specializing in SER Deaf Studies may take SPH 260, “Speech Science” (4) and SPH 280, “Hearing Science” (4) to meet their science requirement.

INDIVIDUALS, SOCIETIES, AND INSTITUTIONS
All SER majors must take at least one course in general psychology. PSYCH 101, “Introduction to Psychology” will satisfy part of the General Education requirements under ISI.

SECOND LANGUAGE
For students seeking the SER major with the emphasis in General Rehabilitation, American Sign Language is acceptable, as well as any other second language approved by the University. American Sign Language is required for students seeking the Deaf Studies specialization.

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 special education & rehabilitation. At the time of catalog production, the major in early childhood education was under review.

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 depart-

ment in the Departments and Courses of Instruction section of this catalog. For information on the professional education requirements, consult an academic advisor in the Office of Student and Career Services.

The Bachelor of Science in Education degree is awarded for a major in special education and 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” in this section for a list of available teaching majors.

Undergraduate Minors
At the secondary level (grades 7-12), most majors will require a teaching minor in a second field of specialization. Course requirements for those teaching minors will be listed under the relevant academic department in the Departments and Courses of Instruction section of this catalog. Three 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 complete an academic concentration of at least eighteen (18) units, chosen in consultation with an academic advisor in the Office of Student and Career Services. Areas for the academic concentration are limited to English, fine arts, foreign languages, math, sciences, social sciences, and environmental education.

Majors in Special Education and Rehabilitation require a minor field chosen from anthropology, psychology or sociology. Other areas may be approved and should be selected in consultation with an academic advisor in the Office of Student and Career Services with approval of the Department of Special Education and Rehabilitation.

There is also a non-teaching minor in Special Education and Rehabilitation offered to persons who wish to explore the field as an adjunct to majors outside the College of Education. Students interested in this minor should consult with an academic advisor in the Office of Student and Career Services or the Department of Special Education and Rehabilitation (see Undergraduate Programs section).

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 three 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 also are available as teaching minors:

Chemistry
Communication
Earth Science
History
Journalism
Latin
obtaining a State of Arizona teaching certificate apply for from a regionally accredited institution and are interested in year. Persons who have previously earned a bachelor's degree
College of Education degree as well as for students who wish to undergraduate students who wish to pursue a major for a
ADMISSIONS

Physical Education (B.S.H.S.)
Music Education (B.M.)
Arts and Sciences

Home Economics Education (B.S.F.C.R.)
College of Agriculture

Music Education (B.M.)
Arts and Sciences
Physical Education (B.S.H.S.)
School of Health-Related Professions

*Only available with another science teaching major.

MAJORS REQUIRING NO MINOR

EXTENDED ENGLISH—For information, see the Department of English 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.

The Office of Student and Career Services has a list of the academic subject matter for all teaching majors and minors offered.

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 Arts and Sciences, Fine Arts, will earn a Bachelor of Fine Arts; similarly, a major in agricultural education, offered by the College 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) ............ College of Agriculture
Art Education (B.F.A) .................. Arts and Sciences
Health Education (B.S.H.S) ............... School of Health-Related Professions
Home Economics Education (B.S.F.C.R) .... College of Agriculture
Music Education (B.M) .................. Arts and Sciences
Physical Education (B.S.H.S) .............. School of Health-Related Professions
Theatre Arts Education (B.F.A) .......... Arts and Sciences

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 purpose of earning a teaching certificate. Undergraduate students normally apply for admission at the end of their sophomore year. Persons who have previously earned a bachelor's degree from a regionally accredited institution and are interested in obtaining a State of Arizona teaching certificate apply for admission in the same way as undergraduate students.

Graduate students who have already been admitted to a graduate degree program in the University must also apply for admission to College of Education programs.

The application deadline for any Fall semester is the second Friday in February; the deadline for any Spring semester is the second Friday in September. Applications for admission to any given term should be available in the Office of Student and Career Services immediately after the deadline for the previous admission term.

Eligibility Requirements

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, as well as professionals in special education and rehabilitation, 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 and service of fellow human beings.

To be considered eligible for consideration for admission to the College of Education, applicants must meet the following minimum requirements:

1. Completion, by no later than the end of the term in which application is made, of at least 56 units of credit applicable to a baccalaureate degree;
2. Attainment of a cumulative grade point average of 2.500 or better on the most recently completed 56 units. For purposes of admission to the College of Education, graded units are considered from all institutions attended;
3. Be in “good standing” at The University of Arizona (i.e., have attained a minimum overall cumulative grade point average at the University of at least a 2.00). The College of Education will not consider any applicant who is “on probation” in another college at The University of Arizona.
4. Have taken or have verified registration for the Upper-Division Writing-Proficiency Exam (UDWPE). Transfer students will take the UDWPE in their first semester of enrollment at the University. This exam is not required of post-baccalaureate applicants.

Students who are judged eligible are then evaluated by four additional 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 the applicant’s written materials, letters of recommendation, test scores, and grades in relevant courses.
3. Multicultural 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 relevant work or volunteer experience, letters of recommendation, the applicant’s self statement, and other pertinent information that the applicant may choose to submit. Students interested in admission to a teacher preparation program are strongly encouraged to pursue experience with school-age children in institutional settings (e.g., tutoring in public schools, day care, community agencies, etc.). Special Education and Rehabilitation students are encouraged to pursue work or volunteer experiences in state agencies, programs for the disabled in the public or private sector, group homes, hospitals, substance abuse programs and human service agencies in the community.
Only those applicants who, in the judgment of the Initial Teacher Preparation Committee or the Undergraduate Special Education and Rehabilitation Committee, 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 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.

Meeting or exceeding minimum admission standards as outlined in this admission policy does not in any way imply or guarantee admission to College of Education programs.

If limitations on resources require restrictions to be placed on the number of students admitted in a given semester or year, students will be admitted 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.

Please note: Students admitted to any teacher preparation program at The University of Arizona are required to pass the Arizona Teacher Proficiency Exam (ATPE) prior to student teaching and are urged to take this examination early in their program of studies. Information and test dates on the ATPE are available in the Office of Student and Career Services.

Students majoring in teacher preparation programs outside the College of Education (See “Teaching Majors for Degrees Outside the College of Education”) are not “admitted” to the College. Rather, students in these programs must meet the admission standards of their own program and then apply for “permission” to enroll in the restricted education courses required in their major. Students enrolled in these majors must meet the following minimum standards before enrolling in any restricted professional education course:

1. Completion, by no later than the end of the term in which application is made, of at least 56 units of credit applicable to a baccalaureate degree;
2. Attainment of a cumulative grade point average of 2.500 or better on the most recently completed 56 units. For purposes of determining permission to enroll in restricted professional courses in the College of Education, graded units are considered from all institutions attended.

Students enrolled in these “associate” programs must meet the same deadlines as students seeking formal admission to the College of Education.

**RESTRICTED ENROLLMENT IN PROFESSIONAL EDUCATION COURSES**

Most professional education courses in the initial teacher preparation program 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. The following restricted courses are open only to those students admitted to College of Education initial teacher preparation programs or to students admitted to teacher preparation programs outside the College (see “Teaching Majors for Degrees Outside the College of Education”). The restricted courses are:

- ED 350 Schooling in America
- ED P 301 Child Development
- ED P 310 Learning in Schools
- LRC 435 Content Area Literacy in a Multicultural School
- LRC 480 Children’s Literature in the Classroom
- SER 301a-b Elementary and Secondary mainstreaming
- TTE 300 Classroom Processes and Instruction
- TTE 322-327 Elementary teaching methods courses
- TTE 394a-b Elementary and Secondary practica
- TTE 493a-b Elementary and Secondary student teaching

In Special Education and Rehabilitation only two courses are restricted to majors only: SER 481, Interviewing and Client Services, and SER 483, Supervised Casework in Rehabilitation. At the discretion of the instructor and depending upon resource limitations, courses in Special Education and Rehabilitation may be limited to those majoring or minoring in this field.

**UNDERGRADUATE PROGRAMS**

The following undergraduate programs are currently being offered within the departments of Teaching and Teacher Education and of Special Education and Rehabilitation.

**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 eighth grade should select a major in elementary education. Students should check with the Office of Student and Career Services for current degree requirements.

**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. Students are encouraged to contact an advisor in the Office of Student and Career Services during their lower-division years concerning selection of appropriate teaching majors and minors and for current degree requirements.

**Major in Special Education and Rehabilitation**

The Department of Special Education and Rehabilitation offers two programs within the major of Special Education and Rehabilitation (SER). The general SER major prepares students for entry-level human service positions in state agencies, programs for the disabled in the public and private sector, and group homes. Many graduates are employed in school transition programs, mental health facilities, corrections, private agencies serving a variety of physical handicaps, and social service agencies.

The Deaf Studies specialization within the SER major provides students with the linguistic and cultural competency necessary to work with individuals who are deaf. Therefore, a major component of the program involves developing advanced competency in American Sign Language (the first two years of sign language course work may be used to satisfy the University's second language requirement). Graduates of the program will be prepared for a range of occupations such as rehabilitation technicians, job coaches, house parents in a school for the deaf, or interpreters, and in a range of settings such as residential schools or service or referral agencies.

SER students will earn a Bachelor of Science in Education degree. With this degree a student is making a tentative career commitment. It is highly recommended that a student pursue — as
many do—a master’s degree to develop specialized skills and make a professional commitment.

**Minor in Special Education and Rehabilitation**

For students majoring in areas outside the College of Education, a non-teaching minor in Special Education and Rehabilitation is offered with a choice of four different emphases:

1. special education
2. general rehabilitation
3. rehabilitation with an emphasis in deaf studies
4. combined special education and rehabilitation

Interested students should contact the Office of Student and Career Services or the Department of Special Education and Rehabilitation for further information.

**SPECIAL PROGRAMS**

**Bilingual Education Endorsement**

Arizona and the Southwest enjoy a rich cultural heritage. Cultural and linguistic resources abound in our communities and in our schools. Bilingual education programs, designed to teach children in their home language in addition to English, are an important part of many public school districts’ educational programs.

The College of Education offers two programs at the undergraduate level in bilingual education.

The first program is combined with the general Elementary Education program. This “bilingual option” includes an additional 18 semester units of coursework in bilingual education. Fluency in the language other than English is determined by state-mandated testing. At this time, the program is designed for bilingual Spanish/English students. In addition, some bilingual Native American/English students can be accommodated. The Department of Language, Reading and Culture offers a diversity of language options in bilingual multicultural education at the graduate level.

The other program offered in bilingual education in the College of Education consists of a minor for secondary education majors. The minor in bilingual/bicultural education (see “Majors and Minors for Secondary School Teaching” section) consists of 21 semester units of course work in bilingual education.

Both programs consist of course work in bilingual foundations/philosophy, methodology, linguistics, and culture. As with the Elementary program, fluency in the language other than English is determined by testing.

Both programs require that student teaching be done in a bilingual setting. This practical experience enhances the overall program and prepares students for today’s diverse classrooms. Further information on bilingual education programs within the College of Education is available in the Office of Student and Career Services.

**Middle Level Teaching Endorsement (grades 5-9)**

Prospective teachers who choose to teach at the middle school/junior high level should possess a sound knowledge base of the developmental characteristics of early adolescents (ages 10 to 15 years) and the relationship of those characteristics to curriculum content, instructional practice, and school organization. The College of Education offers course work to meet the requirements for this endorsement as part of either an elementary or secondary teacher preparation program. Student teaching is done in the middle school setting to allow for practical experience in teaching at this age level.

One major offered in the College of Education, Language Arts/Social Studies, is a 50-unit combination major designed for students interested in these academic areas who particularly wish to teach at the middle school/junior high level.

**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.

**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.
COLLEGE OF ENGINEERING AND MINES
Harshbarger Building, Room 134 • (520) 621-6032

Engineering education is preparation for a professional career. While most graduates embark on careers in engineering practice, men and women with engineering majors find the baccalaureate program excellent preparation for other fields as diverse as law, medicine, business and government. An engineering education develops analytical and quantitative thinking, a critical but optimistic approach to problem solving, and the habit of self-directed future learning. Graduates make successful transitions to a wide variety of different careers. The graduate has a thorough understanding of how materials, energy, and information can be adapted to humanity's needs and desires. This is developed through the study of physical science, mathematics, engineering science, engineering design, humanities, social science and practice.

COLLEGE ENTRANCE REQUIREMENTS

Entering freshmen will meet those requirements outlined in the Admission to the University section of this catalog. Notice that in the section titled “Admission to Particular Colleges, 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

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 102 they should re-evaluate their career choices. There will be no loss in credit if majors are changed at the end of the freshman year.

The common freshman curriculum for all degrees offered by the college is as follows:

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<th>Course</th>
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</tr>
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<td>Hum./Soc. Sci Elect</td>
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</tr>
<tr>
<td>Total</td>
<td>18/16</td>
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<td>17</td>
</tr>
</tbody>
</table>

*College algebra and trigonometry should be reviewed before taking the Math Readiness Test.
**See options below

OPTIONS AVAILABLE DURING THE FRESHMAN YEAR

ENGR 170/HSS - Students can choose either of two computer programming languages or a HSS elective at this time, but the following are recommended:

ENGR 170 (FORTRAN) . Aerospace Engineering, Chemical Engineering, Civil Engineering, Engineering Physics
ENGR 170 (Pascal) . Industrial Engineering, Systems Engineering
ENGR 170 (Either) . Agricultural and Biosystems Engineering, Engineering Mathematics, Geological Engineering, Materials Science and Engineering, Mining Engineering


MSE/CHEM—Students can choose either chemistry option, but the following are recommended:


CHEM 103b-104b . Chemical Engineering, Civil Engineering, Engineering Mathematics, Engineering Physics, Geological Engineering, Hydrology, Mining Engineering

Either . 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.
ACADEMIC ADVISING

Visit your advisor every semester. While this catalog is written to give students the maximum information about curricular requirements, all students should visit with their departmental academic advisor at least once each semester. Academic advisors are assigned by contacting the departmental offices.

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 196a and 196b.

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. A list of approved HSS courses is available in the Harshbarger 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.

OPTIONS

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.

Environmental Engineering

This option is available in the departments of Chemical and Environmental Engineering, Civil Engineering and Engineering Mechanics, Hydrology and Water Resources, Agricultural and Biosystems Engineering and Mining and Geological Engineering. This discipline applies fundamental engineering principles to the prevention and solution of problems affecting our environment. Course work concentration in this option covers important environmental topics such as air and water pollution, hazardous waste management, remediation and reclamation, site characterization and environmental regulations.

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.

Medical and Biological Option
Medical and biological engineering is 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 and Environmental Engineering, Electrical and Computer Engineering, Nuclear and Energy Engineering, and Systems and Industrial Engineering have biomedical options available as undergraduate technical electives, graduate and minor programs and research. A university committee coordinates the option. See "Medical and Biological Engineering" under the Departments and Courses of Instruction section for further details.

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 be 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. Successful completion of all required courses listed in the freshman and sophomore years of the appropriate curriculum of the student's major department. At least 12 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 in the above courses (excluding unspecified Humanities & Social Science Courses) of not less than the minimum set by the major department, but in no case below 2.000.

3. Completion of the Upper-Division Writing-Proficiency Examination.

Students otherwise qualified and lacking no more than three required lower-division courses, and/or the Writing-Proficiency Examination, may be granted temporary advanced standing. If these requirements are not completed during the next semester they are offered, the temporary advanced standing may be revoked until they are completed.

Transfer students who do not meet the 12-unit requirement set forth above, but who meet all other requirements, will be granted temporary advanced standing until they have completed a minimum of 12 units of required courses at The University of Arizona. At that time advanced standing will become permanent if the departmentally specified grade-point average requirement is met. If not, the temporary advanced standing will be revoked.

Application forms are available at the Office of the Dean of the College of Engineering and Mines (Room 134, Harshbarger 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. Students should apply for permission at the office of the department offering the courses.

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 Ceramic Society
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

MINORITY ENGINEERING PROGRAM
The Minority Engineering Program (MEP) is an academically-based student support program for ethnic minorities and women. For additional information, please contact Edmund Tellez, MEP Director, (520) 621-8103 or visit the MEP office in the Engineering Building, Room 212.

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 and computer engineering, engineering mechanics, environmental engineering, geological engineering, hydrology, industrial engineering, materials science and engineering, mechanical engineering, mining engineering, nuclear engineering, reliability and quality 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 engineer-
ing, civil engineering, electrical engineering, engineering mechanics, environmental engineering, geological engineering, hydrology, materials science and engineering, mechanical engineering, 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 AGRICULTURAL AND BIOSYSTEMS ENGINEERING

(ABET Accredited)

Agricultural and biosystems engineers integrate mathematics and the biological, physical and engineering sciences with engineering design principles. These principles are applied to the design, analysis, construction, and management of equipment, systems, and facilities for the efficient production, processing, and utilization of food, fiber, and biological/biochemical products. The curriculum is based on a core of courses required of all students with electives to place emphasis in areas such as agricultural engineering, biological engineering, bioenvironmental engineering, irrigation engineering and water resources management, and agri-biosystems power. Modern developments in control systems, expert systems, robotics, sensors, microprocessors, materials science, and computer-based analyses are emphasized throughout the program as appropriate. The major in agricultural and biosystems engineering assumes substantial knowledge of mathematics. Students must complete MATH 124 or 125a, MATH-223 and 254 and STAT 361.

#### Required Curriculum:

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<tr>
<th>Course</th>
<th>Units</th>
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<tr>
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<tr>
<td><strong>Second Semester</strong></td>
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<tr>
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<td>C E 217</td>
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</tr>
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</table>

Please consult departmental literature for further guidance.

*The 9 units of technical electives are selected, in consultation with an advisor, from upper-division offerings in engineering or other scientific technical fields. Each student is required to complete 16 units of engineering design.

The courses above account for 14.5 design units, so a minimum of 1.5 technical electives must be selected from design courses.

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<thead>
<tr>
<th>Course</th>
<th>Units</th>
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<tbody>
<tr>
<td><strong>Sophomore Year</strong></td>
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</table>
Civil 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:

**Senior Year**

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*Physics, chemistry, biology or related agriculture science.
**Total electives include eight units minimum of approved agricultural/biological sciences and the remaining technical electives dependent upon area of emphasis and advisor's approval. The technical electives should include a minimum of 5.5 units of design. Eighteen units of humanities and social sciences (HUM/SOC SCI), selected in accordance with COEM guidelines, are also required. Courses in each area must be selected in consultation with the student's advisor. For those concentrating in biological engineering CHE 201 and 316 may be substituted for the ABE 230 and three units of electives.

**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**

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**Junior Year**

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**Senior 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

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### Junior Year

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### Senior Year

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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 Microwave 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:

### Sophomore Year

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### Junior Year

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<td>A ME 331a</td>
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### Senior Year

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*Those students interested in using technical electives to emphasize computer science should include C SC 227 and 237 their first three semesters.

**Humanities and social science electives: 17 units to be chosen from a list approved by the college. Technical electives: 17 units to be chosen in consultation with an advisor.
BACHELOR OF SCIENCE IN ENGINEERING PHYSICS

Modern engineering regularly begins at the edge of scientific knowledge. The engineering physics program is designed to provide the strong scientific base and the grounding in engineering perspective essential to use this knowledge. Graduates are prepared for employment in a variety of engineering fields. They are also prepared for graduate study in physics and in some areas of engineering. Which preparation predominates depends on choices of technical elective courses. These are normally upper-division units chosen in conference with an advisor, which constitute a coherent supplemental program.

Students committing to the program in the freshman year are advised to follow the curriculum shown below. The engineering college freshman curriculum is also acceptable; students choosing this option should plan to replace PHYS 111a-111b; 112a-112b with PHYS 110, 116, 121, and 330.

Required Curriculum:

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**Sophomore Year**

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**Junior Year**

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**Senior Year**

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**Summer Session**

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**BACHELOR OF SCIENCE IN HYDROLOGY**

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 resource exploration.

An environmental engineering option is available in the Department of Mining and Geological Engineering. This discipline applies fundamental engineering principles to the prevention and solution of problems affecting our environment. Course work concentration in this option covers important environmental topics such as air and water pollution, hazardous waste management, remediation and reclamation, site characterization, and environmental regulations.

Required Curriculum:

**Sophomore Year**

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<tr>
<th>Course</th>
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**Junior Year**

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**Senior Year**

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*B The 25 units of electives are chosen by the student in consultation with a faculty advisor. 16 units are selected from humanities and social sciences and must satisfy the college requirements for these courses. The remaining 9 units of technical electives are selected from engineering and science courses, and must include 3 units of design.

**BACHELOR OF SCIENCE IN 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 with the degree of Bachelor of Science in 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 at field sites and in research laboratories to solve water resource problems.

Required Curriculum:

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
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### Junior Year

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| Total                   | 17    | 15

### Summer (Preession & Summer Sessions)

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*Initiate Internship/Practicum spring or summer. Final report due subsequent fall semester (Practicum 494).

### Senior Year

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<td>HWR 482*</td>
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<tr>
<td>HWR 494 Practicum*</td>
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<td>ENGL 308</td>
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<tr>
<td>Tech./General Elective**</td>
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</table>
| Total                   | 16    | 16

*Choose 4 out of 5: (1) HWR 427 or WSM 467; (2) HWR 482; (3) HWR 450B; (4) HWR 493/494 Internship/Practicum; (5) A course listed in any of the specialization options mentioned below. The Internship/Practicum project must be approved by the Practicum Instructor or undergraduate advisor. Honors students should complete an approved Senior Honors Thesis in lieu of the Senior Internship/Practicum sequence.


### 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, implement, and operate the system. 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, telecommunications, transportation and government. In each of these environments, industrial engineers are involved with a variety of systems such as production planning, quality assurance, 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 information-driven 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.

### Required Curriculum:

#### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
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<tbody>
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#### Junior Year

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#### Senior Year

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<td>HWR 443</td>
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<tr>
<td>Tech. / General Elective*</td>
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</table>
| Total              | 17    | 17

#### Required Curriculum:

*Hum. and soc. sci. electives must be chosen from a list approved by the College of Engineering and Mines and satisfy sequence requirements. Consult your faculty advisor.

**Three units of technical electives must be upper division SIE courses with at least one hour of engineering design (ED) and 2 hours of engineering science (ES). Others may be selected from a list of 300-400 level courses available in the departmental office and approved by the student's faculty advisor. In the manufacturing systems option, the technical electives are chosen from manufacturing oriented courses such as SIE 485 and 486.

### BACHELOR OF SCIENCE IN MATERIALS SCIENCE AND ENGINEERING

(ABET Accredited)

Materials science and engineering is the study of the structure, processing and properties of materials. The field covers the be-
havior 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 on 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:

### Sophomore Year

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<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
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### Junior Year

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<td>Adv. Basic Sci. Elective*</td>
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### Senior Year

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</table>

Each Student’s program must include 16 units of engineering design content. Nine of these units come from the core courses (ENGR 102, MSE 360R, 442a, 442b, 444) and the rest must be made up through proper choice of electives.

*Electives must be chosen in consultation with the student’s advisor.
**Technical Electives

In the MSE program, students are encouraged to take courses from related disciplines. Some of these disciplines are chemistry, physics, mathematics, statistics, biological sciences, biochemistry, microbiology, geoscience and other engineering areas. Typically, 200 or higher level courses in these disciplines are acceptable. Students with particular career or academic goals may propose technical electives in other subject areas. However, it is important that the courses are chosen in consultation with the advisor to make sure that the engineering design and science component requirements are met.

### 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:

### Sophomore Year

<table>
<thead>
<tr>
<th>Course</th>
<th>Units</th>
<th>Course</th>
<th>Units</th>
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### Junior Year

<table>
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<tr>
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### Senior Year

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<tr>
<td>Tech. Electives*</td>
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</table>
control and application of all forms of energy resulting from nuclear reactions and to the utilization of the unique properties of radioactive materials in research, medicine, and materials processing. This branch of engineering is rooted in the physical sciences and mathematics; its applications range from power generation to radioisotope uses in science, medicine, and industry.

The four-year curriculum begins with a group of science and mathematics studies designed to provide the basis for work in the engineering sciences. Writing and computer skills are also included in the basic curriculum. Subsequent courses provide the specific engineering science and engineering design instruction needed to prepare for work as a nuclear engineer. The further development of computer skills in problem formulation, system modeling, and numerical evaluation are an essential part of this program. Further studies in the humanities and social sciences are included in the latter years of the program. For some students, the opportunity to take for the first time or expand already existing skills in a foreign language is a welcomed option.

The objective is to develop the skills and insight to allow a positive and creative response to new opportunities that may arise from future technological initiatives. Of importance is the understanding that continued intellectual development is a basic ingredient for continued success in any engineering field, and, especially in the changing nuclear engineering discipline.

Facilities available for laboratory instruction and research include: the TRIGA nuclear reactor, operating in either the steady or pulsed mode; the 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.

The major in Nuclear Engineering assumes substantial knowledge of mathematics. Students must complete MATH 124 or 125a, MATH 223 and MATH 254.

**BACHELOR OF SCIENCE IN RURAL ENGINEERING**  
*ABET Accredited*

Nuclear engineering is directed to the study of the release, control and application of all forms of energy resulting from
Energy Management Option: NEE 440 and one of the following: NEE 441, 442, 445, 446 or 447

Health Physics Option: NEE 485a and 485b
Nuclear Waste Management Option: NEE 487a and 487b

*Elective courses are chosen by the student in consultation with a faculty advisor.  H &SS = ECON 210 plus 13 elective units (grid above shows suggested times; H &SS may be taken at any time during the student's academic career); Technical Electives = 9 units.

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:

<table>
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<tr>
<th>Course</th>
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<tbody>
<tr>
<td>MATH 223</td>
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Junior Year

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Senior Year

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<td>Total Credit Hours</td>
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Six units of Technical Electives must consist of two courses from the list: ECE 340, 351b, 425, 430, 434, 456, 459, 482, 487, SIE 230; or one course from this list and its 300-level prerequisite. The remaining nine units may satisfy this rule or be chosen from the union of this list and other 400-level courses in engineering, mathematics, optical sciences or physics. Each student is required to complete 16 units of engineering design.

BACHELOR OF SCIENCE IN SYSTEMS ENGINEERING

(ABET Accredited)

Systems engineers design and build systems to meet the needs of people. As 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, transportation systems, 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 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:

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<td>Course</td>
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First Semester

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Second Semester

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Senior Year

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<tr>
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<tr>
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</table>

**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 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
Admission to the College of Law is very competitive. The College seeks to enroll a class of approximately 150 students reflecting diverse talents and experiences each fall. For the Fall 1994 entering class, 2,444 candidates applied for admission, 399 candidates were admitted and 151 students enrolled. The median LSAT for the 1994 first-year class was a 162 (approximately the 89th percentile) and the median undergraduate grade-point average was 3.34. 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, to read extensively and to develop strong analytical and writing skills. Admission is based on 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 that 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 by the evaluation of the Admissions Committee from a group of exceptional 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. We believe that diverse experiences, ideas and goals are essential to a vital educational process and a dynamic legal profession. In addition to academic records and test scores, the Committee looks to other factors in the assessment of applicants, including colleges or universities attended, course of study, grade trends, graduate study, significant or extracurricular activities, unique educational or occupational experiences, involvement in community affairs, substantial community service, 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, the Committee considers the individual strengths and characteristics of each applicant and the entire file submitted by each applicant in the context of the applicant pool for each year.

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 after Oct. 1 of the year prior to anticipated enrollment.

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. LSDAS report sent to the College directly by Law Services (See item 4 below).
   E. Domicile Affidavit.
   F. Two letters of recommendation (See item 5 below).
   G. A nonrefundable $35 application processing 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 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, including educational and work experiences, talents and special interests, cultural and economic background, involvement in community affairs and public service or any events or circumstances that have helped shape the applicant's life or given it direction.

3. All candidates must take the Law School Admission Test (LSAT), which is given at centers in the United States several times a year. Information about the test can be obtained by writing Law School Admission Services (LSAS), Box 2000, Newtown, PA 18940-0998 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 1995 enrollment and thereafter. If candidates have questions about whether to re-take the LSAT, contact the Admissions Office.

4. All applicants must register for a Law School Data Assembly Service Report (LSDAS). LSDAS reports are produced only for candidates who are registered with and have paid all fees to LSDAS. All candidates must sign the LSDAS "Authorization to Release Education Records, Agreement to Conditions, Signature" section. Please refer to the current LSAT/LSDAS Registration and Information Book.
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 processing 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 meets the requirements of 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 reapply are urged to consider retaking 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. There are no exceptions to these requirements.

LSDAS evaluates the transcripts from very few institutions outside the U.S. and Canada. Applicants who completed undergraduate or graduate work at institutions not evaluated by LSDAS 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.
4. A T.O.E.F.L. score from a test taken during the past year.

Deadline Summary

First-Year Applicants to J.D. Program

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 Applications

A limited number of second-year students who have done exceptional work 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 official LSDAS report reflecting the entire undergraduate career and the LSAT score.
4. An official 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 stating that the student is in good standing and eligible to continue studies at that institution.
6. A nonrefundable $35 application processing fee. (Only checks or money orders, payable to The University of Arizona College of Law, are acceptable.)

Transfer admission is highly selective. 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. 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 considered for transfer to the College of Law.

Factors considered in the transfer admission process include: the nature of the law school attended, the quality of the candidate’s performance as a first-year law student, the nature of the applicant’s undergraduate record and LSAT score, the candidate’s admisibility as a first-year applicant, the circumstances surrounding the request to transfer and letters of recommendation from law faculty with whom the applicant has studied.

Transfer students will not receive credit for work done at a law school that 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
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 apply, 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
(520) 621-2477

**LL.M. PROGRAM**

The University of Arizona College of Law is now offering a program leading to the degree of master of laws in international trade law. The LL.M. program, approved by the American Bar Association and the Arizona Board of Regents, enrolled its first ten students — law graduates from the United States, Mexico, Spain and Germany — in August 1994.

The one-year, full-time program, offered in coordination with the National Law Center for Inter-American Free Trade, is designed to provide candidates with the theoretical and practical knowledge required to understand current developments in the areas of international trade and commercial law, particularly with regard to Western Hemisphere free trade and economic integration. LL.M. candidates will complete a minimum of 24 credit hours for the degree. The curriculum includes “core” courses such as international trade and investment law, international commercial law and international litigation, as well as related general courses such as corporate law, securities law, administrative law, antitrust law and the Uniform Commercial Code.

All LL.M. candidates must be J.D. graduates of an ABA approved law school in the United States, or demonstrate equivalent academic credentials from an accredited foreign law school. Candidates should have a strong academic record, experience or interest in international law, and fluency in English as well as Spanish or Portuguese.

**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 Dean, the Associate Dean for Academic Affairs or other designate of the Dean, be allowed to audit a course or a limited number of courses as Special Students. Applicants must have experience and educational background that indicate a strong probability that they will be successful in law study. They must also demonstrate a special need for legal training. The discretion of the Dean or Associate Dean to permit special students to audit a course is limited to people within the University community (faculty, staff, graduate students) and members of the legal profession (lawyers and judges). If permission is granted to anyone within these designated groups, then the auditing process is administered by the College of Law Registrar’s Office. Students who anticipate the possibility of applying or enrolling as a full-time student at some point 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 participating in a graduate degree program, with the written approval of their advisors and Dean of the Graduate College, may register for a limited number of courses in the College of Law. Students desiring to do so will be required to obtain the approval of the instructor and the Associate Dean for Academic 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

**Honor Code**

The College of Law has a strict Honor Code that governs student conduct. The College of Law Honor Code applies to all elements of life at the College, including the admissions process. Omissions of fact, misrepresentation or false statements may be the basis of denial or revocation of an offer of admission.

**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.

**NONFREE AND EXPENSES**

The University of Arizona College of Law provides an outstanding legal education at a very modest cost relative to private law schools and other public university law schools.

Following is a summary estimate of minimum annual expenses for the 1994-95 academic year for self-supporting law students, who are over 22 years of age living off campus.

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
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<tbody>
<tr>
<td>Room/Board</td>
<td>$6,380.00</td>
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<tr>
<td>Books and Supplies</td>
<td>620.00</td>
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<td>Travel</td>
<td>1,200.00</td>
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<td>Miscellaneous</td>
<td>2,630.00</td>
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<tr>
<td>Registration Fee</td>
<td>3,894.00</td>
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<tr>
<td>Total (Resident of Arizona)</td>
<td>$14,724.00</td>
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<tr>
<td>Nonresident Tuition</td>
<td>$5,606.00</td>
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<tr>
<td>Total (Nonresident)</td>
<td>$20,330.00</td>
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</table>

Students should add incidental personal expenses as anticipated. Fees for each semester are payable upon registration. A fee payment schedule, including information on deadlines and methods of payment, is published in the schedule of classes.

The Board of Regents reserves the right to change charges, including tuition and fees, without notice as necessary.
Medicine
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, please request a College of Medicine 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 general 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 the College of Medicine. The test should be taken in the year preceding that in which the student hopes to enter medical school, or at the earliest, within two years of application. For the 1995-96 academic year, the MCAT must have been taken in 1993 or later. For the 1996-97 academic year, the MCAT must have been taken in 1994 or later. For applications write: MCAT—Program Office, 2255 N. Dubuque Road, P.O. Box 4056, Iowa City, Iowa 52243.

APPLICATION TO THE FIRST-YEAR CLASS
The College of Medicine participates in the American Medical College Application Service (AMCAS). Persons seeking admission to the College of Medicine at The University of Arizona must process their application through AMCAS; even if this is the only school to which they apply. Application materials may be obtained from the pre-med advisor's office, 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. (Positions become available only through attrition.) 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 (B.S.N.) and graduate programs leading to the Master of Science and Doctor of Philosophy degrees with a major in nursing. The B.S.N. and graduate curriculum are currently under review. Prospective students should consult the College of Nursing for current information. 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.N. degree 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 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. Minor programs of study are available for undergraduates. Completion of a minor is not required for graduation from the College of Nursing. A minimum of 18 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. Selection of a minor should be made in consultation with a College of Nursing advisor.

Nursing students are preparing for a profession which is exacting and in which they must take responsibility for the lives and well-being of others. Applicants must be in good physical and mental health; otherwise, they may be denied admission or, once admitted, recommended for withdrawal.

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 of Nursing.

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 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. Before a decision to transfer to The University of Arizona is made, prospective transfer students are strongly advised to have their previous course work evaluated by the College of Nursing.

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 above 3.00 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 a fall semester need to file the special application form, obtained directly from the college, by December 1 of the previous year in which they desire to enter and can expect to hear of their status in early April. Students planning to enter the college in a spring semester must file this application by July 1 of the previous year and can expect a response regarding acceptance in early October. 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.N. 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 2.000 or better for all work undertaken in the major field at The University of Arizona. (See also Graduation Requirements section of this catalog.)
Graduation from the College of Nursing is not the sole criterion for obtaining a license to practice nursing in Arizona. Licensing requirements are the exclusive responsibility of the State Board of Nursing. Graduates must satisfy licensure requirements independently of degree requirements.

Grading Policy for Nursing Courses
The grade of “D” is unacceptable for courses in the nursing major, 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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Sophomore Year

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Senior Year

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<td>TOTAL</td>
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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 approximately six years of college work (two to three 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 Arts and Sciences. Equivalent courses completed at other colleges or universities may be accepted in fulfillment of the prepharmacy course requirements with advisor approval.

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 to be completed, (4) a completed student profile questionnaire, (5) an essay, (6) three recommendation forms, and (7) an interview. All science courses must be complete the spring prior to admission. All application materials, including application form and transcripts, should be sent directly to The University of Arizona, College of Pharmacy, Room 344, Tucson, Arizona 85721. Students who seek admission to the College of Pharmacy are urged to initiate the application process in September of the year preceding admission and have all application materials submitted as soon as possible, but no later than by mid-January of the application year. Applicants will be informed of their admission status by May.

All necessary application materials are available from the College of Pharmacy, Room 344.

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.

INTERNERSHIP 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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*Contact the College of Pharmacy for list of options.

**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.
### First Professional Year

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### Second Professional Year

#### First Semester

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**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
- Pharmacology & Toxicology
- Health-Related Professions
- Psychology
- Management Information Systems
- Marketing
- Microbiology & Immunology
- Molecular & Cellular Biology
- Nutrition & Food Science
- Pharmaceutical Sciences
- Finance & Real Estate
- Pharmacy Practice
- Management & Policy
- Sociology
- Statistics

Examples of electives pertinent to pharmacy that may be taken:

- PHSC 427 (2) Antineoplastic Drugs
- PCOL 399 (1-4) Independent Study
- PHPR 399 (1-4) Independent Study
- PHPR 419 (2) Parenteral Preparation
- PHPR 424 (2) Antibiotics
- PHPR 448 (2) Perspectives in Geriatrics
- PHPR 483 (3) Perspectives in Cancer Care
- PHPR 489 (3) Clinical Pharmacotherapy of Mental Disorders
- PHPR 495a (2) Issues in Pharmacy
- ENGL 307 (3) Business Writing
- ENGL 308 (3) Technical Writing
- MAP 330 (3) Human Resource Management
- MAP 305 (3) Management and Organizational Behavior
- MAP 455 (3) Preventative Health Care Policy and Administration
- MKTG 361 (3) Introduction to Marketing
- MIS 411 (3) Information Systems in Society
- NFSP 310 (3) Principles of Human Nutrition in Health and Disease
- SER 484 (3) Problems of Drug Abuse

### 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.

At the time this catalog was being edited, the School of Health Related Professions and its major programs were undergoing review and reorganization. All current and prospective students considering application to one of the undergraduate or graduate majors offered by the School should check with the academic advisors for that major.

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 units 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 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 that major.

GENERAL EDUCATION REQUIREMENTS

For the Bachelor of Science in Health Sciences

I. Basic Skills and Proficiencies
A. English ................................................. 6

II. Study Areas
A. Traditions and Cultures ............................ 9
B. Biological and Physical Sciences ................. 12
C. Individuals, Societies and Institutions .......... 9
D. The Arts and Literature ............................ 6
Total .................................................. 36
Total General Education Requirements .......... 45-53

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)
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): 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; ENGL 101 (or 103H), 102 (or 104H); EXSS 201, 202, 308; MATH 117R (or 117S), 118, 124 or 125a; MCB 181; PHYS 102a-102b, 180a-180b; PSYC 101.

Major Requirements
The major requires completion of a core of 24 units: EXSS 201, 202, 308, 420, 421, 460, 462, 495a, 496b, and 10 units from
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 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): 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 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 SC 310; OSH 468.

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 2.500 or higher on the most recently completed 56 units of course work completed at the time of application or by the end of the current semester, whether at the University or elsewhere;

2. 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, which is also called clinical laboratory science. This health profession is responsible for clinical laboratory analyses, including quantitative, qualitative and morphological measurements which assist the physician in clinical diagnosis and treatment.

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

Post-baccalaureate students who meet certain minimum requirements may apply for the professional training to become M.T. certification eligible. Students in this category should contact the Medical Technology Program Office for more information.

General Education Requirements for the Major in Medical Technology

I. Basic Skills and Proficiencies (9-17 units)
   A. English Composition (6 units): ENGL 101 (or 103H), ENGL 102 (or 104H).
   B. Foreign Language (0-8 units): Students must demonstrate proficiency in a single foreign language at the 2nd semester level. This can be accomplished through courses (8 units) or by examination (0 units).
   C. Mathematics (3 units): MATH 117R.

II. Study Areas (36 units)
   A. Traditions and Cultures (9 units): Choose a two-course sequence from BookLink List 2 and one course from List 2.
   B. Biological and Physical Sciences (12 units): CHEM 103a, 103b, 104a, 104b, PHYS 102a, 180a.
   C. Individuals, Societies and Institutions (9 units): MEDT 387, 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 (one course in the arts, one in literature).

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 (MATH 124 or 125a may be substituted for MATH 117R and 118); MID 204, 419; PHYS 102b, 180b; 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.
A moratorium has been placed on admissions to this undergraduate major. However, other degree options are available in the areas of environmental and occupational health. Interested students should consult the faculty in occupational safety and health for information concerning these options.

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 102, 103, 181, 182.

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, 420, 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 320, PSYC 101 and one 3-unit course approved from Booklink.
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 3-4 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), 102 (or 104H); EXSS 201, 202, 285, 288, 320, 373, 374, 6 units of professional activities (EXSS 208-232), and 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 2.500 or higher on the most recently completed 56 units of course work completed at the time of application or by the end of the current semester, whether at the University or elsewhere; 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 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 22 units of College of Education course work is required for State Teaching Certification: ED P 510, 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, 410, 497a, 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 outside the United States that lead to degrees considered not equivalent to the U.S. bachelor’s degree, or that lack recognition by the home country’s Ministry of Education.
3. 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.
4. Credits awarded by postsecondary institutions for courses taken at noncollegiate institutions (e.g., governmental agencies, corporations, industrial firms, etc.).
5. Credits awarded by postsecondary institutions for noncredit courses, workshops, and seminars offered by other postsecondary institutions as part of continuing education programs.

In general, degrees that are recognized should be based on a unit of credit comparable to that defined by the Arizona Board of Regents (26 May 1979) for institutions under its jurisdiction. A minimum of 45 hours of work by each student is required for each unit of credit. An hour of work is the equivalent of 50 minutes of class time (often called a “contact hour”) or 60 minutes of independent study work. For lecture-discussion courses, this requirement equates to at least 15 contact hours and a minimum of 30 hours of work outside of the classroom for each unit of credit. Even though the values of 15 and 30 may vary for different modes of instruction, the minimum total of 45 hours of work for each unit of credit is a constant. Admission is granted only after approval of an applicant’s previous academic record by the Dean of the Graduate College and the head of the academic unit in which the greater portion of major academic work will be completed.

Grade-Point Average

Applicants who apply for admission to the Graduate College are evaluated on the individual merits of their academic achievements and individual scholarly potential to complete graduate level course work and curriculum requirements. Ordinarily, a minimum cumulative grade-point average of 3.0 over the last 60 units of course work is required for admission to the Graduate College. Applicants should consult the academic unit to which they are applying regarding that unit’s grade-point average expectations. Prospective students who do not meet this standard may enroll as non-degree students and complete 12 consecutive units of 500-level (or higher) course work with a grade-point average of at least 3.25 in order to establish eligibility for seeking admission to the graduate degree program of their choice.

Graduate Record Examination (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 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 12 units earned while in this status may later be applied toward an advanced degree awarded at the University.

Admission of International Students
Nonimmigrants should request graduate application forms from the Graduate Admissions Office and departmental requirements and materials from the major academic unit. All international student applications, with required credentials, must reach the Graduate 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, Zimbabwe or the republics of the Commonwealth of Independent States. All other international applicants must submit a $35.00 processing fee with their application.

International Special Status
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.

Students admitted to this status are full-time students, taking a minimum of nine units 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. It is the responsibility of the student to initiate the request to change to Regular Graduate Status. Forms are available in the Graduate Degree Certification Office, Administration Building, 316.

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. A minimum, composite score of 550 is required by the Graduate College. Some departments require a higher score. Students whose native language is not English and who wish to be considered for a teaching assistantship must also submit scores on the Test of Spoken English (TSE) that is also administered by the Educational Testing Service of Princeton, NJ 08540, or the SPEAK test available at The University of Arizona.

For those prospective students who lack college-level English proficiency, the Center for English as a Second Language (CESL) offers full-time English language training on campus. The full semester or summer term sessions carry no college credit, but satisfactory completion of CESL training meets the University’s English proficiency requirement for admission. Further information can be requested from the Center for English as a Second Language, Room 104 CESL Building, University of Arizona, Tucson, AZ 85721.

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 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 official transcripts/diploma 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 June 1 for fall term and October 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 requirements.

Students who have been admitted to the Graduate College but who were not enrolled during the previous regular semester
must reapply for admission. (See 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 Music (M.M.)
- Master of Public Administration (M.P.A.)
- Master of Public Health (M.P.H.)
- 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**

Graduate interdisciplinary programs have emerged in response to recent changes in many domains of knowledge. They pool expertise from traditional academic fields and embody the spirit of innovation, the search for new knowledge, and the application of this knowledge into new contexts. The need for interdisciplinary approaches, in a wide spectrum of human endeavors, has been recognized by the National Science Foundation, which states that "many of the challenges and opportunities today and into the next century cross traditional disciplinary boundaries." Consistent with this philosophy, interdisciplinary programs (IDPs) offer cutting edge environments for training graduate students and, in a growing number of cases, provide introductory undergraduate courses to acquaint students with innovative opportunities in graduate education.

There are currently 19 IDPs at The University of Arizona in which more than 680 members of the faculty participate. These faculty members represent most colleges and 74 departments. Approximately 11% of graduate students are enrolled in IDPs, and in 1994 the number of advanced degrees earned through IDPs has increased to 143, accounting for 15% of advanced degrees awarded at the University.

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 the IDP Office reports to the Dean of the Graduate College and the Vice President for Research. Close interactions with college deans and department heads are continuously nurtured to optimize participation of faculty in interdisciplinary programs. Graduate interdisciplinary programs are governed by interdisciplinary faculty committees appointed by the Dean of the Graduate College.

For more information on the following graduate interdisciplinary programs, consult the Departments and Courses of Instruction section of the catalog.

**Graduate Interdisciplinary Programs**

- American Indian Studies
- Applied Mathematics
- Arid Land Resource Sciences
- Cancer Biology
- Cognitive Science
- Comparative Cultural and Literary Studies
- Epidemiology
- Genetics
- Gerontological Studies
- Insect Science
- Latin American Studies
- Neuroscience
- Nutritional Sciences
- Optical Sciences*
- Pharmacology and Toxicology
- Physiological Sciences
- Planning
- Remote Sensing
- Second Language Acquisition and Teaching

*Affiliate program
GENERAL DIVISIONS

EXTENDED UNIVERSITY

1955 East Sixth Street
(520) 624-UofA

The University of Arizona Extended University promotes lifelong learning by extending the resources of The University of Arizona through convenient educational programs.

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 academic deans, Extended University manages degree programs offered through the Evening and Weekend Campus. 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 their 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, business and professional writing, management and leadership, economics, accelerated language, music, arts, creative 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, creative writing, business and professional writing 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.

CHILDREN'S PROGRAMS/SEEK/SPEAK/LEAP—Summer enrichment classes for children include classes for elementary and middle school children, summer Spanish-language and ESL, immersion programs and creative movement. SEEK Saturdays are weekend enrichment classes during the school year in the arts, nature and a variety of other activities. 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.

WRITING WORKS CENTER—Small classes and distinguished faculty members help students improve skills in business and professional writing and creative writing. Certificate programs are available.

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 correspon-
dence students is held in reserve for them until they enroll in a degree program. University of Arizona students must obtain the written approval of an advisor in 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
Evening and Weekend Campus offers credit courses evenings and weekends to adults who cannot attend daytime classes. Now available are the PCC/UA interdisciplinary studies major and the Graduate Gerontology Certificate Program.

The PCC/UA Bachelor of Arts Degree Program
Pima Community College (PCC) and The University of Arizona cooperate in providing evening and weekend courses that 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 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 (520) 624-UofA, ext. 249.

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 (520) 624-UofA, ext. 250.

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.

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.

Certificate Programs: The Professional Certificate in Reliability and Quality Engineering is offered through VideoCampus and requires 15 units of graduate-level coursework.

Noncredit Courses: Prerecorded noncredit courses, available at any time, cover a variety of subjects. For a complete list of courses, call (520) 624-UofA.

Video Conferences: In the Tucson area, VideoCampus delivers video conferences to a variety of locations on topics such as managerial and technical training, professional development, and office management.

SIERRA VISTA CAMPUS
1140 N. Colombo
Sierra Vista, Arizona 85635
(520)629-0335 (Tucson)
(520)629-0362 (Tucson Fax)
(520)458-USAV (Sierra Vista)

The University of Arizona Sierra Vista Campus delivers educational services at the junior, senior, and graduate levels in southeastern Arizona. Students may take lower-division courses at any accredited college or university and upper-division University of Arizona credit work at the Sierra Vista Campus for a complete undergraduate degree program. Courses are offered during the day or in the evenings.

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 Community Affairs, 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 southeastern Arizona 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. Study areas available in Sierra Vista are 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 Education with a major in teaching and teacher education.
6. Master of Science with a major in electrical and computer engineering.

In addition, the Sierra Vista Campus offers a nondegree professional education sequence which prepares students for Postbaccalaureate Certification in Elementary and Secondary 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 (3 credit hours each)*

*Requirements may vary slightly; please consult an advisor for complete degree information.

 Bachelor of Arts Degree: Interdisciplinary Studies Major

Interdisciplinary studies programs are planned with and approved by an academic advisor. 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. Advising appointments may be made by calling the Sierra Vista Campus office at (520) 458-UASV, ext. 125.

 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. (See the Department of Political Science section for specific degree information.) Advising appointments may be made by calling the Sierra Vista Campus, 458-UASV, ext. 133.

 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, 458-UASV, ext. 136.

 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. completed at least 56 credit hours of course work;
4. taken the Upper-Division Writing-Proficiency Examination (UDWPE).

Postbaccalaureate Certification in Elementary and Secondary 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. Advising appointments may be made by calling the Sierra Vista Campus, 458-UASV, ext. 125.

Note: Some secondary education courses may need to be taken on the Tucson 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 nonthesis options. The nonthesis option requires at least 24 units in the major field and six units in a minor field. The thesis option requires 18 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, (520) 621-2434.

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, 458-UASV, ext. 132.

The Office of Community Affairs

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. Call 458-UASV, ext. 137 for additional information.

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 (520) 458 UASV, ext. 141.

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, (520) 458-UASV, ext. 134.

STUDY ABROAD

Harvill Building, Suite 147
(520) 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 counselors assist students in choosing a program, gaining admission, selecting classes, planning housing and transportation and arranging for academic credit. The office keeps an extensive library of literature and videotapes on foreign study programs around the world. Costs for programs vary. Limited financial aid is available through the Study Abroad Office and foreign institutions; in addition, students qualifying for financial aid through The University of Arizona (e.g., Federal grants and loans) can normally apply those funds toward foreign study programs.

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 pursued through study abroad programs. Many programs are available in Western Europe through the Study Abroad Office: England, Spain, France, Italy, and Denmark are popular destinations. Programs also exist in Russia and Hungary. Additionally, as part of a growing commitment to offer more opportunities in non-Western arenas, the Study Abroad Office has expanded its programs in Latin America, the Middle East and East Asia.

In addition to study abroad programs, the Study Abroad Office also offers exchange programs with select foreign universities; exchange programs with a number of universities in Mexico are available to University of Arizona undergraduates, as well as exchange programs in Germany and Taiwan.

GUADALAJARA SUMMER SCHOOL

Harvill Building, Room 309
(520) 621-5137

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 advanced 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
(520) 621-1609, 621-1281, 621-3521, respectively

The Reserve Officer Training Corps (ROTC) has been an integral part of The University of Arizona since 1917. The School of Military Science, Naval Science and Military Aerospace Studies consists of three separate departments, the Department of Military Science (Army), Department of Naval Science (Navy and Marine Corps), and the Department of Military Aerospace Studies (Air Force), under the administrative control of the military coordinator, a civilian member of the University staff designated by the President of the University.

General objectives of the course of instruction are to furnish leaders suitable for commissioning as officers in the U.S. Army, U.S. Navy, U.S. Marine Corps, and U.S. Air Force. Outstanding Army ROTC students who are designated Distinguished Military Students are eligible to apply for appointment as officers in the Regular Army. All graduating students in the Air Force ROTC program go on active duty. Intermediate objectives of the ROTC programs are to develop self-discipline; integrity; a sense of responsibility; an appreciation of the role of a participating citizen in the national defense; and the capacities for thoughtful and decisive leadership.

Department of Military Science

Army ROTC (Reserve Officers’ Training Corps) is a program which offers college students the opportunity to graduate as officers and serve in the U.S. Army, the Army National Guard, or the U.S. Army Reserve. Army ROTC has been an integral part of The University of Arizona since 1917.

Army ROTC enhances a student’s education by providing unique leadership and management training, along with practical experience. It helps a student develop many of the qualities basic to success in the Army, or in a civilian career. ROTC gives each college student a valuable opportunity to build for the future by earning a college degree and an officer’s commission at the same time.

Programs

The Department of Military Science offers a regular four-year program and a special two-year program.

The four-year program is divided into two parts called the Basic Course and the Advanced Course. The Basic Course is usually taken during the first two years of college and covers such subjects as first aid, land navigation, basic rifle marksmanship, 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, 332, 436, 449, 450

Computer Literacy
1. MIS 111, 121
2. C SC 115, 121

Mathematics
1. College Algebra, MATH 117R (or 117S)
2. Elements of Calculus, MATH 123
3. Introduction to Statistics, MATH 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 with approval by the Professor of Military Science.

Lower-Division Credit
One to 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 nonscholarship, 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 101/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 biennial 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.) May be convened with 506. 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./6 units] 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.

1 — 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 "cross-listing" department. Exceptions are house-numbered courses, which do not have course descriptions.

May be convened with 506—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. The 500-level listing designates additional requirements for graduate credit.

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” numbers identify three categories of courses using alternative teaching formats: (1) courses which designate special senior-level undergraduate research or projects, (2) courses offered in small group settings, and (3) courses taught on an individual basis.

Special senior-level undergraduate research or project courses are identified (1) for students pursuing majors which require a synthesizing project or paper as a part of completion of the major and (2) for thesis research and writing for students completing the Honors Program. These courses are designated as 498 and 498H respectively.

Small group courses are identified by numbers ending in 95, 96, and 97. The study area of such courses is indicated through a subscript and subtitle.

Individual-studies courses are those with numbers ending in 91, 93, 94, and 99, as well as all 900-level courses. Under their generic numbers and titles, these courses, with prior approval of the responsible faculty member, may be selected by a student in any department even though the courses are not listed in the departmental course offering section.

**Senior-Level Research/Project Courses**

498. Senior Capstone (credit varies). A culminating experience for majors involving a substantive project that demonstrates a synthesis of learning accumulated in the major, including broadly comprehensive knowledge of the discipline and its methodologies. Senior standing required.

Grades Available: A, B, C, D, E, I, P/F, S/P*, W.

498H. Honors Thesis (3) [Rpt./6 units]. An honors thesis is required of all the 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.

**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.


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.


*Special (i.e., S,P,C,D,E) or regular grades may be used as departmental policy dictates; however, in any single course offering, all registrants must be graded by the same system.

**Individual Studies**

191, 291, 391, 491, 591, 691, 791. Preceptorship (Credit varies.) Specialized work on an individual basis, consisting of instruction and practice in actual service in a department, program, or discipline. Teaching formats may include seminars, in-depth studies, laboratory work and patient study.

Grades Available: S/P, C, D, E, I, W.

193, 293, 393, 493, 593, 693, 793. Internship (Credit varies) Specialized work on an individual basis, consisting of training and practice in actual service in a technical, business, or governmental establishment.

Grades Available: S/P, C, D, E, I, W.

4931, 593L. Legislative Internship [493 (12), 593 (9)] II Working experience at the Arizona State Legislature; responsibilities draw upon student’s area of major expertise and include preparing written and oral reports, summarizing legislative proposals, and providing information to legislators and legislative committees. Participating programs include but are not limited to: architecture, economics, English, geography and regional development, history, hydrology, journalism, management, management information systems, marketing, political science, psychology, public administration, secondary education, sociology, statistics, and urban planning. Students in other programs are eligible and should consult the department head or, in the case of the College of Law, the dean, for appropriate arrangements.

Grades Available: A, B, C, D, E, I, W.

194, 294, 394, 494, 594, 694, 794. Practicum (Credit varies) The practical application, on an individual basis, of previously studied theory and the collection of data for future theoretical interpretation.

Grades Available: S/P, C, D, E, I, W.

199, 299, 399, 499, 599, 699, 799.* Independent Study (Credit varies) Qualified students working on an individual basis with professors who have agreed to supervise such work.

Grades Available: S/P, C, D, E, I, W.

**900. Research** (Credit varies) Individual research, not related to thesis or dissertation presentation, by graduate students.

Grades Available: S/P, C, D, E, K, W.

**908. Case Studies** (Credit varies) Individual study of a particular case, or report thereof.

Grades Available: S/P, E, K, W.

**909. Master’s Report** (Credit varies) Individual study or special project or formal report thereof submitted in lieu of thesis for certain master's degrees.

Grades Available: S/P, E, K, W.
910. Thesis (Credit varies) Research for the master’s thesis (whether library research, laboratory or field observation or research, artistic creation, or thesis writing). Maximum total credit permitted varies with the major department.
Grades Available: S/P, E, K, W.

915. Master's Recitals (Credit varies) For master's students in music 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.
Grades 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.
Faculty Lists
The listing of faculty which precedes the departmental course offerings identifies all resident faculty members appointed for the 1994-95 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
(520) 621-2620; FAX: (520) 621-3742
Professors Dan S. Dhaliwal, Head, Andrew D. Bailey, Jr., William B. Barrett, William L. Felix, Jr., William S. Waller
Assistant Professors Sanjay Kallapur, W. Dana Northcut, Jeffrey W. Schatzberg, Galen R. Svecik, 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.* Inference in Accounting and Auditing (3) I II The application of statistical tools to accounting and auditing problems. P, STAT 275.

310.* Cost and Managerial Accounting (3) I II Concepts and analytical procedures necessary in the generation of accounting data for management planning and control. P, 210, ECON 201a-201b or ECON 300, MATH 123.

400a-400b.* Intermediate Financial Accounting (3) I II Theory and methodology involved in contemporary accounting for assets, liabilities, stockholders' equity, net income and funds; analysis and interpretation of financial statements. Credit allowed for this course or 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 310 but not for both. P, 210. May be convened with 500a-500b.

411.* 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, 420. 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 multinational 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 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, 310. 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, 550. Open to MBA candidates only. May be convened with 401.

510. Principles of Profit Planning and Control (3) I II For a description of course topics, see 410. Graduate-level requirements include a special project. Credit allowed for this
Aerospace and Mechanical Engineering (A ME)

AME Building, Room 301
(520) 621-2235; FAX: (520) 621-8191


Associate Professors Ara Arabyan, Cholik Chan, Edward J. Kerschen, Erdogan Madenci, Alfonso Ortega

Assistant Professors Yonggang Huang, Jeffrey W. Jacobs, Karl Ousterhout, K.R. Sridhar

The department offers the degrees of Bachelor of Science in Aerospace Engineering, Bachelor of Science in Mechanical Engineering, and Master of Science and Doctor of Philosophy with majors in aerospace engineering and mechanical engineering. (See the College of Engineering section of this catalog for specific undergraduate program requirements. Consult the Graduate Catalog for more information about graduate programs.)

195. Colloquium
d. Our Future in Space and Space in Our Future (1) I Field trips.

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 distributions, finite 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

301. Engineering Analysis (3) I II Vector analysis, complex variables, Fourier series, matrices, boundary value problems and applications to current engineering problems.

P, MATH 254

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, C E 217

320. Aerodynamics (3) I II Basic equations and their approximation; potential flow theory; fundamentals of airfoil and wing theory; axisymmetric flows; application to aerodynamics of wings and bodies.

2ES, 1ED, P, 331a; CR, 302

321. Aircraft Performance (3) I II Properties of the atmosphere, concepts in airflow and propulsion, airfoils and wings, airplane performance; energy methods.

2ES, 1ED, P, 250, 331a

322. Gasdynamics (3) I II Homentropic flow with area changes, normal and oblique shocks, one-dimensional flows with friction and heat addition, choking, method of characteristics, applications.

2ES, 1ED, P, 230, 331a, MATH 254

324. Aerospace Structures (3) I II Application of principles of mechanics to the structural analysis of aerospace components. Topics covered are analysis of stress and strain, constitutive relations, plane problems of elasticity, torsion, bending, elastic stability, energy methods, finite element methods.

2ES, 1ED, P, 301, C E 217; CR, 302

330. Intermediate Thermodynamics (3) I II Power systems; nonreacting and reacting mixtures; heat transfer, design exercises.

2ES, 1ED, P, 230

331a-331b. Principles and Applications of Fluid Mechanics (3-3) I II 331a: Fundamentals of fluid mechanics covering properties of fluids, fluid statics, 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.

2ES, P, 250, MATH 223, MATH 254, 331b: Turbomachinery, pump characteristics, lubrication theory, boundary layers, potential flow, one and two-dimensional compressible flow, design project.

2ES, 1ED, P, 331a. Both 331a and 331b are offered each semester.

352. Dynamics of Machines (3) I II Analysis of motions and forces in machines, design exercises.

1.5ES, 1.5ED, P, 250

400. Senior Mechanical Laboratory (2) I II Investigations involving thermal power and mechanical systems.

1R, 3L, 2ES, P, 300, 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).

401. Senior Aerospace Laboratory (1-3) I II Laboratory investigations involving aerodynamic, control, structural, and power systems.

1R, 3L, P, 300, 324, 420, 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).

410. Engineering Design (3) I II Role of design in engineering; strength design factors, stress and strain analysis, deflection analysis
and introduction to failure and fatigue theory, design of specific machine components. 1ES, 2ED. P, 250, C E 217.

412a-412b. Mechanical Engineering Design (4-4) 412a: I Engineering design process steps, idea generation techniques, optimal design, computer aided design, hardware issues, electro mechanical systems, fluid power systems, practical aspects of design for manufacture and assembly, traditional and non-traditional machining, forming and fastening techniques. Major design project. 4R, 4L. 4ED. Fee P, 230; CR, 410, 412b: II Construction, testing and evaluation of prototype design; design iteration to arrive at a final working system. 4R, 4L. 4ED. P, 412a. 412a and 412b must be taken in consecutive semesters.

416. Material Selection (3) II A study of failure in engineering materials, yielding, fatigue, creep, buckling; an introduction to fracture mechanics and modern fatigue models; weight and cost considerations. 1.5ES, 1.5ED. P, C E 217.

420. Aircraft Conceptual Design (3) I Student groups develop conceptual designs for aircraft with specified performance and figures of merit. Design issues include program organization, configuration, aerodynamics, weights, and performance. Design groups develop computer flight simulators to evaluate performance. 3ED. P, 320, 321, 323. May be convened with 520.

422. Aerospace Engineering Design (3) II Application of engineering fundamentals, including structural analysis, structural vibrations, aero-elasticity and finite element methods to aerospace vehicle design project. 3ED. P, 420 or 428. May be convened with 522.

424. Introduction to Space Technologies (3) I The space environment: vacuum, microgravity, radiation(s), free molecule flow and drag on bodies. Resource utilization in deep space. Introduction to orbital mechanics. Space transportation, spacecraft thermal design, automation and robotics, communications, space power, space structures. 1.5ES, 1.5ED. P, 323. 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. 2ES, 1ED.

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 basic concepts 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. 1ED, 2ES. P, 331a, 230.

440. Energy Utilization and Management (3) I (Identical with NEE 440) May be convened with 540.

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.

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) II Aerodynamic theory of horizontal and vertical 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. 2ES. 1ED. P, MATH 254. May be convened with 554.

455. Control System Design (3) I II Mathematical modeling of dynamical systems, hardware and software issues; computer simulations; classical control methods including transient response, steady-state errors, bode diagrams, root locus and design of closed loop control systems; introduction to state feedback design and digital control. 1.5ES, 1.5ED. P, 250, 301; CR, 300.

456. Control of Manufacturing Process (3) II Modeling and control of manufacturing processes: mathematical modeling of manufacturing processes including, metal forming, turning, milling and welding; review of classical control methods; introduction to nonlinear control systems analysis and simulation; analysis, design and applications of digital control systems; robotics; hardware and software issues; computer simulators. 1.5ES, 1.5ED. P, 250, 300, 301, 412a, 455. 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.


466. Biomechanical Engineering (3) II 1996-97 One subject covered yearly from: biomechanical-solid mechanics (orthopedic, vascular, muscle, skin); feedback control (physiological systems); heat transfer, thermodynamics (temperature regulation exercise, hyperthermia, instrumentation). 3ES. P, 330, 331b, 410. May be convened with 566.

Students interested in the biomedical 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 statistics to mechanical and structural design; modern mechanical reliability methods; design philosophy. 1.5ES, 1.5ED. P, C E 217; CR, 410. May be convened with 573.

474 Reliability and Quality Analysis (3) I Probability and statistics with applications to reliability engineering, discrete and continuous statistical models for engineering variables; fundamentals of statistics. 1.5ES, 1.5ED. P, MATH 223. May be convened with 574.

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


520. Aircraft Conceptual Design (3) I 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) II 1996-97 Inviscid flow of compressible fluids; governing equations and their method of so-
lution for subsonic, transonic, supersonic, and hypersonic flows. P, 425, 500a-500b, 536a-536b.

522. Aerospace Engineering Design (3) II For description of course topics, see 422. Graduate students will be responsible for simulation software development or laboratory tests. May be convened with 422.


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.


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) II Reversible and irreversible macroscopic thermodynamics; selected engineering applications. P, 230, 331a.

531. Numerical Methods in Fluid Mechanics and Heat Transfer (3) 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 1995-96 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: I Fundamental equations of motions; surface tension; kinematics of vorticity; integral solutions; irrotational flows; simple viscous flows. P, 500a. 536b: II Small-disturbance inviscid theory; low Reynolds number flow; vorticity dynamics; boundary layers. P, 500b.

537. Fluid Mechanics of Viscous Flows (3) I 1995-96 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 1995-96 Physical phenomena in turbulent shear flows; experimental techniques; observations and physical consequences; prediction methods; recent advances. P, 500b, 536a-536b.


540. Energy Utilization and Management (3) I (Identical with NEE 540) May be convened with 440.

541. Industrial Energy and Power Management (3) II (Identical with NEE 541)

542. HVAC System Design (3) II (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) II (Identical with NEE 547) May be convened with 447.


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. Computational Multibody Dynamics (3) II Computational methods in multibody 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.

554. Optimal Control of Parametric Systems (3) I For a description of course topics, see 454. Graduate-level requirements include a more theoretically oriented design project. P, MATH 254. May be convened with 454.

555. Modern Control Theory (3) II Nonlinear dynamical systems, Lyapunov stability, Lyapunov control system design, controllable and reachable sets. P, 455.

556. Control of Manufacturing Process (3) II For a description of course topics, see 456. Graduate-level requirements include more in-depth homework with focus on theoretical considerations, and comprehensive design project. 1.5ES, 1.5ED. May be convened with 456.


561. Finite Element Analysis in Structural Mechanics (3) II 1996-97 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 1996-97 For a description of course topics, see 462. Graduate-level requirements include an additional project on composite materials. P, 302, 331a. May be convened with 462.

563. Finite Element Analysis in Nonlinear Solid Mechanics (3) I 1996-97 Finite element methods, including material nonlinearity (elastic, plastic, viscoelastic); geometric nonlinearity (finite deformations), numerical solution methods, and nonlinear programs. P, 461.

566. Biomechanical Engineering (3) II 1996-97 For a description of course topics, see 466. Graduate-level requirements include a project and additional reading assignments. 3ES. P, 302, 330, 331b, 410. May be convened with 466.

567. Students interested in the biomedical engineering option: please see the headnotes of this department.

572. Reliability Engineering (3) I For a description of course topics, see 472. Graduate-level requirements include a special report of at least 30 pages on a specific reliability engineering topic. P, CR, 474 or SIE 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 class projects. May be convened with 474.

575. Reliability Testing (3) II Mean-time-between-failure and reliability confidence limits; sequential testing; sampling; accelerated, sudden-death, 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 572; complex systems reliability; maintainability engineering; reliability and availability of maintained systems; operational readiness; system effectiveness; maintainability demonstration. P, 472.

African American Studies (AAS)

MLK Building, Room 305
(520) 621-5665; FAX: (520) 621-9768

Committee on African American Studies

Associate Professor Mikelle Smith Omari,
Interim Directors, Ikenna Dieke, Lanasna Keita
Assistant Professor Ella Ray

African American Studies Advisory Committee: Karen Anderson, Ellen Basso, Myra Dinnerstein, Celestino Fernandez, Jesse Hargrove, 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 methodologies and theory; and exploration of disciplines, scholars, and historical events which have influenced the focus 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 396 H Honors Proseminar (4)
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) III S (Identical with HIST 190)

220. Introduction to African American Studies (3) I Introductory survey of the literature, culture, history, and social issues affecting Black Americans.

222. African American Studies: A History of Ideas (3) [Rpt./2 units] II Enduring problems in the black experience through an examination of some of the political and social ideas in the history of black thought.


311. Archaeology of Africa (3) II 1996-97 (Identical with ANTH 321)
329. Cultures and Societies of Africa (3) II (Identical with ANTH 329)
330. Minority Groups and American Politics (3) I II (Identical with POL 330)

339. Introduction to African-American Art (3) I (Identical with ARH 339)

347. The Old South (3) (Identical with HIST 346)

348. African Literature in Translation (3) [Rpt.] II (Identical with ENGL 342 and WS 342)

349. Race and Class in Latin America (3) II (Identical with HIST 351)

351. Race and Class in Latin America (3) II (Identical with HIST 351)
354. Topics in African History (3) [Rpt.] II S (Identical with HIST 384)
396H. Honors Seminar (4) I II

396J. Honors Seminar (4) I II

396K. Honors Seminar (4) I II

396L. Honors Seminar (4) I II

435. The Coming of the Civil War, U.S. 1845-1861 (3) I (Identical with HIST 435)

436. Civil War and Reconstruction, U.S. 1861-1878 (3) II (Identical with HIST 436)

450. French Literature of Black Africa and the Caribbean (3) (Identical with FREN 450)

467. Race and Ethnic Relations (3) I II (Identical with SOC 467)

468. Government and Politics of Africa (3) II (Identical with POL 468)

478. African American Literature (3) I (Identical with ENGL 478)

487a-487b. Race and Public Policy (3) I II (Identical with POL 487a-487b)

495 Colloquium
b. Issues in African Art History (3) I I II (Identical with HIST 495b)

596. Seminar
j. Issues in African Art History (3) [Rpt./12 units] III I II (Identical with ARH 596)

Agricultural and Biosystems Engineering (ABE)

Shantz Building, Room 403
(520) 621-1607; FAX: (520) 621-3963

Professors Donald C. Slack, Head, Delmar D. Fangmeier, Martin Fogel (Emeritus), Stuart Hoenig (Emeritus), Kenneth A. Jordan, W. Gerald Matlock (Emeritus), W. David Shoup, Frank Wiersma (Emeritus)
Associate Professors Dennis L. Larson, William O. Rasmussen, Muluneh Yitayew
Assistant Professors Christopher Choi, Joel Cuello, Peter Waller
Assistant Specialist Edward Martin

The department offers the Bachelor of Science in Agricultural Engineering (ABE) and the Bachelor of Science in Agricultural and Biosystems Engineering (ABE) in the College of Engineering and Technology. The department graduate program of-

408. Environmental Simulation (3) [Rpt. /2 units] II (Identical with ARH 408)

410. Irrigation Principles and Management (3) I II 1996-97 (Identical with AGTM 120, FCR 120, N SC 120, and PL S 120)

195. Colloquium
a. Introduction to Agricultural Systems Management (1) I II (Identical with AED 195a)

250. Water and Its Uses (3) I GRD Introductory course on water sources, uses, management and conservation; biological, economic, and health issues. Not for ABE majors. (Identical with S W 250) Rasmussen

320. Introduction to Computer Aided Design (3) I II Introduction to computer aided design concepts and techniques. Two and three dimensional drawing presentation, methods of graphical communications, data analysis, design synthesis and production methods. P, computer literacy (DOS), 1R, 6L, 120. Microcomputing Applications (3) I II Introduction to the use of microcomputers in word processing, spreadsheets, presentation graphics, networks and other areas. 1R, 6L. (Identical with AGTM 120, FCR 120, N SC 120, and PL S 120)


340. Applied Hydraulics (3) I GRD Fundamentals of hydraulics applicable to the irrigation of agricultural lands, including fluid properties, hydrostatics, irrigation flow characteristics, open channel and pipeline applications, and measurement of flowing water. Not for ABE majors. P, MATH 118, 123 or 125a, PHYS 102a. May be convened with 506.

Yitayew

408. Environmental Simulation (3) II Introduction to the usage of mathematical tools and techniques to analyze physical, chemical and biological components of the environ-

415. Agri-biosystems Process Engineering (3) II 1995-96 Application of the principles of heat transfer, thermodynamics, psychrometrics and fluid flow to the development and solution of simulation of 1) soil temperature and moisture distribution, 2) radiation balances of plants and ventilated greenhouses and 3) photosynthesis and transpiration. 2R, 3L, 2ES, 1ED, P, A ME 230. May be convened with 515. Jordan

423. Agricultural Systems Analysis and Design (3) II 1996-97 Application of systems analysis to agricultural and biologically related problems; computer modeling and use of operations research methods. 2ES, 1ED. STAT 361. May be convened with 523. Larson


455. Irrigation Engineering (3) II Introduction to soil and water relationships, irrigation systems, irrigation water supply, and irrigation management; basic designs. 3R, 2ES, 1ED, 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 trip. 1ES, 2ED, P, A ME 331a. May be convened with 556. Waller

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. Waller

458. Drainage of Irrigated Lands (3) III 1995-96 Origin and nature of drainage problems in arid lands; drainage theories, investigations and design for irrigated agriculture. Field trip. 1.5ES, 1.5ED, P, C E 321 or A ME 331a. (Identical with C E 458) May be convened with 558. Waller

462. Soil and Water Conservation Engineering (3) II 1996-97 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


470. Irrigation Engineering (3) II For a description of course topics, see 447. 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. Waller

473. Agricultural Systems Analysis and Design (3) II 1996-97 For a description of course topics, see 423. Graduate-level requirements include a special project. P, STAT 361. May be convened with 423. Larson


b. Advanced Agri-biosystems Engineering Design (3) III 3ED, P, 494a.

504. Irrigation Principles and Management (3) II 1995-96 For a description of course topics, see 404. Graduate-level requirements include a special project on a current irrigation topic. P, A ME 250, C E 217. May be convened with 412. Larson

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, PHY 102a. May be convened with 406. Yitayew

508. Environmental Simulation (3) II For a description of course topics, see 408. Graduate-level requirements include a special project on a current environmental topic. P, MATH 123 or 125a. May be convened with 408. Rasmussen

512. Agri-biosystems Machinery Design (3) I 1995-96 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. Larson

515. Agri-biosystems Process Engineering (3) III 1995-96 For a description of course topics, see 415. Graduate-level requirements include a special project. CR, A ME 230. May be convened with 415. Jordan

516. Simulation of Biological Systems (3) S 1996-97 Fundamental differential equations of plant systems are solved using analog computer methodology. Analysis of soil temperature and moisture, mulched systems, plant growth and greenhouse environments are simulated using dynamic digital programs, CSMP and ACSL. Parameters of radiation, heat and moisture transfer, CO2 and unique soil properties are utilized to provide realistic simulation of cyclic conditions. P, knowledge of computer programming. Takakura

523. Agricultural Systems Analysis and Design (3) II 1996-97 For a description of course topics, see 423. Graduate-level requirements include a special project. P, STAT 361. May be convened with 423. Larson

547. Sensors and Controls (3) I For a description of course topics, see 447. Graduate-level requirements include a special project. P, Basic familiarity with computers. 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 (3) II For a description of course topics, see 455. Graduate-level requirements include a special project on a current irrigation topic. P, C E 321 or A ME 331a. (Identical with C E 555) May be convened with 455. Waller

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. Waller

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. Waller

558. Drainage of Irrigated Lands (3) III 1995-96 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. (Identical with C E 558) May be convened with 458. Waller

562. Soil and Water Conservation Engineering (3) II 1996-97 For a description of course topics, see 463. Graduate-level requirements include a special project. P, C E 321 or A ME 331a. (Identical with NEE 563) May be convened with 463. Larson

605. Soil-Water Dynamics (3) III 1996-97 (Identical with S W 605)


662. Seminar a. Agricultural and Biosystems Engineering (1) [Rpt./8] I II Slack

Agricultural and Resource Economics (AREC)
Economics Building, Room 208
(520) 621-6241; FAX: (520) 621-6250
Professors Bruce R. Beattie, Head, Robert C. Angus (Emeritus), Bartley P. Cardon (Emeritus), Dennis C. Cory, Robert S. Finch (Emeritus), Roger W. Fox, Jimmye S. Hillman (Emeritus), Robert D. Innes, Maurice M. Kelso (Emeritus), Robert O. Kuehl, Jeffrey T. LaFrance, William B. Lord, William E. Martin (Emeritus), Eric A. Monke,
Richard T. Newcomb, Lester D. Taylor, Paul N. Wilson
Associate Professors Bonnie C. Colby, Roger A. Dahlgren, Gary D. Thompson
Assistant Professors Satheesh V. Aradhya
Instructors Lewis S. Daugherty, Mark W. Langworthy
Senior Lecturer William J. Hanekamp
Research Scientist Edwin H. Carpenter
Extension Specialists Harry W. Ayer, Russell L. Gum, James C. Wade
Assistant Extension Specialists Julie P. Leones, Russell E. Tronstad

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 and environmental economics for careers in the management of public resources of land and water; and preparation for graduate study for careers in business, teaching and research.

The following degrees are offered: Bachelor of Science in Agriculture with a major in agricultural and resource economics and Master of Science in Agriculture 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 or 124, ECON 201a, 210b, 330 or 332 and AREC 242. Additional requirements include ACCT 200, either ECON 300 or 361, and a minimum of 21 units in upper-division agricultural and resource economics courses. The major in agricultural and resource economics assumes a moderate to substantial knowledge of mathematics. 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 application of economics to societal problems. AREC 339, 403, 404 and 464 are required. Forty-one units of elective credit are open to the student.

Agribusiness Management Option: 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.

Enrollment in 300- and 400-level BPA courses is restricted by the BPA College to those who apply for and attain Advanced Standing. Apply in McClelland Hall 103; call 621-2505 for information.

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 9 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.

195. Colloquium
   a. Environmental Issues in Agricultural and Resource Economics (1) I Wilson/Hanekamp

213. Introduction to Agricultural Marketing (3) II Basic economic principles and marketing methods for agricultural crops and livestock in an international marketplace. Investigation of the organizational, institutional and economic principles that form the agricultural marketing system in the U.S.; application of microeconomic, market performance and international trade analysis. P, ECON 200 or 201a. Hanekamp

215. Agricultural Business Management (3) II Applying economic principles in decision making for the agribusiness firm; analytical techniques and management control; problems in organization, management, and operation of an agricultural business. P, ECON 200 or 201a. Daugherty

217. Resource and Environmental Economics (3) II 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) Imes

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) Fox

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 RCS 310)

313. Economics of Futures Markets (3) I II Futures market participants, evolution, functions, performance, regulation, financial instruments, and options on futures contracts, with emphasis on hedging uses of the futures market for agricultural commodities. P, ECON 200 or 201a. (Identical with ECON 313 and FIN 313) Dahlgren/Newcomb

339. Economic Statistics (3) II Application and interpretation of statistical measures to problems in economics. Not available for students who have completed ECON 320. May be enrolled in ECON/MAP/MKTG 376. P, MATH 123. (Identical with ECON 339) LaFrance

350. Ethics, Economics and Public Policy in Agriculture (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. Wilson

375. Economics of Land and Water in the American West (3) I 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) Colby


404. Production Economic Analysis (3) II 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) 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 200 or 201a. Writing-Emphasis Course*

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

476. Environmental Law and Economics (3) I Economic principles useful in analyzing natural resource problems and policies in the
Southwest and nationwide. P, ECON 300, 361 or consent of instructor. (Identical with ECON 476, HWR 476, and RNR 476) Cory

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

580. Mathematics for Economists (2) I Intensive course in essential mathematics for entering graduate students in the M.S. and Ph.D. programs in Economics and Agricultural and Resource Economics. Topics covered include matrix algebra, functions, limits, differentiation, comparative statics, and constrained and unconstrained optimization. (Identical with ECON 580) LaFrance

676. Economic Dynamics and Natural Resources (3) I 1995-96 Course covers three topic areas: the mathematical structure of dynamic optimization problems; the economics of exhaustible resource use; and the economics of renewable resource use. The methods part of the course treats both discrete and continuous time dynamic programming, as well as deterministic and uncertain environments. Relationships between the methods of Lagrange, dynamic programming, optimal control, the calculus of variations, and the Ito calculus are developed. The sections on natural resource use apply these tools to the classical economic problems of natural resource allocation and exploitation. P, graduate student standing with one year of graduate microeconomic theory. (Identical with ECON 676) LaFrance

696. Seminar

Agricultural Education (A ED)

Forbes Building, Room 224
(520) 621-1523; FAX: (520) 621-9889

Professors Roger T. Huber, Head, Clinton O. Jacobs (Emeritus), Floyd G. McCormick (Emeritus), Kenneth S. Olson, Phillip R. Zurbrick (Emeritus)

Assistant Professors David E. Cox, Glen M. Miller

Assistant Professor John F. Elliott

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 (AED) and agricultural technology management (AGTM). The major in agricultural education has two options: teacher education in agriculture and non-formal education.

The department also offers programs of study leading to the degrees of Master of Science and Master of Agricultural Education. (See the Graduate Catalog for detailed information concerning graduate programs.)

The major in agricultural education assumes moderate knowledge of mathematics. Students must complete MATH 117 or 121.
education in agriculture requires students to complete 31 units of the following professional education courses: A ED 338a, 401, 405, 409, 460, 461, 462, 485 and 489. In addition, 37 units, including the following course work in agriculture are required: AGTM 100, 350, and 330 or 351; 5 units in plant sciences and/or soil science; 5 units in animal sciences; 5 units in agricultural and resource 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

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 nonformal 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 nonformal environmental education focus is designed to prepare students for a teaching 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 305, 330, 401, 405, and 439. In addition to the previously mentioned courses, students in the nonformal environmental education focus must complete AREC 350, A ED 402 and 422, RNR 316 or ECOL 206, RNR 384 and SW 105/106. Students in this option complete a minimum of 18 credits in agricultural education and/or education.

195. Colloquium
   a. Introduction to Agricultural Systems Management (1) II (Identical with ABE 195a)

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.

305. Integrated Agricultural Systems (3) I Holistic, integrated soft systems strategies useful for dealing with agricultural problems. Course focuses upon appropriate problem-solving and critical thinking techniques.

338a. The Teaching of Agriculture (4) II (Identical with TTE 338a)

396H. Honors Proseminar (3) I II

405. Environmental Topics in Agricultural Education (2) I A synthesis of environmental concerns within a "systems" approach of understanding their relationship in agriculture. 1R, 3L. May be convened with 405.

409. Principles of Vocational Education (2) II (Identical with TTE 409)

422. Communicating Knowledge in Agriculture (3) I Principles and processes of knowledge diffusion and methods of transferring appropriate technology to user/clientele groups. Communicating effectively within organizations. (Identical with AGTM 422) May be convened with 522.


462. Curriculum Development (2) II Analysis, design, construction and evaluation of resources appropriate for a competency based agriculture education curriculum. 2R, P, CR 338a.

485. Teaching Psychomotor Skills in Laboratory Sciences (2) I 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 585.

489. Supervised Teaching in Agriculture (1-8) [Rpt./1] I II Observation and teaching vocational agriculture in the classroom and field under supervision. P, admission to teacher education in agriculture.

496. Seminar
   c. Ambassador Orientation (1-2) [Rpt./1] I II Open to COA Ambassadors only.

505. Environmental Topics in Agricultural Education (2) I For a description of course topics, see 405. Graduate-level requirements include an additional report. May be convened with 405.

522. Communicating Knowledge in Agriculture (3) I For a description of course topics, see 422. Graduate-level requirements include an additional report. (Identical with AGTM 422) (Identical with AGTM 522)

539. Non-Formal Education (3) II For a description of course topics, see 439. Graduate-level requirements include an additional research report. (Identical with HE E 539) May be convened with 439.

540. International Extension Education (3) II 1995-96 Critical evaluation of case histories of international extension education models, and integration of successful components into composite models based on cultural, political and educational situations typically encountered in developing countries.

560. Instructional Materials Development (4) I For a description of course topics, see 460. Graduate-level requirements include an additional assignment. May be convened with 460.

589. Teaching Psychomotor Skills in Laboratory Sciences (2) II For a description of course topics, see 485. Graduate-level requirements include additional assigned readings, demonstrations, lesson presentations, and a position paper. May be convened with 485.

597. Workshop
   a. Utilizing Occupational Experience Programs (1) [Rpt./3] I II
   b. Developing Youth Leadership (1) [Rpt./3] I II
   c. Administration, Management, and Supervision of Non-formal Education (1) [Rpt./3] I II (Identical with HE E 597d)
   d. Continuing Education in Agriculture (1) [Rpt./3] I II
   e. Program Planning and Evaluation (1-3) [Rpt./3] I II
   f. Computer Application in Agricultural and Non-formal Education (1) [Rpt./3] I II (Identical with HE E 597g)
   g. Environmental Education Issues in Agriculture (1) [Rpt./3] I II (Identical with HE E 597n)
   h. Developments in Non-formal Education (1) [Rpt./3] I II (Identical with HE E 597l)

601. Advanced Agricultural Education Methods (3) [Rpt./3] I II Problems in organizing and conducting programs of instruction in vocational and extension education. P, eight units of A ED or education.

615. Investigations and Studies in Agricultural Education (3) I Study and analysis of research literature, methods, techniques and procedures for conducting investigations; selecting a problem and developing plans for a study.

616. Research Project Design and Implementation (3) I Principles and practices of selecting, developing and analyzing research instruments; analyzing and interpreting both quantitative and qualitative data research in agricultural and extension education, including the use of the computer. P, 615.

621. Program Planning and Evaluation (3) II Developing and evaluating programs in agricultural teaching and extension; situation analysis, objectives, policies, content, procedures, and evaluative criteria. P, 6 units of agricultural education.

638. Teaching College Level Agriculture (2) I Analysis and preparation for improving effectiveness of teaching college level agriculture, including instructional objectives and strategies; content organization; and evaluation of learning experiences.

Agricultural Technology Management (AGTM)

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 un-
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 sciences, and other areas where 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.

The major in agricultural technology management assumes moderate knowledge of mathematics. Students must complete MATH 117 or 121. In addition, students must complete either MATH 118, 119 or 123 and 3 units of statistics.

Degree requirements: Students must complete course work in the appropriate 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, ACTM 402, ABE 404 or ACTM 350; COMM 312 or 412, A ED 422, ECOL 206, ENGL 307 or 308, ENTO 151, 152, PLS 305, PL P 305 and S W 105, 200, 201, 401. Specialized options can be developed by contacting a faculty advisor in the Agricultural Education Department for specific requirements.

100. Principles and Practices of Agricultural Mechanization (3) Basic principles and operating 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.

120. Microcomputing Applications (3) I II (Identical with ABE 120)

195. Colloquium
   a. Agricultural Technology and Public Policy (1) I II

330. Turf and Landscape Technology (3) I 1996-97 The basic scientific principles and skills of construction, operation, and maintenance in turf, landscape and urban agricultural equipment. Provides student with laboratory experiences in machinery, sprinkler and drip irrigation installation, operation and maintenance, chemical application systems, and hardscaping. 1R, 6L.

350. Applications in Agricultural Mechanics (3) I The fundamentals of electric power, electric motors, and leveling and measurement, and the internal combustion engine.

Subject matter is selected to provide the fundamentals of applied mechanical knowledge and skills basic to urban agricultural mechanization and appropriate for instructional programs in agricultural mechanics at the secondary school level. 1R, 6L.

351. Operations in Agricultural Mechanics (3) I The fundamentals of agricultural power and machinery with emphasis upon applications to urban agricultural mechanization. Competencies include set up, adjustment, lubrication, as well as operation and maintenance of machinery involved in landscape construction, turf installation, turf maintenance, and other machinery specifically suited to urban agricultural mechanization. Selected production agriculture equipment may also be included. 1R, 6L, P, 100. Miller


422. Communicating Knowledge in Agriculture (3) I (Identical with A ED 422) May be convened with 522.

502. Agriculture and the Environment: Focus on Pesticides (3) I II (For a description of course topics, see 402. Graduate-level requirements include an additional report. May be convened with 402. (Identical with ENTO 502 and PL P 502) and evaluative criteria. P, 6 units of agricultural education.

522. Communicating Knowledge in Agriculture (3) I (Identical with A ED 522) May be convened with 422.

American Indian Studies (AINS)

Harvill, Room 430
(520) 621-7108; FAX: (520) 621-7952

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 Evers (English), N. Scott Momaday (English), J. Jefferson Reid (Anthropology), Robert Williams, Jr. (Law)

Associate Professors Thomas M. Holm, Jennie R. Joe (Family and Community Medicine), Tsianina Lomawaima, Alice S. Paul (Teaching and Teacher Education), Ofelia Zepeda (Linguistics)

Assistant Professors Willem DeReuse (Anthropology), Teresa L. McCarty (Language, Reading and Culture), Michelle Taigue, Octaviana Trujillo (Language, Reading and Culture), David E. Wilkins (Political Science), Mary Willie (Linguistics)

Adjunct Associate Research Professor Nancy J. Parezo (Anthropology)
Adjunct Lecturer Mary Jo Fox Research Anthropologist Emory Sekaquaptewa

The American Indian Studies Program does not offer a baccalaureate degree. A minor is available and the AINS 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 II (For admission and degree requirements, please see the Graduate Catalog.)

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) II (Identical with POL 334)

350. Oral Tradition (3) I II (Identical with ENGL 350)

396H. Honors Seminar (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) II (Identical with ANTH 416) May be convened with 516.

423. Anthropology of Rural Mexico (3) II (Identical with ANTH 423) May be convened with 523.
American Indian Women (3) II Interdisciplinary exploration of new information available on American Indian women, especially materials written by Indian women and investigation of the status, experience, and contributions of American Indian women from pre-contact to contemporary times. P. upper class standing or approval of instructor. (Identical with W S 450)

American Indian Literature (3) (Identical with ENGL 477) May be convened with 577.

American Indians and the Supreme Court (3) (Identical with POL 478) May be convened with 578.

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

Areal Survey of Native North American Language (3) I (Identical with ANTH 490) May be convened with 589.

American Indian Law and Policy (3) (Identical with POL 596b, which is home.) Students may also complete a field of study that prepares them for admission to graduate programs in the biological and life sciences or professional schools in veterinary medicine or medicine. A minor in animal sciences is available for nonmajors. The department also offers programs leading to the Master of Science and Doctor of Philosophy degrees. For information regarding graduate degrees, see the Graduate Catalog.

Majors must complete course work in the general education program, as described in the College of Agriculture section of this catalog, as well as completing COMM 100, 102 or 103 or 104 or 105.

Majors must choose course work from options in animal industry, science and preprofessional, or race track industry. Requirements for the options are as follows:

Animal Industry Option: The following required courses also satisfy specific study area requirements: Biological and Life Sciences, ECOL 100 or MCB 181, PL S 100 or MCB 182 and AN S 213; Physical and Environmental Sciences, CHEM 101a-101b and 102a-102b or 103a-103b and 104a-104b; Individuals, Societies and Institutions, ECON 200 or 201a. Foundation courses required are ACCT 200, S W 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, 336, 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 241a-241b, 243a-243b, 322, 323; MATH 123; and PHYS 102-103 and 181-182. Recommended courses are BIOC 460 or 462; CHEM 325; MIC 205.

Animal Sciences (AN S)

Shantz Building, Room 205 (520) 621-7623; FAX: (520) 621-9435


Associate Professors Sue K. DeNise, Vincent Guerrero, William A. Schurg, Mark E. Wise

Assistant Professor Parker Antin

Adjunct Professors Patricia Huyer, David Karabinus, Rita Manak, Catherine Racowsky, Bobby L. Reid

Lecturer Thomas N. Wegner (Emeritus)

Adjunct Lecturers Wendy Davis, F. Doug Rees

Extension Specialists Dennis V. Armstrong, Robert M. Kattning, 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. The department also offers programs leading to the Master of Science and Doctor of Philosophy degrees. For information regarding graduate degrees, see the Graduate Catalog.

Majors must complete course work in the general education program, as described in the College of Agriculture section of this catalog, as well as completing COMM 100, 102 or 103 or 104 or 105.

Majors must choose course work from options in animal industry, science and preprofessional, or race track industry. Requirements for the options are as follows:

Animal Industry Option: The following required courses also satisfy specific study area requirements: Biological and Life Sciences, ECOL 100 or MCB 181, PL S 100 or MCB 182 and AN S 213; Physical and Environmental Sciences, CHEM 101a-101b and 102a-102b or 103a-103b and 104a-104b; Individuals, Societies and Institutions, ECON 200 or 201a. Foundation courses required are ACCT 200; S W 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, 336, 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 241a-241b, 243a-243b, 322, 323; MATH 123; and PHYS 102-103 and 181-182. Recommended courses are BIOC 460 or 462; CHEM 325; MIC 205.
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. 2R, 3L. Field trip. (Identical with N SC 280)

295. Colloquium
   a. Career Orientation (1) II

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.*

315R. Physiology of Reproduction (3) I Study of the organs of reproduction and their accessories; physiology and endocrinology related to the process of reproduction and milk secretion. P, CHEM 101b, CHEM 102b, 3 units of animal anatomy/physiology. (Identical with V SC 315R)

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 WFS 330)


340. Race Track Marketing and Media Relations (3) 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.

342. Organization and Administration of the Racing Industry (3) II Basic duties and functions of the racing office and department. Personnel required and procedures utilized in developing the racing program. P, 142.


395. Colloquium
   a. Professional Development in Animal Agriculture (1) I

397. Workshop


443. Research Animal Methods (3) I (Identical with V SC 443) May be convened with 543.


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.

473. Swine Production (2) I The production, feeding and management of swine in intensive production systems. 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) II Integration of beef production resources into a comprehensive beef production system; including breeding, feeding and marketing strategies. Field trip.

478. Feedlot Beef Production (3) I Feeding and management systems of beef cattle in the feedlot. All-day field trips. P, 280, 336.

496. Seminar

497. Workshop
   a. Race Track (1) [Rpt./4 units] 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 II 1996-97 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 1996-97 Theory of quantitative genetics including idealized populations, forces that change gene frequency, breeding systems, and estimation of genetic parameters in a population. P, 6 units of genetics. (Identical with GENE 513)

520. Pathways and Signals in Cells (3) II (Identical with BIOC 520)

535. Biotechnology in Animal Science (3) II 1996-97 Survey of current recombinant DNA technology and principles. Topics include: vectors and host 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 (Identical with V SC 543) May be convened with 443.

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, MCB 181. (Identical with CBA 556 and MCB 556) May be used in biochemical.


596. Seminar (a) Animal Sciences (1) [Rpt.] I II
(b) Nutritional Biochemistry Techniques (3) II (Identical with N SC 609)
(c) Biological Electron Microscopy (4) I (Identical with MCB 612)
(d) Chemistry and Metabolism of Lipids (3) II 1995-96 (Identical with N SC 615)
(e) Mineral Metabolism (2) I 1995-96 (Identical with N SC 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.


655. Analysis and Purification of Proteins (3) II 1995-96 Principles and procedures for analyzing, purifying, and characterizing proteins and amino acids from cells or from CDNA expression systems. P, BIOC 462 preferred, BIOC 460 acceptable. (Identical with BIOC 665 and N SC 665)

664. Animal Physiology Research Techniques (2) I 1996-97 Introduction to selected physiological and biochemical techniques used in animal research. 1R, 3L. Open to majors only. P, BIOC 460 or 462a.

687. Environmental Physiology of Domestic Animals (3) II 1995-96 Physiological, behavioral and anatomical responses of domestic animals to their environment, with emphasis on adaptive mechanisms. P, 313, 315R, 330, 3 units of general physiology/anatomy.

696. Seminar (a) Animal Sciences (1) [Rpt.] I II

Anthropology (ANTH)
Anthropology Building, Room 210 (520) 621-2585; FAX: (520) 621-2088

The science of anthropology is the study of human beings, their origins, thought, and behavior. The Department of Anthropology offers graduate and undergraduate course work in four subdisciplines: archaeology, biological anthropology, cultural anthropology and linguistic anthropology, as well as specialized training for field research. Special internships and independent studies in museology are available through the Arizona State Museum. The Bureau of Applied Research in Anthropology is a center for applied anthropological research in the American Southwest and similar multicultural and ecological settings elsewhere in the world. The department cooperates with the Arizona Health Sciences Center in offering a program in medical anthropology.

The 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 that 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). All majors are required to take MATH 117 (College Algebra). For those students concentrating in biological anthropology, an additional course from MATH 123, 124, 125a or 125b is recommended.

The supporting minor may be chosen from any department or program within the University.

The department participates in the Honors Program.

101. Introduction to Biological Anthropology and Archaeology (3) I II Basic concepts and methods used by biological anthropologists and archaeologists.

102. Introduction to Cultural Anthropology and Linguistic Anthropology (3) I II Basic concepts and methods used by cultural and linguistic anthropologists.

110. Exploring Archaeology (3) I An introduction to the past as revealed by archaeological research; from Neanderthals and their antecedents to Stonehenge, Maya pyramids, and Homer's Troy.

111. Exploring Biological Anthropology (3) I II An introduction to human evolution for the non-science student.

171. Ancient Civilizations of the Near East (3) I (Identical with NES 171)
tion 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.*

409. Economic Anthropology (3) II Analysis of production, exchange, distribution, consumption, property, economic surplus, inheritance, and types of economic structure. P, 200, or 12 units of economics. (Identical with LA S 409) May be convened with 509.

410. Ceramic Ethnoarchaeology (3) I 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 RELI 411) May be convened with 511.

412. Peasants and Peasant Societies (3) II 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-Writing-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) History, arts, crafts, economics, social institutions, religions, and mythology of the present-day Indians of the Southwest.

416. Contemporary Indian America (3) II The historical development and contemporary significance of the 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 ethnographic 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, psychopathology. P, 102 or 200. May be convened with 519.

420. Contemporary American Culture (3) Diverse perspectives on American values as expressed in organization of kinship, space, bureaucracies, media, social classes, ethnic groups, religious sects and movements. May be convened with 520.


422a-422c. Pre-Hispanic Art (3-3) (Identical with ARH 422a-422c) May be convened with 522a-522c.

423. Anthropology of Rural Mexico (3) Historical and cultural background, and contemporary economic, political and social organization of indigenous and non-indigenous groups in rural Mexico. Primarily concerned with the people of the countryside, and the Mexican revolution. (Identical with AINS 423, LA S 423 and MAS 423) May be convened with 523.

425. Language Variation (3) II 1996-97 (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 Anthropology of Pre-Han China (3) II The origin and florescence of Chinese culture and civilization from an anthropological perspective. An in-depth survey of Chinese prehistory and early history from the early Pleistocene to the third century BC. 427a is not a prerequisite for 427b. P, 101; (Identical with CHN 427b) May be convened with 527b.


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.

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) I Introduction to the principles of archaeological fieldwork, with emphasis on method and theory of survey and excavation. 2R, 3L. P, 235. May be convened with 535.

436. Japanese Sociolinguistics (3) (Rpt./1) Identical with JPN 436)

437. Ethnographic Film and Video (3) I II P, anthropology majors, junior standing. (Identical with M AR 437)

441. Organization of Museums (3) An intensive introduction to museum studies, with emphasis on the history, philosophy, structure, and function of museums. May be convened with 541.

442a-442b. Field Training in Archaeology (3-3) S Archaeological methods, theory, and field techniques. 442a: Three-week field excavation and survey. Fee. 442b: Three-week laboratory processing and analysis. Fee. Registration restricted. Contact department for application, which must be returned by April 1.

443a-443b. The Archaeology of Neolithic and Bronze Age Greece (3-3) (Identical with CLAS 443a-443b) May be convened with 543a-543b.

447. Anasazi Archaeology (3) Detailed review of the archaeology of the Colorado Plateau emphasizing its agriculturally-based occupants, the Anasazi, and their descendants, the Pueblo Indians. May be convened with 547.

448. Writing Culture (3) [Rpt.] I The development of anthropological writing as it has moved toward cultural critique: the use of knowledge of other cultures to examine the assumptions of our own. Comparison of ethnographic examples. May be convened with 548.

449a-449b. Folklore (3-3) (Identical with ENGL 449a-449b) May be convened with 549a-549b.

450. Social Stratification (3) I II (Identical with SOC 450)

451. Archaeology of North America (3) I Intensive survey of the development of culture in North America from the time of the initial peopling of the New World to the historic period. May be convened with 551.

453a-453b. Mesoamerican Archaeology (3-3) I II Development of culture in Mexico and Central America from the origins of agriculture through the Spanish Conquest. 453a: Maya culture. 453b: The culture of Mexico north of the Maya area. 453a is not a prerequisite to 453b. (Identical with LA S 453a-453b and MAS 453a-453b) May be convened with 553a-553b. Writing-Emphasis Course.*

454. Andean Archaeology (3) II Development of culture in the Andean countries of South America from hunters and gatherers of the terminal Pleistocene through Inca civilization. (Identical with LA S 454) May be convened with 554.

455. Ethnoarchaeology (3) I History, method, and theory of ethnoarchaeology with case studies of the use of ethnography in archaeological interpretation and theory-building. May be convened with 555.

456a-456b. Old World Prehistory (3-3) I II A survey and interpretation of archaeological evidence for human cultural development of the Old World prior to the appearance of anatomically modern humans. 456a: The Paleolithic; from earliest tools to the cave artists at the end of the Ice Age. 456b: From hunting and gathering to the roots of urban society following the Ice Age. May be convened with 556a-556b.

457. Prehistoric Mesopotamia (3) I Theories of the rise of civilization tested against archaeological data from Mesopotamia with comparative material from other areas. Time period: end of the Paleolithic to historic (Sumerian) civilization. (Identical with NES 457) May be convened with 557.

460. History of Archaeological Theory (3) II Explores the relationship between method and theory in anthropological archaeology over the past 100 years. The intimate relationship between general theory and the development of methods and research interests in archaeology will be demonstrated through case studies. May be convened with 560.

462. Introduction to Quaternary Ecology (3) I (Identical with GEOS 462)

463. Classical Field Archaeology (3) (Rpt./1) S (Identical with CLAS 463)
464. Introduction to Dendrochronology (4) (Identical with GEOS 464) May be convened with 564.

465. Women in International Development (3) II The impact of international development on women as agricultural producers, householders, migrants, workers in formal/informal labor markets and participants in planned change. (Identical with LA S 465, FCR 465 and W S 465) May be convened with 565.

466. Paleoanthropology (3) I Evidence for human and nonhuman primate evolution including laboratory study of fossil casts and modern skeletal biology. P, 265 or consult department before enrolling. May be convened with 566. Writing-Emphasis Course.*

467. Race and Ethnic Relations (3) I II (Identical with SOC 467)

468. Human Osteology (4) I Human osteology for the archaeologist and biological anthropologist; techniques of in situ and laboratory identification, preservation and measurement. P, consult department before enrolling. May be convened with 568.

470a-470b. Human Adaptability (3-3) Study of the means by which humans adjust to their environments through the processes of growth and development. Focus is on physiological, nutritional, and epidemiological factors. 470a includes discussion of the biology of human aging. P, 265 or consult department before enrolling. 470a is not prerequisite to 470b. (470a is identical with GERO 470a) May be convened with 570a-570b.

472. The Relationship of Early Hominids and Contemporary Faunas (3) I The faunal association of contemporary animals and hominids 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.

474. Archaeometry: Scientific Methods in Art and Archaeology (3) II Critical survey of scientific methods used in archaeology and art history. Emphasis on the potential and limitations of these techniques for reconstructing human behavior. P, 304 or equivalent experience. (Identical with CLAS 474 and NBS 474) May be convened with 574.

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*


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 1995-96 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.*

481. Quaternary Palynology and Plant Macrofossils (2-4) II (Identical with GEOS 481)

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.

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 497)

488. Governing Science and Technology (3) II (Identical with GEOG 488)

489. Areai Survey of Native North American Languages (3) I The field of native North American linguistics: areal and genetic classifications; how the study of particular languages provides insights into theories of linguistic anthropology and general linguistics. P, ANTH 276 or LING 101. (Identical with LING 489 and AINS 489) May be convened with 589.

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 W S 490) May be convened with 590.

491. Seminar f. Ceramic Analysis (3) II May be convened with 596f. h. Experimental Archaeology (3) I May be convened with 596h.

497. Workshop c. Dendrochronology (3) II 3L. May be convened with 597c.

*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).

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 a major term paper. May be convened with 403.

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.

509. Economic Anthropology (3) II For a description of course topics, see 409. Graduate-level requirements include an in-depth research paper. (Identical with LA S 509) May be convened with 409.

510. Ceramic Ethnoarchaeology (3) I 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) For a description of course topics, see 412. Graduate-level requirements include a 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 GEOG 514)

515. Cultural Ecology of Agrarian Societies in the Middle East (3) II Emphasis is on land tenure, Islamic law, irrigation and agricultural development in the central Middle East, Nile valley, North Africa, and the Sahel from the Middle Ages to the present.

516. Contemporary Indian America (3) 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-522c. Pre-Hispanic Art (3-3) (Identical with ARH 522a-522c) May be convened with 422a-422c.

523. Anthropology of Rural Mexico (3) For a description of course topics, see 423. Graduate-level requirements include a term paper based on original library, 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-
ate-level requirements include a 20 to 30 page research paper. (Identical with EAS 527a) May be convened with 427b.

527b. The Archaeology of Pre-Han China (3) II For a description of course topics, see 427b. Graduate-level requirements include a 20 to 30 page research paper. (Identical with CHN 527b) May be convened with 427b.

528. Near East Pastoral Nomads and Arid Lands Hunter-Gatherers (3) I A rigorous introduction to pastoral nomads and hunter-gatherers with a focus on arid lands.

530. The Anthropology of Visual Art (3) II 1995-96 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.

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 For a description of course topics, see 435. Graduate-level requirements include additional readings and a detailed term paper. May be convened with 435.

536a. Medical Anthropology (3) I Anthropology of illness and health. Lay perceptions of health, ethnophysiology and pathology; pluralistic ideas about illness experiences; idigenous ideas about preventative and pro-active health; folk diets; social labeling; and illness responsibility attribution. Emphasis on the study of health culture and how the subjective experience of illness and health is influenced by cultural variables. Draws upon cross-cultural ethnographic research and consideration of American health culture.

536b. Ethnomedicine (3) II Comparative medical systems and healing traditions, regional health arenas, and health care seeking. Topics include folk medicine, traditional medical systems, distinctive illnesses and public health 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.

541. Organization of Museums (3) 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.

543a-543b. The Archaeology of Neolithic and Bronze Age Greece (3-3) (Identical with CLAS 543a-543b) May be convened with 443a-443b.

544. In the Wake of the Green Revolution (3) II 1995-96 Survey of agricultural and fisheries production, marketing, and research activities in Sonora, Mexico, locus of "Green Revolution" in wheat breeding. Field trip conducted during Spring Break. P, consult department before enrolling. (Identical with LAS 544)

547. Anasazi Archaeology (3) For a description of course topics, see 447. Graduate-level requirements include a longer term paper. May be convened with 447.

548. Writing Culture (3) [Rpt.] 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.

552b. Archaeology of the Southwest (3) I Development of culture in the prehistoric Southwest from the late Pleistocene to the historic period.

552r. Archaeology of the Southwest (3) II The nature of archaeological data recovered in the Southwest, with emphasis on their potential for the drawing of both cultural and chronological inferences.

553a-553b. Mesoamerican Archaeology (3-3) II 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 LA S 553a-553b) May be convened with 453a-453b.

554. Andean Archaeology (3) II For a description of course topics, see 454. Graduate-level requirements include two reviews of research monographs. (Identical with LAS 554) May be convened with 454.

555. Ethnoarchaeology (3) II For a description of course topics, see 455. Graduate-level requirements include a research paper. May be convened with 455.

556a-556b. Old World Prehistory (3-3) I 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 For a description of course topics, see 457. Graduate-level requirements include additional readings and a detailed research paper. (Identical with NES 557) May be convened with 457.

560. History of Archaeological Theory (3) I 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 GEOS 561)

562. Archaeological Quantitative Methods (3) I Intensive review of the theory and application of statistical and mathematical methods to archaeological data.

563. Evolution of Ancient States and Civilizations (3) I 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 GEOS 564) May be convened with 464.

565. Women in International Development (3) II For a description of course topics, see 465. Graduate-level requirements include additional readings and a research paper. (Identical with FCR 565 and LAS 565) May be convened with 465.

566. Paleanthropology (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) I For a description of course topics, see 468. Graduate-level requirements include an additional research paper. P, consult department before enrolling. May be convened with 468.

570a-570b. Human Adaptability (3-3) For a description of course topics, see 470a-470b. Graduate-level requirements include a substantial research paper on a topic appropriate to the subject matter. 570a is identical with GER 570a May be convened with 470a-470b.

571a-571b. Applied Medical Anthropology in Western Contexts (3-3) Investigations of the illness experience; symbolic interpretations of medicines and medical procedures; doctor-patient communications and illness narratives. 571a demonstrates the applicability of major social science theories in the related study of health-related behavior. 571b focuses on methods of data collection and presents case studies illustrating the application of methods in the study of designated health problem areas, interviewer transfere- nce and issues of reflexivity. P, 536a.

572. The relationship of Early Hominids and Contemporary Faunas (3) I For a description of course topics, see 472. Graduate-level requirements include a research paper. May be convened with 472.

573. Primate Anatomy (4) I For a description of course topics, see 473. Graduate-level requirements include a comprehensive research paper or project, an annotated bibliography, or specialized examinations. May be convened with 473.

574. Archaeometry: Scientific Methods in Art and Archaeology (3) II For a description of course topics, see 474. Graduate-level requirements include one substantial critical review of the literature on some archaeological application of archaeometry. (Identical with CLAS 574 and NES 574) May be convened with 474.

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 mono- graph. (Identical with LING 576) May be convened with 476.
577. Discourse and Text (3) I 1995-96 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 con
vened with 477.

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 con
vened with 479.

580. Historical Comparative Linguistics (3) II 1995-96 For a description of course topics, see 480. Graduate-level requirements include a research paper. (Identical with LING 580) May be con
vened with 480.

581. Quaternary Palynology (4) II (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 con
vened with 482.

583. Sociolinguistics (3) I 1996-97 Contributions of the ethnography of communication, language variation studies, and conversa
tion/discourse analysis to the interdiscipl
inary development of sociolinguistics. (Identical with LING 583)

585. Social Organization of India and Pak
istan (3) I (Identical with NES 585) May be con
vened with 485.

586. Healing Systems in the Southwest (3) I II (Identical with NURS 588)

589. Areal Survey of Native North Ameri
can Languages (3) I The field of native North American linguistics; areal and genetic class
ifications; how the study of particular lan
guages provides insights into theories of lin
guistic anthropology and general linguistics. P, ANTH 276 or LING 101. (Identical with LING 589 and AINS 589) May be con
vened with 489.

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 con
vened with 490.

596. Seminar
a. Paleoanthropology and Paleolithic Ar
chaeology of Africa (3) II P introductory and upper-division courses in archaeol
ogy and biological anthropology.

b. Biological and Forensic Anthropology II (2) [Rpt.] II Consult dept. before en
rolling.

c. Dendrochronology (2) 3L. May be con
vened with 497c. (Identical with GEOS 5
77)

597. Workshop
a. Biological and Forensic Anthropology I (2) [Rpt.] I Consult dept. before enrolling.

b. Biological and Forensic Anthropology II (2) [Rpt.] II Consult dept. before en
rolling.

c. Dendrochronology (2) 3L. May be con
vened with 497c. (Identical with GEOS 5
77)

598. Survey of Cultural Anthropology (3) I Intensive introduction, overview, and synthe
sis of cultural anthropology.

600. Professional Ethics and Skills (3) II Treatment of a series of ethical issues that can arise in acquisition and dissemination of an
thropological data; (b) design and implemen
tation of research through the construction of fundable research proposals; (c) professional self-presentation. Course materials will repres
ent the four sub-disciplines of anthropology.

605. Women's Health in the United States (3) II An examination of social, cultural and political-economic factors affecting women's health in historical and contemporary con
texts 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.

613. Policy Making and Organizational Culture (3) II Examines the development, goals, techniques and practices of anthropol
ogy as a policy science.

620. Linguistic Field Techniques (3) I 1995-96 Practice in asking linguistically informed and ethnographically sensitive questions in face-to-face interaction with a linguistic consul
tant; techniques of language data analysis and description

631. Anthropology and Development (3) II The role of anthropology in interdisciplinary projects involving economic development and planned change on the national and inter
national levels. (Identical with AR L 631 and LA S 631)

636. Foundations of Archaeological Inter
pretation (3) I Surveys the history of archaeo
logical interpretation. Central concepts in archaeological method and theory are presented.

637. Archaeological Methodology (3) II Surveys the fundamental principles, methods, and techniques of archaeological analysis and inference from a multidisciplinary perspec
tive.

642a-642b. Advanced Field Course in Ar
chaeology (3-3) S Archaeological methods, theory, and field techniques. 642a: Three-
week field excavation and survey. Fee. 642b: Three-week laboratory processing and analy
sis. Fee. Registration restricted. Contact department for application, which must be re
turned by April 1.

645. Early Civilizations (3) [Rpt.] II Compar
ative 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.

655. Survey of Biological Anthropology (3) II Modern biological anthropology including evolutional theory, genetics, skeletal biol
ogy, primatology, paleoanthropology, human growth, adaptability and demography.


674. The Impact of Modernization on the Third World (3) II Intensive study of speci
cific theories and varieties of culture change. P, 6 units in cultural anthropology or consent of instructor.

675a-675b. Anthropology and International Health (3-3) 675a An intensive overview of the field of international health and anthro
pologists' 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 an
thropological investigations of health within a broader development context. P, 536a.

679. Language and Ethnography (3) II 1996-97 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 is
sues in linguistic analysis. Language as a cultural code, biological foundations, universals and typology, language and social reality, tex
tual analysis.

695. Colloquium
a. Forensic Anthropology (2) [Rpt./6 units] II 2R, 1L. P or CR, 468 and 597b.

696. Seminar
a. Archaeology (1-3) [Rpt./3] I II
b. Cultural Anthropology (1-3) [Rpt./3] I II (Identical with AR L 696b and NES 696b)
c. Linguistic Anthropology (1-3) [Rpt./3] I II
b. Biological Anthropology (1-3) [Rpt./3] I II

Applied Mathematics (APPL)
Mathematics Building, Room 414
(520) 621-4664; FAX: (520) 621-8322
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. Dal
las (Radiology), William G. Faris (Mathematics), Hermann Fasel (Aero-

ders 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.

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 and building consequences. 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 and small discussion groups 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) I Basic design principles and introduction to design of built form and exterior space, with attention to site analysis and natural sitting, horizontal circulation systems, basic materials and structural systems. F, admission to professional phase.

202. Environmental Influences in Architectural Design (6) II 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, sustainable materials and structural systems. Fee. P, 201, 212.

212. Design Communications (3) I Methods of generating, studying, and communicating architectural concepts. Direct perspective,
shadow casting, and conceptual diagramming. 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.

270. Introduction to Architectural Computing (3) I II Micro-computer presentation techniques in architecture, including CAD, desktop publishing, and computer presentation. Previous experience is required with word processing, spread sheets and the DOS and Macintosh operating systems. 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.

318. Elements of Structural Systems (3) I Force systems in equilibrium; introductory mechanics of materials; response of structural elements to stresses; principles of structural design including general characteristics of structural hierarchies. P, 118 and admission to professional phase.

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, upper-division standing or permission of instructor. Open to non-majors.

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, upper-division standing or permission of instructor; 324 is recommended. Open to non-majors.

335. Construction Systems (3) II Analysis of contemporary systems of building construction with emphasis on assembly and integration of components; construction procedures and sequences; understanding how buildings go together; introduction to codes and regulations. P, 235.

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.

401. Emphasis Areas in Architecture (6) I Nine studios emphasizing one of the following: desert architecture, interior architecture, design competition, design/build, technology and form, practice, and large-scale projects. Offerings are determined by faculty availability, and all topics may not be offered each year. Other topics may be introduced. Fee. P, 270, 302. May be convened with 501. Vertical studio.

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 determined 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 and 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 AS 404).

412. Publication Graphics (3) I Designing compositions of text and graphics, and preparing them for publication. Class produces annual AIAcalendar and other publications. 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, 334 or permission of instructor. Open to non-majors. 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) II Study of recent architectural developments throughout the world, focusing on the personalities, theoretical and issues influencing built form since 1945. P, 334 or by permission of instructor; upper-division standing. May be convened with 524.


432. Video and Media in Design Communications (3) [Rpt./1] II 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) II Survey of lightweight construction techniques, including pneumatic, tensile membranes, three-dimensional cable nets, grid shells and flexure stiff plates. May be convened with 533.

434. History of the American House (3) II Survey of American domestic buildings from European settlement to the present including social, political, and economic forces affecting architectural change. P, 334 or permission of instructor. (Identical with ARH 434) Open to non-majors. May be convened with 534.


442. Architectural Photography (3) II Theory and practical techniques for the varied uses 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.
43. Architecture in the Mediterranean (3) S Summer study tour of the Mediterranean focusing on architecture. Includes Greece and the Greek islands. Includes courses on graphic and written projects and assignments. Emphasis on field investigation. May be convened with 543.

44. Site Planning (3) 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 specific development project is required. P. 330. (Identical with PLNG 444) May be convened with 544.

45. Option Areas in Architecture (6) I Nine studios emphasizing one of the following: desert architecture, interior architecture, design competition, design/build, technology and form, practice, and large-scale projects. Offerings are determined by faculty availability, and will not be offered each year. Other topics may be introduced. Fee. P. 334, 335, 336, 402. May be convened with 551. Vertical studio.

46. Senior Project (6) II Studio-based project demonstrating a synthesis of knowledge or development of theoretical concepts. Fee. P. 451.

47. Honors Senior Project (6) I II S Studio-based honors project demonstrating a synthesis of knowledge or development of theoretical concepts. P. 451, admission into Honors Program.

48. Ethics and Practice (3) I Standards and values of architectural services and professional practice and project and practice management. P. 270 and 402. May be convened with 559.

49. Readings and Research in Design Communication (3) I Reading and discussion of design communication theory and research. Generating, developing and defending a research proposal in design communication. P. 402. May be convened with 562.


51. Women in American Architecture (3) I Women as users, patrons, and architects of American buildings with emphasis on understanding the relationship between gender and architecture in the history of the United States. P. upper division standing and permission of instructor. (Identical with ARH 464 and WS 546) May be convened with 564.

52. The Art and Architecture of LeCorbusier (3) I Introduction to the art and architecture of Le Corbusier (1887-1965), emphasizing his urban plans, building designs, and plastic art. P. 334. (Identical with ARH 466) May be convened with 566.

53. Computer Graphics in Architecture (3) II Introduction to the theory, techniques, and applications of computer-aided design. Focusing on modeling buildings using 3D CAD strategies and techniques on DOS and Macintosh platforms. Lectures on technical topics, with intensive experience on computers. P. 270 and 202. May be convened with 570.

54. Introduction to the Conservation of Cultural Resources (3) I An overview of the Historic Preservation movement in America, including discussion of concepts, rationale for and methods of resource utilization, implementation of plans, legislation, etc. Field trips. May be convened with 573.

55. Field Methods in Environmental Psychology (3) II (Identical with PSYC 474) May be convened with 574.

56. Computer Presentations in Architecture (3) I Introduction to the theory, techniques, and applications of computer-based presentations. Focusing on generating realistic architectural images and fly-throughs that are assembled in a finished multimedia presentation. In-class experience on computers. P. 470. May be convened with 580.


58. Planning the Built Environment (2) I A lecture survey dealing with the origins and implications of manifestations of communal ordering systems. An analytical vocabulary is developed with which current and historic settlement patterns are visually compared to discover spatial attributes as a dimension of human experience. Writing. Emphasis Course for architecture majors. P. 302, 334 and upper-division written proficiency requirement. (Identical with PLNG 484) May be convened with 584.

59. Space: A Social-Cultural View (3) [Rpt. /1] I Human, socio-cultural use of space. Including processes of symbolic expression. Investigation of the role of space through ethnographic readings describing both ritual and architectural examples. Consult department before enrolling. May be convened with 587.

60. Seminar a. Readings in Architectural Theory (2-4) [Rpt. /1] II Open to majors only. May be convened with 596a.


62. Emphasis Areas in Architecture (6) I For a description of course topics, see 401. Graduate-level requirements include additional documentation demonstrating theoretical understanding of design. Fee. May be convened with 401. Vertical studio.

63. 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.

64. 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.

65. Architecture and Planning in Mexico (3) For a description of course topics, see 404. Graduate-level requirements include an additional research paper on a particular aspect of Mexican architecture. (Identical with LA S 504) May be convened with 404.

66. Publications in Graphics (3) 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.

67. 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.

68. History of American Architecture (3) I For a description of course topics, see 414. Graduate-level requirements include an additional research project that focuses on and develops one of the major topics of the course. P. 334 or permission of instructor. Open to non-majors. May be convened with 414.

69. Urban Communication (3) [Rpt. /1] 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.

70. Modern Architecture (3) II For a description of course topics, see 424. Graduate-level requirements include an additional in-depth research paper. May be convened with 424.

71. Video and Media in Design Communications (3) [Rpt. /1] II For a description of course topics, see 432. Graduate-level requirements include an in-depth research paper or project. May be convened with 432.

72. Lightweight Construction Techniques (3) II For a description of course topics, see 433. Graduate-level requirements include an additional project demonstrating a comprehensive grasp of one lightweight construction technique. May be convened with 433.

73. History of the American House (3) S For a description of course topics, see 434. Graduate-level requirements include an additional research project. (Identical with ARH 534) Open non-majors. May be convened with 434.

74. Construction Documents (3) I For a description of course topics, see 439. Graduate-level requirements include an in-depth research paper focusing on one particular aspect of developing new techniques in the field. May be convened with 439.

75. Architectural Photography (3) II For a description of course topics, see 442. Graduate-level requirements include a research project. May be convened with 442.

76. Architecture in the Mediterranean (3) S For a description of course topics, see 443. Graduate-level requirements include a research paper. May be convened with 443.

77. Site Planning (3) II For a description of course topics, see 444. Graduate-level requirements include an in-depth research paper focusing on one particular aspect of developing new techniques in the field. (Identical with PLNG 544) May be convened with 444.
551. Option Areas in Architecture (6) I For a
description of course topics, see 451. Graduate-
level requirements include additional project
development focusing on a particular aspect of
the topic under study. May be convened with

559. Ethics and Practice (3) I For a descrip-
tion of course topics, see 459. Graduate-level
requirements include an in-depth research
paper focusing on a particular aspect of con-
temporary professional practice. May be con-
vened with 459.

560. Introduction to Architecture Graduate
Computing (3) II Study and use of comput-
ing applied to the architecture graduate pro-
gram including architectural graphics, desk-
top publishing, CAD, and computer pre-
sentations. Previous experience required with
word processing, spreadsheets and the DOS
and Macintosh operating systems. P, graduate
admission.

562. Readings and Research in Design
Communication (3) I For a description of
course topics, see 462. Graduate-level re-
quirements include an in-depth research paper
or project. May be convened with 462.

563. Computer Energy Analysis (3) [Rpt./I]
For a description of course topics, see 463. Gradu-
ate requirements include an in-depth research
paper or project. May be convened with 463.

564. Women in American Architecture (3) I
For a description of course topics, see 464. Gradu-
ate-level requirements include an in-depth
research project. (Identical with ARH 564)
and W S 564) P, permission of instructor. Open
to non-majors. May be convened with 464.

566. The Art and Architecture of LeCor-
busier (3) I For a description of course topics,
see 466. Graduate requirements include an ad-
tional research paper or project. (Identical
with ARH 566) May be convened with
466.

570. Computer Graphics in Architecture (3)
II For a description of course topics, see 470.
Graduate-level requirements include a special
project demonstrating in-depth understand-
ing of one particular theory or technique cov-
ered in the course. May be convened with
470.

573. Introduction to the Conservation of
Cultural Resources (3) I For a description of
course topics, see 473. Graduate-level re-
quirements include an in-depth research paper
focusing on a particular concept or methodology utilized in preservation prac-
tice. Field trips. May be convened with 473.

574. Field Methods in Environmental Psy-
chology (3) II (Identical with PSYC 574) May
be convened with 474.

580. Computer Presentations in Architec-
ture (3) I For a description of course topics,
see 480. Graduate-level requirements include
additional project development demonstrat-
ing in-depth comprehension of the potential
of the application under study. May be con-
vened with 480.

583. Advanced Computer Energy Analysis (3)
[Rpt./I] II For description of course topics, see
483. Graduate requirements include a research
paper or project. May be convened with 483.

584. Planning the Built Environment (2) I
For a description of course topics, see 484. Gradu-
ate-level requirements include an ad-
titional research paper that focuses on and
develops one of the major themes of the
course. (Identical with PLNG 584) May be con-
vened with 484.

587. Space: A Social-Cultural View (3)
[Rpt./I] I For a description of course topics,
see 487. Graduate-level requirements include
an additional research paper that focuses on and
develops one of the major topics of the
course. May be convened with 487.

596. Seminar
a. Readings in Architectural Theory (2-4)
[Identical with PLNG 596a]
1.1 Open to majors only. May be convened with 496a.
b. Research Methods in Architecture (3) I
P, graduate admission.
. Interdisciplinary Environment-Behavior-
Design (5) I (Identical with PSYC 596u)

597. Workshop
a. Architecture (3-8) [Rpt.] I II Open to ma-
jors only. (Identical with PLNG 597a)
b. Special Projects in Architecture (1-3)
[Identical with ARH 597b]
II S Consult college before enrolling. May be convened with 497b.
i. Interdisciplinary Studio for Community
Design (3-6) I Field trips. Open to non-
majors only. (Identical with L AR 597i
and PLNG 597i) May be convened with
497i.

696. Seminar
b. Financing Public Services (3) I (Identical
with PLNG 696b)

Arid Lands Resource
Sciences (AR L)

845 N. Park Avenue, Room 102
(520) 621-1955; FAX: (520) 621-3816

Graduate Interdisciplinary Program in Arid
Lands Resource Sciences

Committee:

Professors Joseph J. Hoffman, Chair,
Paul G. Bartels (Plant Sciences),
Robert B. Bechtel (Psychology),
Michael E. Bonine (Near Eastern Studies),
Herbert E. Carter (Emeritus),
Donn C. Cory (Agricultural and
Resource Economics),
Steven N. Davis (Emeritus),
Peter F. Frolkis (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 (Anthropology and
Geosciences),
Mary H. Hoffmann (Arid Lands),
Helen M. Ingrahm (Political
Science) 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 S. Schiffer (Anthropology),
Donald C. Slack (Agricultural and
Biosystems Engineering),
Barbara N. Timmermann, (Arid Lands),
Thomas Weaver (Anthropology)

Associate Professors Charles F.
Hutchinson, (Arid Lands), D. Robert
Altschul (Geography and Regional
Development), Bonnie G. Colby
(Agricultural and Resource
Economics),
Owen K. Davis (Geosciences),
Michael J. Donoghue (Ecology
and Evolutionary Biology),
Lisa J. Graumlich (Laboratory of
Tree-Ring Research),
Katherine K. Hirschboeck
(Laboratory of Tree-Ring Research),
Stuart E. Marsh (Geography and
Regional Development),
Steven P. McLaughlin (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),
James C. Wade (Agricultural and
Resource Economics),
Donovan Wilkin (Renewable Natural
Resources)

Assistant Professors Andrew Comrie
(Arid Lands Studies),
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 pro-
gram is interdisciplinary and provides an
academic environment in which to exam-
ine the ecological, economic and social
factors which influence the sustainable
use of arid and semiarid lands. Interested
students should request additional infor-
mation from the program chairman. For
admission and degree requirements, please see the Graduate Catalog.

512. Economic Policy in Developing Coun-
tries (3) II (Identical with AREC 512).

521. Physical Climatology (3) II (Identical
with ATMO 521).

530. The Climate System (3) I (Identical with
GEOG 530).

523. Hydrology (3) I (Identification with C E 523).

535. Water Management in Dryland Ecosys-
tems (3) I (Identical with WS M 535).

541. Economic Botany of Arid Lands (3) I II
(Identical with PL S 541).

550. Geomorphology (4) I (Identical with
GEOS 550).

564. The Arid and Semiarid Lands (3) I (Identical with
GEOS 564).

565. Physical Aspects of Arid Lands (3) II
(Identical with GEOG 565).

575. Economics of Natural Resource Policy
(3) I (Identical with AREC 575).

590. Remote Sensing for the Study of Planet
Earth (3) 1995-96 II (Identical with REM 590)
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 \textit{Arts and Sciences/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. The major in studio art assumes general knowledge of mathematics. Students must complete MATH 117, 121, 122 or MIS 111. These 80 units in art are subdivided as follows:

- **Foundations requirements** — 15 units: 101, 102, 104, ARH 117, 118.
- **Distribution requirements** — 30 units:
  - 2-\textit{Dimensional Studies}: 9-12 units chosen from 205, 241, 250, 251, 253, 255, 265, 266, 280, 285. 3-\textit{Dimensional Studies}: 6-9 units chosen from 271, 273, 276, 287, 289.
- **Art history**: 9-12 units of upper-division art history and/or related courses.
- **Major area of concentration** — 24 units in any one emphasis area:
  - 2-\textit{D studio emphasis} in drawing, painting, or printmaking, or an approved combination: 24 units of upper-division studio art courses.
  - 3-\textit{D studio emphasis} in sculpture, ceramics, fibers, or metals: 24 units of upper-division courses including 15 units in primary medium and 3-6 units in each of 2 secondary media.
  - **Photography emphasis**: 24 units of upper-division courses to be selected from 341a, 341b, 341c, 341e, 343a, 343b, 345, 346, 441, 447, and 448. 12 units of upper-division art history from any art history or ART 342.
  - **New Genre emphasis**: 24 units of upper-division new genre courses.
- **Visual Communication**: emphasis in graphic design, illustration or an approved combination: 24 units of upper-division courses including 363, 364, 365, 366, 464, 466 with 465 (twice) for graphic design, or 363, 364, 365, 366, 467, 464, 466 and 467 for illustration.
- **Combining Media emphases**: 24 units of upper-division courses including 15 units of primary medium and 9 units of secondary medium. Combinations from the following media: painting/drawing, printmaking, new genre, visual communication, sculpture/ceramics/fibers/metals. This emphasis curriculum must be approved in writing by the primary area coordinator. \textit{Minimum total units for the degree with this major} — 125.

Art electives — 11 units from other courses in art, 6 of which must be upper division.

The major in art education is for students planning to teach art in the elementary and secondary schools. Graduates qualify for the K-12 Art Specialist Endorsement on a Secondary Certificate for the State of Arizona. This program approximates certification requirements of most states. At least 12 units of art must be taken at the University of Arizona. The major in art education assumes general knowledge of mathematics. Students must complete MATH 117, 121, 122 or MIS 111.

In addition to the general education requirements for the Bachelor of Fine Arts degree described under the \textit{Sciences/Fine Arts} in this catalog, the following major area of study requirements must be met: Foundations courses and Distribution courses as described in the \textit{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, (See "Teaching Major for Degrees Outside the College of Education" in the College of Education section of this catalog) 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. \textit{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 \textit{Arts and Sciences/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 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 Minor: 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.

**Photography:** 241, 341, 343, 346, 441.

**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, 366, 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 course in drawing problems using the model. 6S. Fee. P, 205.

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. 2S, 25. Field trips. Fee. (Identical with M AR 241)


251. Intaglio (3) I II Introductory course in the fundamental techniques and aesthetics of intaglio printmaking with emphasis on etching. 65. 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. Stone and metal plate processes are covered. 6S. Fee. P, 101, 102, or permission of department.


271. Beginning Jewelry and Metalsmithing (3) I II Introduction to the fundamentals of jewelry and metalwork processes. 65. Fee. P, 104.

273. Beginning Ceramics (3) I III Introduction to the basic clay processes of hand construction, potter’s wheel, surface decoration and glaze application, kiln firing, and ceramic history. 1R, 4S. Fee. P, 104.

276. Beginning Fibers (3) I II Structural development of fibers into woven forms, using the frame loom; fiber as a fine arts medium. 65. P, 104.

280. Painting I (3) I II Elementary course in the methods and techniques of painting with oils and/or acrylics. 65. Fee. P, 101, 102, 205.


287. Beginning Sculpture (3) I II Introduction to fundamentals of sculpture process through carving, fabrication and casting, to develop personal approaches to dimensional composition. 65. Fee. P, 104.

289. Beginning Modeling Emphasizing the Figure (3) I II Beginning modeling techniques in clay emphasizing the figure. Scale, composition, gesture, surface and anatomical structure will be studied to develop creative solutions. Fee. P, 104.

305. Figure Drawing II (3) [Rpt./2] I II Intermediate course in drawing problems using the model. 65. Fee. P, 205.
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. Typography (3) I II GRD The study of letterforms and their appropriate and effective use in visual communications, from a historic as well as from a contemporary perspective. 6S. Fee: P, 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. 6S. 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 completion. Fee: P, 102, 205, 265, acceptance of portfolio.

366. Rendering Techniques (3) [Rpt./1] I II Drawing and rendering techniques with various media in the creation of editorial and advertising illustration. 6S. Fee: P, 265, 266, acceptance of portfolio.


371. Intermediate Jewelry and Metalsmithing I (3) [Rpt./2] I Design and creation of jewelry and metalsmithing forms by construction methods. Emphasis on form development through raising, forging, repousse, casting, etc. 6S. Fee: P, 271.

372. Intermediate Jewelry and Metalsmithing II (3) [Rpt./2] II Three-dimensional fibers techniques including 4-harness loom weaving (loom and weaver controlled weaves) and tapestry weaving (cartoon as well as spontaneous methods). Emphasis on individual interpretation of traditional woven techniques. 6S. P, 276.

376. Intermediate Fibers I (3) [Rpt./3] I Two-dimensional fiber techniques including loom weaving (loom and weaver controlled weaves) and tapestry weaving. Emphasis on individual exploration of the media and concepts of sculpture through metal and wood fabrication processes. 6S. Fee: P, 287.

387c. Intermediate Sculpture/Carving (3) I II In-depth exploration of the subtractive process with direct carving versus specific imagry. 6S. Fee: P, 287.

387e. Intermediate Sculpture/Experimental and Combined Media (3) [Rpt./2] I II In-depth exploration of the techniques and concepts of experimental and combined media as applied to individual directions. 6S. Fee: P, 287.

387g. Intermediate Sculpture/Kinetic (3) I [Rpt./2] I II In-depth exploration of the techniques and concepts of kinetic sculpture and applied to individual directions. 6S. Fee: P, 287.

389. Intermediate Modeling Emphasizing the Figure (3) I II Intermediate modeling techniques in clay emphasizing the figure. Scale, composition, gesture, surface and anatomical structure will be studied to develop creative solutions. Fee: P, 104.

405. Figure Drawing III (3) [Rpt./3] I II Advanced drawing with emphasis on personal expressive development. 6S. Fee: P, 6 units of 305.

409. Drawing Critique (3) [Rpt./5] I II Individual exploration and development of visual concepts through drawing, accompanied by individual and class critiques. 6S. Fee: 405.

422. Performance: Live/Photo/Video (3) An overview of diverse approaches within performance art in an interdisciplinary context. Combines live performance with video and photography. 6S. May be convened with 522.

423. New Genre Concept Development (3) [Rpt./1] Studio course to assist students with defining intentions, refining project ideas and clarifying the content of their artmaking. Open to students working in any medium. May be convened with 523.

441. Advanced Photography (3) [Rpt./1] I II Current trends, philosophies and experimentation in still photography. 2R, 2S. Fee: P, 341, acceptance of portfolio. May be convened with 341.

446. Experimental Color Photography (3) [Rpt./1] I II 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, 2S. Fee: P, 341a, 341b or 341c; 346, acceptance by portfolio. May be convened with 346.

447. Mixed Media Book (3) [Rpt./1] I II Investigation of the book as a format for presenting visual material; the process of making simple books. Contemporary bookmakers will be presented. 2R, 2S. Field trips. P, 12 units of upper-division studio art courses. May be convened with 347.

448. Video for Artists (3) [Rpt./1] I II Seniors and graduate students utilize small format video camera and editing to extend/amplify concept that have developed in their artistic inquiry. 2R, 2S. Field trips. P, admission by portfolio. May be convened with 348.

449. Advanced Artists’ Video (3) [Rpt./1] I II Students will produce individual video projects with an experimental, self-expres-
Art

485. Watercolor Painting III (3) [Rpt./5] I II

486. 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, 25. Fee. May be convened with 446.

487. 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.

488. Video for Artists (3) 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.

489. Advanced Artists' Video (3) [Rpt./1] 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.

500. Graduate Relief Printmaking (3) I II Relief printmaking with emphasis on individual research, personal direction and professional standards. 6S. Fee.

501. Graduate Intaglio (3) I II Intaglio printmaking with emphasis on individual research, personal direction and professional standards. 6S. Fee.

502. Graduate Alternative Methods in Printmaking (3) I II Nontraditional approaches to printmaking with emphasis on individual research, personal aesthetic, and professional standards. 6S. Fee.

503. Graduate Graphic Design Problems (3) [Rpt./1] I II Two- and three-dimensional design considerations with emphasis on conceptualization and presentation. 6S. Field trips. Fee. P, acceptance of portfolio.

504. Editorial Illustration (3) [Rpt./1] I For a description of course topics, see 466. Graduate-level requirements include an in-depth research project on a single aspect of a current scholarly interest. Fee. 9 units of illustration courses and approval of portfolio. May be convened with 466.

505. Graduate Illustration (3) [Rpt./1] II Exploration of any optical material or phenomenon as a possible solution to illustration problems. 6S. Fee. P, 466, acceptance of portfolio.

506. 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. 9 units of graphic design courses and approval of portfolio by Portfolio Committee. May be convened with 469.

507. Advanced Jewelry and Metalsmithing II (3) [Rpt./1] II For a description of course topics, see 472. Graduate-level requirements include an in-depth studio research project. Fee. P, 471. May be convened with 472.

508. 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, 373. May be convened with 473.

509. 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.

510. Graduate Two-Dimensional Fiber Techniques (3) I Advanced fiber technique course for graduate students who wish to develop further their strengths in special technical areas. Stresses two-dimensional work. 6S. P, consult department before enrolling.

511. 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. 6S. P, consult department before enrolling.

512. Graduate Painting (3) [Rpt./5] I II Graduate study in painting with an emphasis on the development of a personal imagery and body of work. 6S.

513. Combining Media (3) [Rpt.] For a description of course topics, see 483. Graduate-level requirements include an in-depth studio research project. May be convened with 483.

514. Graduate Watercolor Painting (3) [Rpt./5] I II High level experimentation in personal expression with watercolor and related media. Demonstration and critique.

515. Sculpture/Casting Materials (3) [Rpt./3] I II An in-depth exploration of the techniques and concepts of casting. Advanced process of mold making as applied to individual directions. 6S. Fee.

516. Sculpture/Materials/Metal and Wood Fabrication (3) [Rpt./3] I II An in-depth exploration of advanced processes and concepts of sculpture through metal and wood fabrication. 6S. Fee.
Art Education (ARE)

130. Appreciating the Visual Arts (3) II Introduction to techniques for describing and analyzing works of art utilizing relevant material from history and aesthetics. 2R, 2S.

330. Foundations of Art Education (3) II The development of objectives for art education based upon the visual arts, philosophy, aesthetics, and the behavioral sciences; a critical examination of current art education texts and theories. P, 10 units of art.

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. Is meant to build on the theoretical base each student has already acquired in previous art 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 496.

431. The Teaching of Art (3) II Exploration of art education curricula and instructional methodology in the elementary school. P, TTE 300, EDUC 350; CR, 338L, and 400. May be convened with 531.

434. Cross-Cultural Issues in Art Education (3) Multicultural and cross-cultural issues within visual arts education (e.g., in studio art, art criticism, art history, and aesthetics). May be convened with 534.

496. Seminar h. Current Issues in Art Education Theory and Practice (3) [Rpt./12 units] II P, upper-division standing. May be convened with 596.

500. Art for Exceptional Learners (3) For a description of course topics, see 400. Graduate-level requirements include an in-depth research article. P, courses in art or special education. May be convened with 400.

530. Introduction to Research in Art Education (3) I II Development of competency in application of language, methods, and diverse research procedures used in the visual arts and education as demonstrated by a scholarly written research report.

531. The Teaching of Art (3) II For a description of course topics, see 431. Graduate-level requirements include an in-depth research paper on a single aspect of current scholarly interest. P, TTE 300, EDUC 350; CR, 338L. May be convened with 431.


534. Cross-Cultural Issues in Art Education (3) For a description of course topics, see 434. Graduate-level requirements include a choice of either developing a curriculum unit/project based on some aspect of multicultural art education, researching and writing a ten-page paper related to a multicultural topic, or conducting a small multicultural research project. May be convened with 434.

558. Theories of Curriculum and Instruction in Art (3) Recent theories in the fields of curriculum and art education. Review and evaluation of extant art curricula and development skills for presentation, monitoring and evaluation of instruction. P, 338L.

596. Seminar h. Current Issues in Art Education Theory and Practice (3) [Rpt./12 units] II May be convened with 496.

630. History and Philosophy in Art Education (3) Critical analysis of objectives, current theories, and texts that are shaped by the visual arts, history, philosophy, aesthetics and the behavioral sciences.

633. Issues and Recent Research in Art Education (3) The identification of problems in art education at various curricular levels; examination of related research with possible implications for practice.

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 Survey of American architecture, painting, sculpture, photography, and the decorative arts from colonial times to present.

320. Introduction to European Modern Art (3) I Painting and sculpture in Europe from about 1886 to recent times.

321. Introduction to Contemporary Art (3) I 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 Meso; Central and South America; art since the conquest of Mexico, Central and South America; and Hispanic Arts of the Southwest and contemporary Chicano art. (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) (Identical with CLAS 334)

339. Introduction to African and African-American Art (3) I II Chronological, metatheno-aesthetic overview of continental African art 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) (Identical with CLAS 340a-340b)

412a-412b-412c-412d. Medieval Art (3-3-3-3) The history of art and architecture in Western Europe and Byzantium between ca. 300 and ca. 1300. 412a: Early Christian and Byzantine Art. 412b: Early Medieval Art. 412c: Romanesque Art. 412d: Gothic Art. 412a is not prerequisite to 412b, etc. May be convened with 512a-512b-512c-512d.

413b-413c. Renaissance Art in Italy (3-3) Painting, sculpture and architecture in Italy, 14th-15th century. 413c: 16th century. 413b is not prerequisite to 413c. May be convened with 513a-513b-513c.

414a-414b. Northern Renaissance Art (3-3) 414a: German, French and Netherlandish
Astronomy (ASTR)

933 N. Cherry Avenue, Room N204
(520) 621-2288; FAX: (520) 621-1532

Professors Peter A. Strittmatter, Head,
J. Roger Angel, W. David Arnett (Physics), Willy Benz, John Black,
Adam Burrows (Physics), Thomas Gehrels (LPL), William F. Hoffmann,
J. R. Jokipii (LPL), Robert C. Kennicutt, Jr., James W. Liebert, Frank J.
Low, Fulvio Melia (Physics), George H. Rieke, Marcia Rieke, Elizabeth Romeo,
Gary Schmidt, Thomas L. Swift (Emeritus), Rodger I. Thompson,
William G. Tifft, Raymond E. White, Neville J. Wolh

Astronomers Craig B. Foltz, Donald McCarty

Associate Professors John Bieging,
William J. Cocke, Christopher Impey,
Andrzej G. Pacholczyk

Associate Astronomers Edward Olaszewski, Erick Young

Assistant Professors Jill Bechtold, Philip A. Pinto, Hans-Walter Rix, Christopher Walker

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 of courses in physics and mathematics. Students must complete MATH 124 or 125a-125b, and MATH 223 and 254. 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 (or 110, 116) is available. Other minor options are available to students in other departments. These include a 20-unit technical minor, mainly for science and engineering majors, and a 20-unit liberal arts minor for students in other fields. Consult the College of Arts and Sciences or the astronomy department office for details.

Teaching Majors: The department does not offer a teaching major in astronomy. However, students interested in secondary school science teaching may earn teaching majors in Physics or Earth Science (which includes astronomy). Information on these majors is given under the catalog listings for the Department of Physics and the Department of Geosciences, respectively.

The department participates in the Honors Program.

100* Essentials of Astronomy (3) I I S Survey of astronomy, with attention to its interdisciplinary aspects and its relationships to other sciences. Planetarium work and some night-time observing sessions and field trips supplement class lectures. Primarily for non-science majors.

101L Astronomy Laboratory (1) I I S Projects, telescope observing, planetarium work, discussions. Can be taken alone or with 100. Combination is equivalent to 102. Labwork includes frequent mathematical calculations using basic algebra. Recommended preparation is satisfactory completion of the University entrance requirement in mathematics.

102* Introductory Astronomy (4) I I Survey of astronomy equivalent to combination of 100 and 101L. Our solar system, stars, galaxies and the structure and evolution of the universe. Laboratory sessions include planetarium work, some nighttime observing sessions and field trips. Laboratory exercises require use of basic algebra. Recommended preparation is satisfactory completion of the University entrance requirements in mathematics. 3R, 3L.

*Credit will be allowed for only one of the following: 100 or 102.
of the likelihood, possible nature and distribution of life in the universe. Planetarium visits, observing sessions with optical and radio telescopes and field trips. Laboratory exercises include frequent calculations using basic algebra. 3R, 3L. P, 100 or 102.

105a. The Universe and Human: Origin and Destiny (3) I II (Identical with PTYS 105a)

106. Survey of the Solar System (4) I II (Identical with PTYS 106)

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 instrumentation, measuring equipment, and data reduction techniques. Practice in observing at optical and radio wavelengths. 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.

396H. Honors Preseminar (3) Offered every third semester.

400a-400b. Theoretical Astrophysics (3-3) Stars, interstellar matter, galaxies, radio sources, cosmology. P, MATH 254, 6 units upper-division physics. 400a is a Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).


502. Astronomical Instrumentation Project (3) II 1995-96 Design, construction, and testing of an astronomical instrument chosen by each student under the guidance and supervision of the instructor. Regular class sessions are devoted to discussing techniques and reporting progress and problems.


515. Interstellar Medium and Star Formation (3) II 1996-97 Derivation of physical conditions from spectral data. Ionized, atomic and molecular clouds, interstellar dust and magnetic fields. Ionization equilibrium, heating and cooling, supernova shocks, dust and protostellar evolution.

518. Modern Astronomical Instrumentation and Techniques (3) I 1995-96 For a descrip-

522. Atomic and Molecular Astrophysics (3) I 1996-97 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 Mechanical Problems in the Space Sciences (3) I 1996-97 (Identical with PTYS 523)

535. Stellar Structure (3) II 1995-96 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.


541. Extragalactic Astronomy and Cosmology (3) II 1996-97 The structure, origin and evolution of the physical universe from the theory and observations of systems outside our own galaxy. Relativistic cosmology; galaxy evolution and clustering; active galaxies and quasars; the microwave background; galaxy formation; the hot big bang; and physics of the early universe. P, 540.

545. Stellar Atmospheres (3) I 1995-96 Radiative transfer, gray atmosphere, opacity, line formation, non-LTE, curves of growth, stellar hydrodynamics, planetary applications. (Identical with PTYS 545)

553. Solar System Dynamics (3) I 1995-96 (Identical with PTYS 553)

555. Solar System Dynamics (3) I 1995-96 (Identical with PTYS 555)

556. Electrodynamics of Conducting Fluids and Plasmas (3) 1995-96 (Identical with PTYS 556)

575. General Relativity and Cosmology (3) II 1996-97 General relativity with application to celestial mechanics, stellar structure, gravitational radiation, black holes, gravitational lensing and cosmology.

582. High Energy Astrophysics (3) 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)

Atmospheric Sciences (ATMO) Physics-Atmospheric Sciences Building, Room 542
(520) 621-6831; FAX: (520) 621-6833

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)
Associate Professors Eric A. Betterton, Joseph A. Zehnder
Assistant Professors Rong Fu, Steven L. Mullen

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; ENGR 170 (FORTRAN); PHYS 141, 142, 241; CHEM 103a-103b, 104a-104b; ATMO 300a-300b, 350, 441a-441b, 451a, 456, 471, 472. Students selecting the hydrometeorology option do not need to take CHEM 103b-104b, but must take WHR 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 141, 142, 241.

The undergraduate minor in atmospheric sciences: 20 units in atmospheric sciences, including ATMO 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.

Students should have a good working knowledge of the material covered in the prerequisites that are listed for all ATMO courses.

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 171. (Identical with GEOG 171L)

195. Colloquium
   a. The Atmosphere, U of A, and You (1) I

300a-300b. General Meteorology (3-3) Survey of physical (300a) and dynamic (300b)
361. Weather, Climate and Society (3) I II The effects of weather on society, including its influence on history, comfort and health, and music and art.


421. Physical Climatology (3) II The global and surface energy balance; the hydrologic cycle; the influence on climate of the atmospheric and oceanic circulation; climate history, sensitivity, modeling, and natural and anthropogenic change. P, 171, MATH 125b. (Identical with GEOG 421) May be convened with 521.

440. Air Pollution Meteorology (3) II 1996-97 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, 300b, PHYS 142, MATH 254, CHEM 103a, or consult department before enrolling. 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, 300a-300b or consent of instructor; PHYS 142; MATH 254. (Identical with PTYS 441a-441b) May be convened with 541a-541b.

451a-451b. Introduction to Physical Meteorology (3-3) Introduction to atmospheric physics that includes the composition and chemistry of the atmosphere, kinetic theory, the mechanics of ideal and real fluids, aerosol mechanics, atmospheric acoustics, atmospheric radiation, scattering, radiative transfer, atmospheric optics, cloud physics, and atmospheric electricity. P, 300a-300b or consent of instructor; PHYS 142; MATH 254. May be convened with 551a-551b.


465. Mesoscale Analysis (3) II Description, analysis, and dynamics of weather systems of the mesoscale. Topics may include fronts, thunderstorms, gravity waves, lake effect storms and sea breezes. P, 441 or consent of instructor, 471. May be convened with 565.


521. Physical Climatology (3) II For a description of course topics and prerequisites, see 421. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. (Identical with AR L 521) May be convened with 421.

530. Micrometeorology (3) I 1995-96 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, 541b.

535. Air/Sea Interactions (3) I 1996-97 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 1996-97 For a description of course topics and prerequisites, see 440. Graduate-level requirements include more difficult homework and project assignments that require a deeper understanding of the material and more comprehensive examinations. May be convened with 440.

541a-541b. Dynamic Meteorology (3-3) For a description of course topics and prerequisites, see 441a-441b. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. (Identical with PTYS 541a-541b) May be convened with 441a-441b.

544. Physics of High Atmospheres (3) II 1995-96 (Identical with PTYS 544)


551a-551b. Introduction to Physical Meteorology (3-3) For a description of course topics and prerequisites, see 451a-451b. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. (Identical with PTYS 551a-551b) May be convened with 451a-451b.

554. Physics of Hot Atmospheres (3) II 1996-97 (Identical with PTYS 554)


551a-551b. Introduction to Physical Meteorology (3-3) For a description of course topics and prerequisites, see 451a-451b. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. (Identical with PTYS 551a-551b) May be convened with 451a-451b.


565. Mesoscale Analysis (3) II For a description of course topics and prerequisites, see 465. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. 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 and prerequisites, see 471. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter. 1R, 6L. P, knowledge of FORTRAN or similar programming language. May be convened with 471.

572. Weather Analysis and Forecasting (3) II For a description of course topics and prerequisites, see 472. Graduate-level requirements include a survey paper on some aspect of weather prediction. May be convened with 472.

583. Remote Sensing Instrumentation and Techniques (3) II (Identical with ECE 583)

585. Tropospheric Chemistry (3) I 1995-96 Tropospheric chemistry of both the natural and polluted atmosphere. Topics include biogeochemical cycling of major constituents, urban air pollution and measurement techniques. P, 300a.

589. Atmospheric Electricity (3) I 1995-96 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, mechanisms of lightning damage and lightning protection. P, MATH 322, PHYS 241 (Identical with ECE 589).


595. Colloquium
a. Atmospheric Measurement Techniques (1-3) I 1995-96
b. Global Climate Change (2) [Rpt./I] I 1996-97 P, strong quantitative background in HWR, ATMO, GEOS or RNR. (Identical with GEOS 595b and HWR 595b).
c. General Circulation Observations and Modeling (3) II P, 541a, 551a, ENGR 170 (FORTRAN). (Identical with GEOS 595c and HWR 595c).


651. Cloud and Precipitation Physics (3) II 1996-97 Thermodynamics of nucleation, drop growth by condensation, collection and coalescence processes, drop breakup, ice crystal growth, accretion and aggregation, P, 551a.

656a-656b. Atmospheric Radiation and Remote Sensing (3-3) 1996-97 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 OPTI 656a-656b)
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 major preprofessional program for qualification for professional schools of medicine, dentistry and osteopathy.

The University Department of Biochemistry offers the Bachelor of Science, Bachelor of 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 in Biochemistry assumes substantial knowledge of mathematics. Students must complete MATH 124 or 125a and B.S. students must complete MATH 223.

The major for the B.S.: CHEM 103a-103b, 104a-104b, or 105a-105b, 241a-241b, 243a-243b; MATH 125a-125b, 223; PHYS 104a-104b, BIOC 181R, 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; MATH 125a-125b, PHYS 102a-102b, BIOC 181R, 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 Admissions Test (MCAT).

The minor for both undergraduate degrees consists of CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b; MATH 124 or 125a and 125b plus the following course 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.

Middle and high school teachers who desire advanced, specialized training in the biological sciences to enhance their classroom teaching methods may do so through the Master of Science in General Biochemistry degree program. See the headnotes under "General Biology" in the Graduate Catalog for a complete description of the program and admission procedures.

The department participates in the honors program.

105a. The Universe and Humanity: Origin and Destiny (3) I II (Identical with PTYS 105a)

181L. Introductory Biology Laboratory (1) I (Identical with MCB 181L)

181R. Introductory Biology I (3) I (Identical with MCB 181)

182. Introductory Biology II (4) II (Identical with ECOL 182)

295. Colloquium
   a. Great Experiments in Microbiology (1) I II (Identical with MIC 195a)
   b. Biotechnology (1) I II (Identical with MIC 195b and MCB 195b)
   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)

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. Teaching Biology Labs (2) II Preparation and teaching of lab and field exercises for high school biology. Includes brief high school teaching experiences. Designed for prospective high school biology teachers. 1R, 3L. Field trip. Open to prospective biology teachers only. P, 12 units of biology. (Identical with ENTO 433) May be convened with 533.

443. Research Animal Methods (3) I (Identical with V SC 443) May be convened with 553.

455. Developmental Mechanisms (3) I (Identical with MCB 455)

460. General Biochemistry (5) I Fundamentals of biochemistry, including proteins, nucleic acids, enzymes, carbohydrates and lipids and their metabolic relationships. Open to nonmajors only, P, 181, CHEM 241b. (Identical with CHEM 460 and N SC 460)


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.

473. Recombinant DNA Methods and Techniques (4) I (Identical with MCB 473)

496. Seminar
   a. Biochemistry (1) [Rpt./1] II Open to majors only. P, 462a or CR. Consult department before enrolling.

497. Workshop. Special Tutoring Workshop (1-3) I Open to senior MCB and Biochemistry majors only. Consult department before enrolling. (Identical with MCB 497a, which is home).  

501. Medical Biochemistry (7) II P, formal admission to the Ph.D./M.D. program, and permission of the course instructor.
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, and in other colleges.

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 or life science 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 in several departments in the Colleges of Agriculture, Business and Public Administration, Engineering and Mines (for engineering minor programs) and Medicine, and in Sciences and Social and Behavioral Science. Areas of emphasis include: biological imaging; biomaterials, biomedical instrumentation; cardiovascular and respiratory mechanics and transport; medical informatics and decision support systems; modeling and simulation of health delivery systems, biological systems and molecular and cellular systems; musculoskeletal biomechanics, robotics and prosthetics; and neural networks.

For additional information contact Dr. Ralph Martinez (Electrical and Computer Engineering/Radiology), Dr. Timothy Secomb (Physiology), Dr. Bruce Simon (Aerospace and Mechanical Engineering), or Dr. Stuart Williams (Surgery/Physiology).

Biophysics (BIP)

Graduate Interdisciplinary Program in Biophysics

At the time of publication of this catalog, the Graduate Interdisciplinary Program in Biophysics was under review. For current information, contact R. Gruener, (520) 621-8368; FAX: (520) 621-4189.

578a-578b. Introduction to Biophysics (3-3) Introduction to the structure of cells and the chemistry of macromolecules, followed by a survey of the principal areas of biophysics: molecular biophysics, membrane and cellular biophysics, and systems biophysics. P, PHYS 332, 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 only to majors only.

Business Administration

McClelland Hall

Accounting (520) 621-2620
Finance (520) 621-7554
Management Information Systems (520) 621-2748
Management and Policy (520) 621-1035
Marketing (520) 621-3519
Karl Eller Graduate School of Management (520) 621-2169

Committee on Business Administration

Professors Lee Roy Beach (Management and Policy), Price V. Fishback (Economics), Melanie R. Wallendorf (Marketing)
Associate Professors Sudha Ram (Management Information Systems), Michael S. Weisbach (Finance)
Assistant Professors Chris C. Demchak (Public Administration and Policy), Mark A. Trombley (Accounting)

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 (CBIO)

Arizona Health Sciences Center, Room 0914
(520) 626-7479; FAX: (520) 626-4480

Graduate Interdisciplinary Program in Cancer Biology

Committee:
Professors G. Tim Bowden, Chair (Radiation Oncology), David S. Alberts (Internal Medicine), Harris Bernstein (Microbiology and Immunology), Danny L. Brower (Molecular and Cellular Biology), William S. Dalton (Internal Medicine), 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 (Cancer Center), Sydney E. Salmon (Internal Medicine), I. Glenn Sipes (Pharmacology and Toxicology), Raymond Taitle (Internal Medicine), Samuel Ward (Molecular and Cellular Biology), Ronald Weinstein (Pathology)
Associate Professors Emmanuel Akporiaye (Microbiology and Immunology), Louise M. Canfield (Biochemistry), Anne E. Cress (Radiation Oncology), Carol Dieckmann (Biochemistry), Harinder S. Garewal (Medicine), Helen Ginsler (Radiation Oncology), Robert Gillies (Biochemistry), Jennifer D. Hall (Molecular and Cellular Biology), Kit S. Lam (Internal Medicine), Daniel C. Liebler (Pharmacology and Toxicology), Alan F. List (Medicine), Charlene McQueen (Pharmacology and Toxicology), Roger L. Miesfeld (Biochemistry), Charles W. Taylor (Internal Medicine)
Assistant Professors Alison E. Adams (Molecular and Cellular Biology), Lynne Manseau (Molecular and Cellular Biology), Jesse D. Martinez (Radiation Oncology), Kathy McGovern (Radiation Oncology), Roy R. Parker (Molecular and Cellular Biology), Scott Selleck (Molecular and Cellular Biology), Ted Weisheit (Molecular and Cellular Biology), Luke Whitesell (Pediatrics)

Scientists from various departments comprise the interdepartmental 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 Molecular and biochemical aspects of DNA replication in mammalian cells will be described in conjunction with discussions of recent journal articles on selected topics. Includes the regulation of S phase within the eukaryotic cell cycle; nuclear organization during DNA synthesis; DNA replication enzymes; viral, yeast and embryo models of DNA replication; the initiation of DNA replication; DNA replication origins and the reconstitution of DNA replication complexes. P, BIOC 462b. (Identical with BIOC 505, MCB 505, and MBIM 505) Cress

550. Drug Disposition and Metabolism (2) II (Identical with PHCL 550)
Cell Biology and Anatomy (CBA)

Arizona Health Sciences Center
Room 4205
(520) 626-6084; FAX: (520) 626-2097

Professors Robert S. McCuskey, Head,
Jay B. Angevine, Jr., Joseph T. Bagnara (Emeritus),
Bryant Benson, Robert W. Gore (Physiology),
F. E C. Hadley, Mary I. Johnson (Pediatrics),
Philip H. Krutzsch (Emeritus),
Raymond B. Nagle (Pathology),
John Nolte, Donald P. Speer (Surgery),
Nicholas J. Strausfeld (Arizona Research Laboratories, Neurobiology)

Associate Professors Gail D. Burd (Molecular and Cellular Biology),
C. Ward Kicsher (Emeritus), R. Clark Lantz (Associate Head),
Christopher A. Ledem, Albert V. Lebouth, Mary E. Morbeck (Prof. Anthropology),
Raymond Runyan, Paul A. St. John, Leslie P. Tolbert (Arizona Research Laboratories, Neurobiology)

Assistant Professors Parker Antin (Animal Sciences),
Herman Gordon, Nathaniel McMullen, Naomí Rance (Pathology),
Mary Rykowski, Jean M. Wilson

Research Assistant Professor Helen Armerongen

Lecturer Norman E. Koelling
Senior Clinical Lecturer James C. Dunn
Assistant Specialists Danny Burns, Grant Dahmer

Research areas of faculty include cell biology, developmental biology, endocrinology, molecular biology, neurobiology, reproductive biology, systems biology and biological anthropology. The Department of Cell Biology and Anatomy offers a program of study leading up to the Doctor of Philosophy degree. The Master of Science is offered only in rare instances in which students are unable to continue in the doctoral program. For admission and degree requirements, please see the Graduate Catalog.

401. Human Gross Anatomy (3) II Survey of the gross structure of the human body. IR, 6L. Open to pharmacy and selected students. (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. MAy be convened with 515.

456. Developmental Biology (3) I (Identical with AN S 456) May be convened with 556.

457R. Endocrinology (3) II Neural and endocrine integration in the regulation of mammalian physiological functions. (Identical with MCB 457R) May be convened with 557R.

471. Human Embryology (4) II Normal and abnormal development of the human with functional aspects stressed. Includes matura-
tion of germ cells to fertilization to birth. Lecture, discussion and demonstration format. P, MCB 181, 182; ESSL 201, 202 or MCB 457 or 457R, or consult with department. (Identical with ECOL 471 and MCB 471) May be convened with 571.

502. Principles of Neuroanatomy (4) II Cellular elements and recognized subsystems of the mammalian nervous system, with emphasis on general principles of neuroanatomical organization and their functional significance. Not open to premedical students. P, 8 units of biological lab. science; 401; PSYC 302, PSIO 480 desirable. Consultant instructor before enrolling. (Identical with ESSL 502, PSYC 502, and SP H 502)

515. Human Reproductive Biology (3) For description of course topics, see 415. Graduate-level requirements include oral presenta-
tions and an in-depth research paper on a selected topic of current interest in reproductive biology. May be convened with 415.

550. Topics in Pigment Cell Biology (3) Selected topics on the development and control of normal and abnormal pig-
ment cells in various pigmentary phenomena. (Identical with MCB 550)

555. Cancer Biology (3) II 1996-97 (Identical with CBI 555)

556. Developmental Biology (3) I (Identical with AN S 556) May be convened with 456.

557. Experiments in Developmental Biology (4) For a description of course topics, see 457. 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.

588. 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 descri-
tion of course topics, see 471. Graduate-level requirements include extensive term pa-
ers plus a class presentation on the topics. P, MCB 181, 182; ESSL 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 1995-96 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. (Identical with PSIO 575 and MCB 575)

577. Principles of Cell Biology (4) II Intensive, graduate-level introduction to principles and mechanisms of cell biology, including current research strategies in the field. P, consult course coordinator before enrolling. (Identical with MCB 577)

582. Topics in Neural Development (2) I 1995-96 (Identical with NRSC 582)

583. Topics in Neural Plasticity (2) II 1996-97 (Identical with MCB 583)

584. Cellular Neurobiology (2) II 1996-97 Readings and discussions of primary literature on the cell biology of the synapse. P, permission of instructor and prior course in neurobiology or cell biology. (Identical with MCB 584 and NRSC 584) Tolbert-St.John

588. Principles of Cellular and Molecular Neurobiology (4) (1) (Identical with NRSC 588)

589. Principles of Systems Neurobiology (4) II (Identical with NRSC 589)

595. Colloquium a. Journal Club (1) [Rpt./14] I II Consult department before registering.

d. Special Topics in Cell Biology (2) [Rpt./6 units] II 1996-97 (Identical with CBIO 595d)

596. Seminar c. Concepts in Cellular Differentiation (2) II 1995-96 P, 577 or equivalent (Identical with MCB 596c)


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 Comprehensive study of the development and gross structure of the human body or of selected areas of systems. Permission required to enroll; 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. (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.

612. Biological Electron Microscopy (4) I (Identical with MCB 612)

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. Student Seminar (1) I II [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.

802. Histology and Cell Biology (5) Essentials of microscopic human anatomy and cell biology. (Same as 602)

805. Human Neuroscience (6) I II Morphological organization of the human central nervous system. (Identical with NEUR 805, PHCL 805, and PSIO 805)

**Chemical and Environmental Engineering (CHE)**

Harshbarger Building, Room 120 (520) 621-6044; FAX: (520) 621-6048


Chemical engineers apply basic principles of chemistry, physics and mathematics to the development of safe, environmentally and economically sound processes in which chemical and/or physical changes take place. Environmental engineers apply those same basic principles directly to the prevention and remediation of environmental problems. These curricula prepare students for employment in research, development, design and operations aspects of the chemical, energy, environmental, food, micro-electronics, petroleum, pharmaceutical, plastics and related industries.

The department offers the Bachelor of Science in Chemical Engineering and the Master of Science and Doctor of Philosophy with a major in either chemical engineering or environmental engineering. For graduate admission and degree requirements, consult the Graduate Catalog.

Undergraduate students are advised that success in upper-division courses ordinarily requires an average of "C" or better in the prerequisite courses (CHEE 201, 202 and 203).

The department participates in the Honors Program.

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 elective 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 102, 170.

202. Introductory Engineering Analysis (3) II Application of selected mathematical and numerical procedures to the formulation and solution of chemical engineering problems. 1.5ES, 1.5ED. P, 201.

203. Chemical Engineering Heat Transfer and Fluid Flow (3) II Theory and calculations in the unit operations of fluid flow, heat transfer, and evaporation. 1.5ES, 1.5ED. P, 201.

203. 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.

204. Chemical Engineering Operations Laboratory (3) II Lab. investigation of process equipment. 1.5ES, 1.5ED. P, 201, 203.

205. Chemical Engineering Transport Phenomena (3) II Theory and calculations pertaining to fundamental transport processes. 3ES. P, 201, 402.

207. 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.

316. 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.

326. Chemical and Physical Equilibrium (3) II Applications of thermodynamics to equilibrium processes; chemical and physical equilibrium in multicomponent systems. 3ES. P, 316, CHEM 480a.

370. Water Supply and Wastewater Systems (3) I II CDT Design of water distribution and
wastewater collection systems and fundamental principles of unit treatment processes. 1ES, 1.5ED, P, 203 or CE 321. (Identical with CE 370)

371. Water and Wastewater Treatment Process (3) I Analysis of processes controlling water quality and the design of water, wastewater, and recycle treatment systems. 1ES, 2ED, P, 370. (Identical with CE 371)

402. Intermediate Engineering Analysis (3) I Solution of complex chemical engineering problems utilizing both analytical and numerical techniques. 1.5ES, P, MATH 254, CHE E 202, CR, 303.

413. Process Control and Simulation (3) I Theory of automatic control as applied to elementary chemical engineering processes. Use of continuous system simulation languages for study of practical control problems in the process industries. 1.5ES, 1.5ED, P, CR, 402.

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

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

420. 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.

421. 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.

422. 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.

435. Corrosion and Degradation (3) II (Identical with MSE 435) May be convened with 535.

442. 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.

443. 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.

451. 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 or consult with department. May be convened with 551.

454. Law for Engineers/Scientists (3) I 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.

460. Aerosol Science and Engineering (3) I 1995-96 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.

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. (Identical with CE 478) May be convened with 578.

480. Bioseparation Techniques for Engineers (3) Methods of separation for purification of bioproducts such as - amino acids, proteins, nucleic acids, carbohydrates, lipids, cells. 3ES, P, CHEM 243a-243b. May be convened with 580.

481. Bioreactor Engineering (3) I Introduction to biotechnology; chemistry of microorganisms, design of bioreactors to include cellular and extracellular enzymes; transport phenomena and control of bioreactors; instrumentation and measurement in bioreactors. 3ES, P, MATH 254, CHEM 241a, CHEM 480a. May be convened with 581.

485. Biomedical Transport Phenomena (3) I 1996-97 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.

494. Practicum
   a. Senior Project (1-3)


506. Advanced Chemical Engineering Thermodynamics (3) I Advanced applications of First and Second Laws, nonideal gases and liquids and their mixtures, principles of chemical equilibrium, and molecular theory. P, 326.


520. 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.

521. Topics in Real-Time Computing (3) I For a description of course topics, see 421. Graduate-level requirements include a special project. May be convened with 421.


532. Solid-Fluid Reactions (3) I Characterization of solid structural properties, principles of heterogeneous reactions involving a fluid and a reacting solid. P, 326 and 420, or MSE 450R and 412. (Identical with MSE 532)

535. Corrosion and Degradation (3) II (Identical with MSE 535) May be convened with 435.

541. Industrial Energy and Power Management (3) I (Identical with NEE 541)

551. Chemical and Physical Fundamentals of Air Pollution (3) II For a description of course topics, see 451. Graduate-level requirements include a special project. P, 305, 420 or consult with department. May be convened with 451.

554. 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.

560. Aerosol Science and Engineering (3) I 1995-96 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.

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. Ior 2R, 3L. P, 577, or consult with department. (Identical with CE 573)

574. Environmental Transport Processes (3) I Engineering concerns in toxic and hazardous waste management with focus on aspects of chemical transport between air, water and soil systems, and microbial degradation processes in natural and engineered environment. (Identical with CE 574)

577. The Physiological Bases of Microbial Treatment Processes (3) I Principles of bacterial physiology including morphology, metabolism and genetics. Applications of importance to waste treatment and environmental quality. P, 370, or consult with department. (Identical with CE 577)

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 consult department before enrolling. (Identical with CHEE 578) May be convened with 478.

580. Bioseparation Techniques for Engineers (3) I 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.
R. Salzman, Richard Shoemaker (Optical Sciences), Cornelius Steelink (Emeritus), Gordon Tollin (Biochemistry), F. Ann Walker, Edward N. Wise (Emeritus)

Associate Professors Ludwik Adamowicz, Michael F. Burke, Eugene A. Mash, Jr., Robin L. Poll, John V. Rund, Mark A. Smith, G. Krishna Vemula- palli, David E. Wigley

Assistant Professors Jacquelyn Gervay, 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 with a teaching major 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 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 for a degree approved of the American Chemical Society. 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; 396 or 396H; 405; 480a-480b; and at least six additional units in chemistry chosen from the following, three of which must be laboratory courses: 402, 407, 440, 446, and 460 or 462a-462b; or as approved by a chemistry advisor. Students planning to pursue careers as practicing chemists are encouraged to fulfill the foreign language requirement with German, Russian, or Japanese.

The chemistry teaching major: Students wishing to acquire a B.S. degree in education with a teaching major in chemistry enroll in the Science and Math 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; 405; 433; and 480a-480b; MATH 124, 125b; PHYS 104a-104b and 180a-180b; PHYS 433 or BIOL 433; MCB 181-182 or GEOS 101-102-103-104.

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 326; 325 or 326. 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**-101c. Lectures in General Chemistry (3-3-3) 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 prospective chemistry majors, with an emphasis on organic and biochemical principles. A modular approach is used with case studies of "real world" problems. 101c: Application of chemical principles presented in 101a to problems of interest to nonscience majors. Credit is allowed for only 101b or 101c, not for both. These courses are designed for nontechnical students and are not prerequisites for higher level chemistry courses. P, algebra recommended; CR, 102 encouraged.

102a*-102b**-102c. General Chemistry Laboratory (1-1-1) An introduction to the 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. Strong emphasis on laboratory safety. Designed for students with a minimal background in science and math. 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 101 lecture class.

103a-103b.* Fundamentals of Chemistry (3-3) Essential concepts and problem-solving techniques, with chemical bond, structure and properties, stoichiometry, kinetics, equilibria, and descriptive organic and inorganic topics. 103a: P, completion of MATH 117R/S or an equivalent level of proficiency as demonstrated by the student’s score on the Math Readiness Test; CR, 104 encouraged. Both 103a and 103b are offered each semester. For Honors listing, see 105a-105b.

104a-104b.* Fundamental Techniques of Chemistry (1-1) 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. Strong emphasis on laboratory safety. Designed for science and engineering majors. The experiments are selected 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. For Honors listing, see 106a-106b.

105a-105b.* 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, MATH 124.

106a-106b.* Honors Fundamentals Techniques of Chemistry (1-1) Advanced techniques in college chemistry; measurements, separations; identification; purification, identification, and analysis of organic and inorganic substances. Lab stresses individual studies and library research. P, CR, the corresponding 105 lecture class. Fees. Students are encouraged to CR for 199H to pursue original research project.

* Credit is allowed for only one of the following lecture-laboratory combinations: 101a-102a, or 103a-104a and 103b-104b, or 105a-106a and 105b-106b.

241a-241b.* Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P, 103b and 104b, or 105b and 106b. Both 241a and 241b are offered each semester.

242a-242b.* Honors Lectures in Organic Chemistry (3-3) General principles of organic chemistry. P, 103b and 104b, or 105b and 106b. Both 241a and 241b are offered each semester.

243a-243b.* Organic Chemistry Laboratory (1-1) An introduction to the organic chemistry 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. Heavy emphasis on microscale techniques, laboratory safety and waste disposal. Not available for chemistry majors. 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 241 lecture class. Both 243a and 243b are offered each semester.

245a-245b.* Organic Chemistry Laboratory (2-2) Similar to 243a-243b. Designed for chemistry and biochemistry majors and chemical engineers. Fees; 1R, 4L. 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 and 104b, or 105b and 106b. (Identical with BIOC 296a)

302. Scientific Glassblowing (1 to 2) I II Methods of design and construction of scientific glass apparatus. Fees; 6L.

322.** Principles of Analysis (2) I II Principles of modern quantitative analysis. Open to nonmajors only. P, 103b and 104b, or 105b and 106b; CR, 323 encouraged.

323.** Principles of Analysis I Laboratory (1) I II Experiments in modern quantitative analysis. Open to nonmajors only. Fees. 3L, P, CR, 322 or 325.

325.** Analytical Chemistry (2) I II 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 325 encouraged.

326.** Analytical Chemistry Laboratory (2) I II Experiments in modern quantitative analysis. Designed for chemistry majors. Fees. 6L, P, CR, 325.


400a-400b. Chemical Measurements Laboratory (3-3) II I Laboratory work in modern chemical measurements and instrumentation. Fees. 1R, 6L. 400a: P, 424 or CR. 400b: P, 480b. 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).


404. Inorganic Chemistry (3) I Fundamentals of inorganic chemistry. P, 480a or CR. May be convened with 504.

405. Chemical Safety (1) II Fundamental principles of the safe handling, use, storage and disposal of hazardous chemical substances. Survey of protective and emergency equipment, hazard evaluation, laws and regulatory statutes and liability. P, 241b; 243b or 245b, or permission of the instructor.

407. Chemistry of the Solar System (3) II 1994-95 (Identical with PHY 407)

412. Inorganic Preparation (3) I Standard inorganic laboratory preparations, including coordination compounds, isomeric compounds, and compounds typifying the groups of the periodic table. Fees. 9L, P, two semesters of laboratory chemistry beyond the first year. P, CR, 404 or permission of instructor. May be convened with 512.

424. Instrumental Analysis (3) I 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, PHYS 102b, 180b.

433. Chemistry Demonstrations (3) II S Preparation and presentation of demonstrations of chemical phenomena in the classroom. Designed for undergraduate teaching majors in chemistry, for graduate students interested in teaching chemistry at the secondary or college level, and for chemistry teachers already employed in secondary school. 1R, 6L, P, at least one year college-level chemistry; or permission of instructor. May be convened with 533.
molecules by X-ray crystallography; the evaluation of structural information; current topics in structural chemistry 2R.

517L. Structural Chemistry Laboratory (2) I Laboratory designed to accompany 517. Students work in the lab, solve structures and report their findings in papers. 3L. CR, 517.

518. Computational Chemistry I State-of-the-art computational methods in chemical research, including approximate and ab initio electronic structure methods, molecular mechanics and modeling graphics. P, consent of department.

518L. Computational Chemistry Laboratory (1-2) Laboratory designed to accompany 518. Students work in the computer lab and report their findings in papers. 3 or 6L. P, consent of department. CR, 518.

520. Advanced Topics in Analytical Chemistry (2-3) I Special topics in modern analytical chemistry. Recent offerings have included principles of biochemical analysis and mass spectrometry. Students enrolled for 3 units are required to complete an additional research project including a written paper and an oral presentation. P, consent of instructor.

521a-521b. Advanced Analytical Chemistry (3-3) I 521a: Principles of electronics, principles of signal processing hardware and software, instrumental principles of atomic and molecular spectroscopy, statistical treatment of data, chemometrics. P, 241b, 480b. 521b: Advanced fundamentals of equilibrium chemistry, principles of analytical separations including chromatography, principles of electroanalysis including ion selective electrodes and chemical sensors. P, 325, 424 480b.

522. Electroanalytical Chemistry (2-3) Principles of electrochemistry and electroanalysis, including topics on electrochemical equilibrium, electrode kinetics, potentiometry, coulometry, voltammetry and spectrophotometry. Students enrolled in 3 units are required to complete an additional research project including a written paper and an oral presentation. P, consent of instructor.

523. Advanced Topics in Equilibrium Chemistry (2-3) I Special topics in equilibrium chemistry including mathematical description of equilibria in aqueous and nonaqueous media, metal chelate chemistry. Students enrolled for 3 units are required to complete an additional research project including a written paper and an oral presentation. P, consent of instructor.

525. Practical NMR Spectroscopy (3) I Basic principles of nuclear magnetic resonance (NMR) spectroscopy, common pulse sequences for 1- and 2-dimensional NMR experiments; operation of modern Fourier transform NMR spectrometers; interpretation of NMR spectra. P, 480b.

526. Analytical Spectroscopy (2-3) I II (a) Principles of atomic absorption and emission spectrometries and X-ray methods for chemical analysis. (b) Principles of molecular absorption, emission and scattering spectrometries for chemical analysis. Students enrolled for 3 units are required to complete an additional research project including a written paper and an oral presentation. P, consent of instructor.

527. Analytical Separations (2-3) I Fundamentals of separation processes including single and multistage analytical chromatographic methods. Students enrolled for 3 units are required to complete an additional research project including a written paper and an oral presentation. P, consent of instructor.
Civil Engineering and Engineering Mechanics (CE/EM)

Civil Engineering Building, Room 206
(520) 621-2266; FAX: (520) 621-2550

Professors Dinshaw N. Contractor, Head, Donald A. DaDeppo, Chandrakant S. Desai, Martha W. Gilliland, Achintya Haldar, David J. Hall (Emeritus), Simon Ince (Hydrology and Water Resources), Rudolf A. Jimenez, James D. Kriegh (Emeritus), Tribikram Kundu, Emmett M. Laursen (Emeritus), Allan J. Malvick, Haaren A. Miklofky (Emeritus), Richmond C. Neff (Emeritus), Philip B. Newlin (Emeritus), Ralph M. Richard (Emeritus), Ernest T. Smerdon

Associate Professors Donald J. Baumgartner, Muniram Buddh, Moham mad R. Elsani, George N. Frantzkopipos, Donald B. Hawes (Emeritus), Panos D. Kiousis, Kevin E. Lansey, Margaret S. Petersen (Emerita), Hamid Saadatmanesh, Robert H. Wortman

Assistant Professors Sonia H. Armaleh, William M. Isenhower

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. IR, 2ES, 1ED.

214. Statics (3) I II S GRD Equivalent force systems; equilibrium; geometric properties of areas and solids; friction; virtual work; potential energy. Honors section is available. 3ES, P, PHYS 141, MATH 125b.

217. Mechanics of Materials (3) I II S GRD Property characteristics; relationship between external forces acting on elastic and inelastic bodies; strain energy stored; 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 III S GRD Theory of measurements and errors; vertical and horizontal control methods; topographic, photogrammetric, and construction surveys; use of surveying instruments. 2R, 3L. 3ES, P, 210, MATH 110.


307. Contracts, Specifications and Engineering Ethics (3) I III S Law as applied to engineering contracts and contract documents; including specifications; and ethics in engineering. Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).

309. Fluid Mechanics Laboratory (1) I II Open channel and closed conduit studies of basic flow phenomena, with emphasis on continuity, conservation of momentum, and exchange of energy; calibration of flow measuring devices. 3L. 1ES. CR, 321, A ME 250.

311. Civil Engineering Hydraulics (3) I III S Hydrostatics, continuity, irrotational flow, pressure distributions, weirs and gates, moment and energy, surface drag, pipe friction, time drag, pipe fitting losses. 3ES. P, 214, MATH 223.

312. Water Resources Engineering (3) I II Open-channel flow, natural streams and waterways, hydrologic analysis, fluid measurement apparatus, hydraulic models, economic aspects of water resources. 1.5ES. 1.5ED. P, 321, A 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 Castiglioni's theorem. 3ES. P, 217.

331. Structural Engineering II (3) I III S Analysis of statically indeterminate beams, frames, and trusses; use of computer programs. 3ES. P, 330; CR 302.

336. Structural Design in Steel (3) I CDT Design of steel members, connections and simple structures, including tension members, laterally supported and unsupported beams, columns, beam-columns, bolted and welded connections; introduction to load and resistance factor design. 3ED. P, 330; CR 331.
337. Structural Design in Concrete (3) I II S
Introduction to reinforced concrete design.
3ED. P. 330.

340. Soil Engineering (4) I II 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 CDT Basis for planning, design, and operation of transport facilities; transport modes discussed include mass transit, passenger cars, bicycles, and pedestrian movement. 1ES, 2ED. P. 251, SIE 265, A ME 250.

361. Highway and Airport Engineering (3) I CDT Materials, construction and structural design of highways and airports. 1ES, 2ED. P. 340.


371. Water and Wastewater Treatment Process (3) I (Identical with CHEE 371).

380. Materials Laboratory (2) I II Mechanical properties of concrete, concrete aggregates, steel, and other metals as engineering materials. 1R, 3L. 2ES. P. 217, CHEM 103b.

394. Practicum
a. Junior Field Trip (1) II Fee. Students are urged to take this trip in the junior year Fee.

400. Civil Engineering Design (3) I II 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.


417. Mechanics of Materials II (3) I II Three dimensional analysis of stress and strain. Castigliano's theorem, 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. 217. May be convened with 517.

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) I 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, pipe 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, floodplain hydrology 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) I II Hydrodynamics of the coastal zone; coastal sediment processes and their interaction with structures; diffusion in 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 II 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.

437. Advanced Structural Design in Concrete (3) I II Advanced problems in the analysis and design of concrete structures, design of slender columns and one- and two-way slabs; lateral and vertical load analysis of bridges and multi-story buildings; introduction to design for torsion and seismic forces; use of structural computer programs. 3ED. P. 337. May be convened with 537.

440. Foundation Engineering (3) I II Settlement and bearing capacity of shallow and deep foundations; beam on elastic foundation; design of footings and pile foundations; foundations on metastable soils; the use of computer codes for foundation problems. 1ES, 2ED. P. 340. May be convened with 540.

441. Earth Structures in Geotechnical Engineering (3) I Stability analysis for earth slopes, including planar, circular piecewise-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 reinforced earth walls; computer-aided analysis and design. 1ES, 2ED. P. 340. May be convened with 541.

444. Special Topics in Geomechanics (3) I Introduction to geoenvironmental engineering: physiochemical and microstructural behavior of geomaterials, effect of pollutants, design of waste disposal systems; advanced laboratory testing, geotextiles, space geomechanics, etc. P. 340 or consent of instructor. May be convened with 544.

452. Engineering Surveys (3) I CDT Solar and Polaris observations; mineral, public, and private land surveys; route surveying, curves, and earthwork; triangulation, photogrammetry, and modern engineering surveys. 2R. 3L. 1.5ES. 1.5ED. P. 251. May be convened with 552.

455. Irrigation Engineering (3) I (Identical with ABE 455) May be convened with 555.

458. Drainage of Irrigated Lands (3) II 1995-96 (Identical with ABE 458) May be convened with 558.

462. Bituminous Materials (3) I 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) I 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) I 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.

468. Urban Transportation Planning (3) I 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 468) May be convened with 568.

479. Introduction to Hazardous Wastes (3) I (Identical with CHEE 478) May be convened with 578.

486. Fundamentals of Industrial Hygiene (3) I (Identical with OSH 486) May be convened with 568.

487. Advanced Industrial Hygiene and Safety (3) I (Identical with OSH 487) May be convened with 587.

497. Seminar
w. Advanced Cadastral Survey (1-4) I (Identical with RNR 497w) May be convened with 597w.

502. Introduction to Finite Element Methods (3) I II For a description of course topics, see 402. Graduate-level requirements include research 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)

510. Probability in Civil Engineering (3) II
For a description of course topics, see 410. Graduate-level requirements include a project paper. May be convened with 410.

511. Computer-Aided Geometric Design (3)
(Identical with A ME 511)

517. Mechanics of Materials II (3) II
For a description of course topics, see 417. Graduate-level requirements include a research paper or a comprehensive project. May be convened with 417.

523. Hydrology (3) I
For a description of course topics, see 423. Graduate-level requirements include a project paper. P, 321. (Identical with HWR 523 or AR L 523) May be convened with 423.

524. Hydraulic Engineering Design (3) II
For a description of course topics, see 424. Graduate-level requirements include a research paper and/or a design project. P, 322. May be convened with 424.

525. Water Quality Modeling (3) II 1995-96
Deterministic and stochastic modeling of surface water systems with particular emphasis on water quality management functions. Applications and modifications of Streeter-Phelps technique for predicting oxygen levels in streams. P, 321. (Identical with HWR 525)

526. Water Quality Management (3) II
(Identical with HWR 526)

527. Computer Applications in Hydraulics (3)
(Identical with HWR 527)

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) II
1995-96 Material and member behavior to full plasticization; redistribution of forces; plastic design of continuous beams and frames; influence of axial and shear forces; deflections and rotations; alternating plasticity; shake down analysis. P, 432 or consult department before enrolling.

534. Design of Wood and Masonry Structures (3) II 1995-96
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) II 1995-96 Behavior, analysis, and design of statically determinate and indeterminate prestressed concrete structures. P, 337.

537. Advanced Structural Design in Concrete (3) II 1996-97
For a 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. Special Topics in Geomechanics (3) II
1995-96 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 1997-97 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) III 1995-96 II 1996-97 Brief statements and applications of numerical methods based on closed-form solutions, finite difference, finite element and boundary element methods for problems involving soil structure interaction such as piles, retaining walls, group piles, underground works; seepage; and consolidation. P, 340, 402 or 502.

552. Engineering Surveys (3) I
CDT For a description of course topics, see 452. Graduate-level requirements include a comprehensive surveying project. P, 251. May be convened with 452.

555. Irrigation Engineering (3) II (Identical with ABE 555) P, CE 321 or A ME 331a. May be convened with 455.

556. Drainage of Irrigated Lands (3) III 1995-96 (Identical with ABE 556) 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 enrollment. 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
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, 360. 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 enrollment. (Identical with PLNG 568) May be convened with 468.

573. Biodegradation of Hazardous Organic Compounds (2-3) II (Identical with CHEE 573)

574. Environmental Transport Processes (3)
I (Identical with CHEE 574)

575. The Physiological Bases of Microbial Treatment Processes (3) II (Identical with CHEE 577)

578. Introduction to Hazardous Wastes (3) II
(Identical with CHEE 578) May be convened with 478.

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. Research Topics (1) [Rpt/II] I (Identical with E M 596)

597. Seminar
w. Advanced Cadastral Survey (1-4) II
(Identical with RNR 597w) May be convened with 497w.

621. Sediment Transportation (2) I 1995-96 1996-97 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.

623. Flow through Hydraulic Structures (3) I 1996-97 Subcritical and supercritical flow through culverts, bridges, spillways, stilling basins, transitions, bends; hydrologic effects on inflow; pumps and turbines. P, 322.

624. Planning and Design of Multipurpose Water Resources Projects (3) I 1995-96 Design of water resource systems for surface water supply; flood control, hydropower and navigation, either as single purpose or as multipurpose projects; brief review of environmental, economic and legal aspects. Field trips. P, 321, 423 or 523.

633. Reinforced Concrete Members (3) I 1995-96 1996-97 Inelastic behavior of beams and columns; short- and long-term beam deflections; combined bending, shear, and torsion in beams; behavior under load reversals; analysis and design of beam to column connections and shear walls. P, 437 or departmental approval.


640. Advanced Soil Mechanics (3) I Site investigation and in situ testing; shear strength of sands and clays; interpretation of laboratory test results; consolidation theory; one-dimensional infinitesimal and finite strain; slope stability. P, 340.

645. Geoenvironmental Engineering (3) I 1995-96 II 1996-97 Interaction of environmental and geo-technology, physiochemical properties and mechanisms of pollutant transport; effects on soil and foundation behavior and ground water, analytical and numerical modeling, design of geotechnical structures and waste contaminant systems; P, 340, 544 or consent of instructor.


648. Constitutive Laws for Engineering Materials (3) I 1996-97 Statement of axioms of continuum mechanics, strain, stress and nonlinear behavior. Laboratory testing including hyperelasticity, hypoplasticity, rate type models, plasticity review, hardening, volume change and dilatancy, softening, inherent and induced anisotropy, laboratory testing and implementation. P, E M 505, 605, or consult department before enrolling. (Identical with E M 648)


661. Structural Design of Flexible Pavements (3) I Analysis of loads, stresses, material characteristics, and environmental factors for the theoretical and practical design, construction and maintenance of pavements. P, 340, 361.

662. Structural Design of Rigid Pavements (3) II Analysis of loads, stresses, material characteristics, and environmental factors for the theoretical and practical design, construction and maintenance of these pavements. P, 340, 361.

664. Transportation Economics (3) I 1996-97 Economic analysis of transport projects, including rural and urban roadways, control systems, and mass transit; discussion of environmental and financial factors. P, 463 or 563.


666. Highway Geometric Design (3) I Study of geometric elements of streets and highways, with emphasis on analysis and design for safety. P, 463 or 563.


673. Advances in Water and Waste Reclamation and Reuse (2) I (Identical with CHEE 673)

675. Wastewater Treatment (3) II (Identical with CHEE 675)

676. Advanced Water Treatment System Design (3) II (Identical with CHEE 676)

Engineering Mechanics (E M)

502. Introduction to Finite Element Methods (3) I II (Identical with C E 502)


508. Fracture Mechanics (3) I 1996-97 Modes of fracture; crack propagation; Griffith energy balance; crack tip plasticity; J-integral; fatigue cracks; analytical and numerical techniques; constitutive models for damaged materials. P, 565, or consult with department.


596. Seminar

a. Research Topics (1) [Rpt. /2] II (Identical with C E 596a)

603. Elasticity Theory and Application (3) I General three-dimensional equations of elasticity; problems in plane stress, plane strain, extension, torsion, energy, residual and other solution methods; applications to rings, beams, plates, torsion and other problems. P, C E 217, 302.

604. Plasticity Theory and Application (3) II Yield conditions and flow rules for perfectly plastic and strain hardening materials; application to various elastoplastic problems such as bars, cylinders and plates; effect of volume change behavior, isotropic and anisotropic hardening plasticity with expanding/contracting yield surfaces. P, C E 417 or E M 603, or consult department before enrolling.


635. Matrix Methods in Structural Mechanics (3) I Formulation of the force and displacement methods; the finite element method, with application to bar, beam, plate, and shell structures; organization and development of computer programs; linear and nonlinear systems. P, C E 331 or A M E 461.


Classics (CLAS/GRK/LAT)

Modern Languages Building, Room 371
(520) 621-1689; FAX: (520) 621-3678

Professors J. Norman Austin, Head, Robert M. Gimello, Thomas Marlin, Marilyn Skinner, H. David Soren

Associate Professors Robert A. Burns, Richard Jensen, Jon Solomon, Mary E. Voyatzis, Thomas D. Worthen

Assistant Professors Janet Jakobsen, Frank E. Romer, Cynthia White

The cultural environment of Greece and Rome is the subject matter taught in the classics department. Courses are given in the language, literature (in the original and in translation), art and archaeology and in the development and heritage of these civilizations.

The department offers a degree of Bachelor of Arts with majors in Greek, Latin, and classics and a degree of Master of Arts with a major in classics with concentrations in ancient Greek, Latin, or classical archaeology. The B.A. with a major in Greek, Latin or classics assumes general knowledge of mathematics; students must complete MATH 122.

Programs leading to a Bachelor of Arts in Education and a Master of Education with a teaching major in Latin are also available. In addition, a number of the department's courses may be used toward a supporting minor in other graduate programs. Requirements for the B.A. are as follows:

The major in Greek: 32 units in Greek, Latin, and classics, including GRK 201, 202; CLAS 250a-250b; at least 12 units at the 400 level in Greek; 6 additional units in Greek, Latin, classical art and archaeology or classical literature and civilization. Students majoring in Greek are encouraged to begin the study of Latin. The program of study should be planned in consultation with an advisor.

The major in Latin: 32 units in Latin, Greek and classics, including LAT 201, 202; CLAS 250a-250b; at least 12 units at the 400 level in Latin (including LAT 400); 6 additional units in Greek, Latin, classical art and archaeology, or classical literature and civilization. Students majoring in Latin are encouraged to begin the study of Greek. The program of study should be planned in consultation with an advisor.
The major in classics: 32 units in classics, Greek and Latin, including: GRK 201, 202 or LAT 201, 202; 6 units in ancient history; CLAS 250a-250b; at least 12 upper-division credits in Greek, Latin, classical art and archaeology, or classical literature and civilization; 6 additional units in Greek, Latin, classical art and archaeology, or classical literature and civilization. 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)

325. Faunal Analysis from Europe, Asia and Africa (3) II 1994-95 (Identical with ANTH 325)

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, ART 329)

334. Art and Archaeology of Ancient Egypt (3) 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) An archaeological history of Greece and Italy through the study of major excavations and monuments, with emphasis on cultural developments and relationships. 340a is not a prerequisite to 340b. (Identical with ARH 340a-340b, ARH 340b-340a.)

341. Ancient Greek Monuments (3) [Rpt./2]S Firsthand study of the monuments and material culture (sculpture, vase painting, minor arts, etc.) of the ancient Greeks; reading from history, philosophy and literature in English translation. Five-week tour in Greece.

355. Ancient Egyptian Architecture (3) Architecture of ancient Egypt with special emphasis on its relationship to the social, religious and political needs of the culture. May include a two-week study tour in Egypt following the end of the semester.

443a-443b. Archaeology of Neolithic and Bronze Age Greece (3-3) History, art and culture of prehistoric Greece through the study of archaeological excavation and artifacts. 443a: emphasizes the "Minoan" culture of Crete. 443b: emphasizes the Mycenaean culture of the Greek mainland. 443a is not a prerequisite to 443b. (Identical with ANTH 443a-443b.) 443b may be convened with 453a-453b. Writing-Emphasis Course*

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) [Rpt./1] 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*

454. Greek and Roman Sculpture (3) Survey of the development of classical sculpture from the eighth century B.C. to circa 300 A.D. P: 340a-340b. (Identical with ARH 454) May be convened with 554.

456. 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.

457. 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, Pylas, Delphi, Athens and Corinth. P: 340a-340b. (Identical with ARH 457) May be convened with 557.

458. Greek and Roman Provincial Archaeology (3) Survey of classical archaeology in ancient Tunisia, Cyprus, Portugal and Turkey. P: 340a or 340b. May be convened with 558.

461. 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. P: consult department before enrolling. (Identical with ANTH 463.) May be convened with 563.

474. Archaeometry: Scientific Methods in Art and Archaeology (3) II (Identical with ANTH 474) May be convened with 574.

481. Archaic Greek Sanctuaries (3) Archaeology of the sanctuary sites from the Archaic Period in Greece, both those which became Pan-Hellenic and those associated with individual states. Relationships between the temples 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).

453a-453b. Archaeology of Neolithic and Bronze Age Greece (3-3) [Rpt./1] For a description of course topics, see 443a-443b. Graduate-level requirements include extensive reading and an in-depth paper. 543a is not a prerequisite to 543b. (Identical with ANTH 543a-543b.) May be convened with 443a-443b.

552. Etruscan Art and Archaeology (3) For a description of course topics, see 452. Graduate-level requirements include extensive reading and an in-depth paper. P: 340b or consent of instructor. (Identical with ARH 552) May be convened with 452.

553. Research Methods in Classical Archaeology (3) [Rpt./1] For a description of course topics, see 453. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a or 340b. May be convened with 453.

556. Greek and Roman Painting (3) For a description of course topics, see 456. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a or 340b. (Identical with ARH 556) May be convened with 456.

557. Greek Architecture (3) For a description of course topics, see 457. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a or 340b. (Identical with ARH 557) May be convened with 457.

558. Greek and Roman Provincial Archaeology (3) For a description of course topics, see 458. Graduate-level requirements include extensive reading and an in-depth paper. P: 340a or 340b. May be convened with 458.

561. Greek Pottery 1200-400 B.C. (3) For a description of course topics, see 461. Graduate-level requirements include extensive readings and an in-depth paper. (Identical with ARH 561) May be convened with 461.

563. Classical Field Archaeology (6) [Rpt./1] For a description of course topics, see 463. Graduate-level requirements include extensive reading and an in-depth paper. May be convened with 463.

564. Topics in Ancient Mediterranean Archaeology (3) [Rpt./1] Research papers and oral presentations on different aspects of Greek and Roman archaeology: preparation in writing scholarly articles for refereed journals. P: 340a or 340b.

574. Archaeometry: Scientific Methods in Art and Archaeology (3) II 1993-94 (Identical with ANTH 574) May be convened with 474.

581. Archaic Greek Sanctuaries (3) For a description of course topics, see 481. Graduate-level requirements include extensive readings and an in-depth paper. May be convened with 481.

584. Roman Art and Architecture (3) For a description of course topics, see 484. Graduate-level requirements include extensive reading and an in-depth paper. P: ARH 117, 118, or 6 units of ancient history. (Identical with ARH 584) May be convened with 484.

587. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)
Classical Literature and Civilization (CLAS)

115. The Study of English Words (3) I Vocabulary building through the systematic study of English words derived from Latin and Greek. Readings in translation.

126. Greek Mythology I (3) I II 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. P, 220.

250a-250b. Classical Literature in Translation (3-3) Historical survey of the major authors and works of ancient Greece and Rome. 250a: From Homer to the Greek novel. 250b: Roman literature of the Republican period and the early Empire. 250a is not prerequisite to 250b.

260. Ancient Philosophy (3) I (Identical with PHIL 260)

285. Introduction to Humanities Computing (3) S (Identical with GER 285)

305. Greek and Roman Religion (3) I II Religious beliefs and cult practices in ancient Greece and Rome. Readings in translation. (Identical with RELI 305)

306. The Transformation of a Society: Christianity in the Greco-Roman World (3) I 1995-96 Investigates the emergence of Christianity in the first four centuries of the Greco-Roman milieu. (Identical with RELI 306)

326. Greek Mythology II (2-4) [Rpt./9 units] II S An intermediate examination of Greco-Roman mythology which focuses on source materials or the influences of classical myths.

330. Women in Antiquity (3) I S Women in literature, archaeology and history from the Bronze Age to the Roman Empire. (Identical with HUM 330 and W 5330) Writing-Emphasis Course*

342. Homer (3) A study of the Homeric poems, the Iliad and the Odyssey, in translation.

345. Ancient Cosmology (3) Investigation of ancient Greek concepts of the universe, with emphasis on theories regarding nature, matter, and the soul. Readings in translation.

346. Classical Greek Tragedy (3) Readings in ancient Greek tragedy in translation. Writing-Emphasis Course*

348. Myth and Archetype (3) An investigation of modern psychological theories and their relevance to ancient Greek and Roman myths. Readings in translation. P, 126 (Identical with RELI 348)

396H. Honors Proseminar (3) I II

403a-403b. History of Greece (3-3) (Identical with HIST 403a-403b)

404a-404b. History of Rome (3-3) (Identical with HIST 404a-404b)

470. Greek Philosophy (3) [Rpt./1] (Identical with PHIL 470) May be convened with 570.

472a. Ancient Philosophy (3) [Rpt.] (Identical with PHIL 472a) May be convened with 572a.

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, paleography, papyrology, archaeology.

570. Greek Philosophy (3) [Rpt./1] (Identical with PHIL 570) May be convened with 470.

572a. Ancient Philosophy (3) [Rpt.] (Identical with PHIL 572a) May be convened with 472a.

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 I II Advanced Studies in Ancient History (3) [Rpt./5] II (Identical with HIST 695)

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 audio-visual practice.


201. Intermediate Classical Greek I (4) Selections from classical Greek chosen in accordance with the student's needs and interest. P, 102.


203. Intermediate Modern Greek I (4) Pronunciation, grammar, and vocabulary of modern Greek; development of skills in conversation, composition, and reading; emphasis on aural-oral skills. P, 104.


400-401. Greek Literary Terms (3-3) [Rpt./1] Readings in major Greek authors including Homer, Plato, and the historians and dramatists. P, 202. May be convened with 502. Writing-Emphasis Course.*

412. Greek Literary Terms (3) [Rpt./1] Extensive readings in Greek in one of the following areas of Greek philosophy: the pre-Socratics, Plato's ethics and epistemology, Aristotle's Nicomachean Ethics. P, 202.

(identical with PHIL 412) May be convened with 512. Writing-Emphasis Course.*

421. Greek Lyric Poetry (3) [Rpt.] Study in Greek of the early Greek lyric writers from Archilochus to Bacchylides, including Pindar. P, 202. May be convened with 521. Writing-Emphasis Course.*

422. Readings in Greek Drama (3) [Rpt.] Close reading in Greek of either (1) tragedy—one play each by Aeschylus, Sophocles and Euripides or (2) comedy—two plays of Aristophanes, one of Menander. P, 202. May be convened with 522. Writing-Emphasis Course.*

424. Homer (3) [Rpt.] Close reading of selections from the Iliad and Odyssey in Greek and an introduction to the critical secondary literature. P, 202. May be convened with 524. Writing-Emphasis Course.*


431. Greek Orators (3) [Rpt.] Readings in Greek from Lysias, Isocrates and Demosthenes as sources for ancient rhetoric, politics, and private life. P, 202. May be convened with 531. Writing-Emphasis Course.*


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. Greek Reading Course (3) [Rpt.] For a description of course topics, see 402. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Greek. May be convened with 402.

512. Readings in Greek Philosophy (3) [Rpt./1] For a description of course topics, see 412. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Greek. (Identical with PHIL 512) May be convened with 412.

521. Greek Lyric Poetry (3) [Rpt./1] For a description of course topics, see 421. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Greek. May be convened with 421.

522. Readings in Greek Drama (3) [Rpt./1] For a description of course topics, see 422. Graduate-level requirements include extensive reading and an in-depth paper. P, 3 units of 400-level Greek. May be convened with 422.

524. Homer (3) [Rpt./1] For a description of course topics, see 424. Graduate-level requirements include extensive reading and an in-depth paper. May be convened with 424.

530. Readings in the Greek Historians (3) [Rpt.] For a description of course topics, see 430. Graduate-level requirements include extensive readings and an in-depth paper. P, 3 units of 400-level Greek. May be convened with 430.
531. Greek Orators (3) [Rpt.] For a description of course topics, see 431. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 431.

532. Literature of Archaic Greece (3) [Rpt.] For a description of course topics, see 432. Graduate-level requirements include extensive readings and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 432.

596. Seminar
   a. Topics in Ancient Greek Literature (3) [Rpt./30 units]

Latin (LAT)

101. Elementary Latin I (4) An introduction to the basic grammar, syntax and vocabulary of Latin through reading and composition.


112. Accelerated Latin I (6) S Equivalent of LAT 101 and 102. Covers all basic grammar and syntax. Credit is allowed for this course or for 101 and 102, but not for both. Previous language experience or departmental approval required.


212. Accelerated Latin II (6) S Equivalent of LAT 201 and 202. Reading and composition, prose and poetry. Credit is allowed for this course or for 201 and 202, but not for both. P. 101 and 102 or 112.

400. Prose of the Roman Republic (3) [Rpt./6 units] II Extended readings from Salust, Cicero and Caesar with some grammatical review; development of skills in rapid readings and sight reading. P. 202.

401. Latin Reading Course (3) [Rpt./1] Readings in one of the following: epic, lyric, drama, history, oratory, satire, epistles, novel, philosophical, technical or medieval literature. P. 400. May be convened with 501. Writing-Emphasis Course.*

403. Late Antique Literature (3) [Rpt/1] I II S Selections from genres and/or authors, both Christian and non-Christian, from the late antique period. P. 400. May be convened with 503. Latin Composition (3) [Rpt./1] For a description of course topics, see 401. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 401.

501. Latin Reading Course (3) [Rpt./1] For a description of course topics, see 401. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 501.

503. Late Antique Literature (3) [Rpt/1] I II S For a description of course topics, see 403. Graduate students will be required to write a research paper using standard reference works, periodicals, and recent publications. P. 400. May be convened with 403.

505. Latin Composition (3) [Rpt./1] For a description of course topics, see 405. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 405.

513. Augustan Literature (3) [Rpt./1] For a description of course topics, see 413. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 413.

514. Medieval Latin (3) For a description of course topics, see 414. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 414.

515. Latin Love Elegy (3) [Rpt./1] For a description of course topics, see 415. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 415.

520. Latin Paleography (3) 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 420.

525. Cicero (3) [Rpt./1] For a description of course topics, see 425. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 425.

526. Roman Historians (3) [Rpt.] For a description of course topics, see 426. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 426.

528. Silver Age Latin (3) [Rpt.] For a description of course topics, see 428. Graduate-level requirements include extensive reading and an in-depth paper. P. 3 units of 400-level Latin. May be convened with 428.

596. Seminar
   a. Topics in Latin Literature (3) [Rpt./30 units]

Cognitive Science

Psychology Building, Room 312
(520) 621-2065; FAX: (520) 621-9306
Graduate Interdisciplinary Program in Cognitive Science

Committee:
Professors Merrill F. Garrett, Chair (Linguistics), Carol A. Barnes (Psychology), Kathryn A. Bayles (Speech and Hearing Sciences), Robert C. Cummins (Philosophy), Richard A. Demers (Linguistics), Kenneth I. Forster (Psychology), Alvin I. Goldman (Philosophy), R. Michael Hamish (Philosophy), Thomas J. Hixon (Speech and Hearing Sciences), Audrey L. Holland (Speech and Hearing Sciences), William H. Ittelson (Psychology), Alfred Kaszniak (Psychology), D. Terence Langendoen (Linguistics), Adrienne J. Lehrer (Linguistics), John C. Maloney (Philosophy), Bruce McNaughton (Psychology), Lynn Nadel (Psychology), John Pollock (Philosophy), Alan B. Rubens (Neurology), Susan M. Steele (Linguistics)
Associate Professors Diana B. Archangeli (Linguistics), Felice L. Bedford (Psychology), Michael Hammond (Linguistics), Laura A. McCloskey (Psychology), Richard T. Oehrle (Linguistics), Mary A. Peterson (Psychology), Linda Swisher (Speech and Hearing Sciences), Joseph Tolliver (Philosophy)
Assistant Professors John J. Allen (Psychology), Andrew Bass (Linguistics), Paul Bloom (Psychology), Elizabeth Glisky (Psychology), Kerry P. Green (Psychology), Chad J. Marsolek (Psychology), Cecile McKee (Linguistics), Janet L. Nicol (Linguistics), Cyma Van Petten (Psychology), Ying-yong Qi (Speech and Hearing Sciences), Margaret K. Wynn (Psychology)

Cognitive science is the interdisciplinary study of the workings of the mind. It seeks to link theories of human mental capacities to experimental and computational approaches to cognition, and to discover the ways in which the brain carries out high-level mental functions.
The program offers a Doctor of Philosophy minor in cognitive science. For admission and degree requirements, please see the Graduate Catalog.

Communication (COMM)

Speech Building, Room 209
(520) 621-1366; FAX: (520) 621-5504

Professors William D. Crano, Head, Judee K. Burgoon, Michael Burgoon (Family and Community Medicine), Henry L. Ewbank, Klonda Lynn (Emerita)

Associate Professors David B. Buller, Sally A. Jackson, Curtis S. Jacobs, Henry C. Kenski (Political Science), Robert W. Sankey, David A. Williams

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 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 in communication assumes moderate knowledge of mathematics. Students must complete MATH 117 or 121 (or equivalent), or a higher level course. 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 493. 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, 309, 318, 403, 417 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 S Argument identification and evaluation in a variety of communication contexts. Argument 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 collegiate debate and forensics. Open only to members of the university forensics team. Approval of the instructor is required prior to admission. 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 structural 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.

281. Field Methods in Communication Research (3) I II S Introduction to field methods in communication research to enable students to understand communication research literature.

300. Introduction to Communication Theory (3) I S Origin and development of basic concepts 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 Seminar (3) I III

403. Theories of Small Group Communication (3) I II S Theory and research on social control and deviance in groups, from the perspective of communication behavior. P or CR, 300, 318 and 325, or permission of instructor. May be convened with 503.

409. Theories of Mass Communication (3) I II An in-depth analysis of theories of the social effects of various mass media sources on society. 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 411.

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 mes-
sages 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 Presentations of an accomplishment and challenges in the social scientific study of law, with special emphasis on the effects of communication and social structure on the legal process. 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 I I Investigation and analysis of communication principles and strategies in 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 Theories of argumentation theory focused on examination of scientific argument in public decision-making. Topics include general theory of fallacies and significant fallacies related to scientific reasoning. P or CR, 300, 318, and 325, or permission of instructor. May be convened with 525.

428. Communication Research Methods (3) 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.

429. Theories of Mass Communication (3) II For a description of some 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 509.

503. Theories of Small Group Communication (3) I II For a description of some topics, see 403. Graduate-level requirements include an in-depth theoretical paper on social effects of the mass media. May be convened with 510.

510. Struggle for the Presidency (3) I For a description of some topics, see 410. Graduate-level requirements include an in-depth research project. (Identical with POL 510) May be convened with 510.

511. Communication and Conflict Management (3) I II For a description of some topics, see 411. Graduate-level requirements include an in-depth research paper on communication in conflict situations. May be convened with 511.

514. Verbal Communication (3) I II For a description of some topics, see 414. Graduate students will be required to write a final paper. May be convened with 514.

515. Nonverbal Communication (3) I II For a description of some topics, see 415. Graduate-level requirements include an in-depth research project on nonverbal communication. May be convened with 515.

517. Relational Communication (3) I II For a description of some topics, see 417. Graduate-level requirements include an in-depth research project or theoretical paper on some issue in the management of interpersonal relationships. May be convened with 517.

520. Communication and the Legal Process (3) I For a description of some topics, see 420. Graduate-level requirements include an in-depth research paper 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 some topics, see 421. Graduate-level requirements include an in-depth research project or theoretical paper on some issue in a recent campaign. May be convened with 421.

522. Presidential Leadership and Communication (3) II For a description of some topics, see 422. Graduate-level requirements include an in-depth research paper or project. May be convened with 422.

523. Topics in Rhetorical Theory and Criticism (3) (Rpt./1) For a description of some 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 a description of some topics, 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 some 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 some 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 some 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 some 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 LIS 589)

610. Communication Theory I (3) I An overview of theoretical perspectives in 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 to social influence attempts from interpersonal to mass media contexts. (Identical with PHL 620)

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 (4) I An introduction to research methods and designs used in contemporary communication research.

670. Research Methodologies II (4) II Advanced study of research design and statistical analysis in contemporary communication research.

Comparative Cultural and Literary Studies (CCLS)

1239 North Highland Avenue
Building 431a
(520) 626-8693; FAX: (520) 626-8694

Graduate Interdisciplinary Program in Comparative Cultural and Literary Studies
Committee:
Professors Barbara A. Babcock, Director (English), Jane H. Hill (Anthropology), Jerrold E. Hogle (English), Herbert N. Schneidau (English), Melanie R. Wallendorf (Marketing)
Associate Professors Kamakshi P. Murti (German), Eileen R. Meehan (Media Arts), Marvin Waterstone (Geography and Regional Development)
Assistant Professors Elizabeth G. Harrison (East Asian Studies), Michelle A. Taigue (American Indian Studies)
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 in the area of comparative cultural and literary studies. Students pursue a core of theoretical courses and study at least two primary disciplines. 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.

Computer Engineering

(See Electrical and Computer Engineering)

Computer Science (C SC)

Gould-Simpson Building,
Room 721
(520) 621-6613; FAX: (520) 621-4246


Associate Professors Saumya K. Debray, Peter J. Downey, Larry L. Peterson, Richard T. Snodgrass

Assistant Professors Mary L. Bailey, John H. Hartman, 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 serve to fulfill existing major, minor, or general education requirements for the B.S. degree. The 30 units include five required pre-major courses: 127, 227, MATH 124 or 125a, 125b, and 4 units of a department approved laboratory science (as of Fall 1992 these include PTYS 106, PHYS 115, PHYS 141, or CHEM 103a, 104a.) Students should apply for admission to the major as soon as possible after finishing the above course work. To apply to the major, students complete an application form, attach a current transcript of grades, and write a well-considered essay describing their interest in the major and experiences or accomplishments that would be relevant to the admission decision. The department Admissions Committee makes decisions based upon the student's overall University record, with particular emphasis on the pre-major course work, the essay, and any other computer science course work. Students who have earned a cumulative GPA of at least 3.0 and grades of at least B in all computer science and mathematics courses are typically admitted. All other applications are considered on a case-by-case basis. A student may apply more than once. 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: 127, 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 from an approved computing-related discipline (a split minor).
The minor in computer science requires a minimum of 20 units in computer science. The student's major advisor approves the course 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.

Honors: The department participates in the Honors Program. All honors students in computer science complete 6 units of 498Hon and 3 units of the 400-level computer science elective requirement.

115. Computer Science Principles (4) II S Algorithms, programs and computers; problem analysis and structured program design in a high-level language; machine and systems organization, data representation, program testing and verification. P, MATH 117PS.


227. Program Design and Development (4) I II S Programming using a language such as C. Several medium-sized projects will be required, with emphasis on program design and implementation techniques. P, 115, MATH 124 or 125a.


342. Data Structures and Algorithms (3) I II S Mathematical preliminaries; fundamental data structures and associated algorithms, implementations and applications: stacks, queues, trees, graphs, sorting, and searching. P, 227, MATH 243 or MATH 362. (Identical with MIS 342)


372. Comparative Programming Languages (3) II S Introduction to several major high-level programming languages and their characteristics. Programming projects are required in at least three languages. P, 237 or MIS 307 or ECE 274, 342. (Identical with MIS 372)


412.* Advanced Systems Modeling and Simulation (3) I (Identical with MIS 421)

422. Principles of Concurrent Programming (3) II Fundamental concepts of concurrent programming; synchronization mechanisms based on shared variables and message passing; systematic development of correct programs; paradigms for parallel and distributed programming. P, 344, CR 452. May be convened with 522.

430. Case Studies in Software Design (3) II S Techniques and tools for program design and implementation, especially of large programs. Specification, abstraction, verification, maintenance, performance tuning. Includes substantial programming. P, 237 or ECE 274; 342. May be convened with 530.


438. Computational Linguistics (3) I (Identical with LING 438) May be convened with 538.

443. Theory of Graphs and Networks (3) I (Identical with MATH 443) May be convened with 543.

445. Algorithms (3) II Mathematical preliminaries; using induction to design algorithms; introduction to analysis of algorithms; algorithms involving sequences and sets; graph algorithms; advanced topics. P, 342, 344, MATH 362. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirements. (See "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog.)

449. Continuous-System Modeling (3) II (Identical with ECE 449) May be convened with 549.


452. Principles of Operating Systems (4) II Concepts of modern operating systems; concurrent processes; process synchronization and communication; resource allocation; kernels; deadlock; memory management; file systems. P, 430.

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.


472. Continuous-System Simulation I (3) I (Identical with ECE 472) May be convened with 572.

473. Automata, Grammars and Languages (3) I Finite automata, regular expressions, and their applications; context-free grammars, pushdown automata, and their applications; Turing machines and undecidability; the Chomsky hierarchy. P, 344. (Identical with MATH 473) 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).

479. Game Theory and Mathematical Programming (3) II 1995-96 (Identical with MATH 479) May be convened with 579.

475a-475b. Mathematical Principles of Numerical Analysis (3-3) (Identical with MATH 475a-475b)

482. 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. 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 RPC. 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, 237 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.

538. Computational Linguistics (3) I (Identical with LING 538) May be convened with 438.

541a-541b. Computer-Aided Information Systems Analysis and Design (3-3) (Identical with MIS 541a-541b)

543. Theory of Graphs and Networks (3) I (Identical with MATH 543) May be convened with 443.

545. Design and Analysis of Algorithms (3) I Time-space complexity; recurrences; algorithm design techniques; lower bounds; graph, matrix, set algorithms; sorting; fast Fourier transform; arithmetic complexity; intractable problems. P, 445, 473, MATH 362.

549. Continuous-System Modeling (3) II (Identical with ECE 549) May be convened with 449.

550. String and List Processing (3) II For a description of course topics, see 450. Graduate-level requirements include more exten-

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.

571. Digital Systems Design (3) (Identical with ECE 571a)

572. Continuous-System Simulation (3) I (Identical with ECE 572) May be convened with 472.

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) II (Identical with MATH 578)

579. Game Theory and Mathematical Programming (3) II 1995-96 (Identical with MATH 579) May be convened with 479.

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.

630. Advanced Topics in Software Systems (3) [Rpt./12 units] I Problems in design and development of large systems of programs; specific topics to be determined by current literature and faculty and student interest.

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.

652. Advanced Topics in Operating Systems (3) [Rpt./12 units] II Operating system design, development, analysis, and performance; specific topics to be determined by current literature and faculty and student interest.

674. Test Generation for Automata (3) I (Identical with ECE 674)

696. Seminar
   a. Current Computing Research (1-3) [Rpt./8] I II S

Critical Languages (CRL)

1230 N. Park Avenue, Suite 214
(520) 621-3387; FAX: (520) 621-3386
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 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 audiolinguial instructional materials. Sections vary in size from four to seven students.

Languages recently offered are Czech, Hindi-Urdu, Hungarian, Indonesian, Irish-Gaelic, Kazakh, Korean, Swahili, Swedish, Tagalog, Turkish, Ukrainian and 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 developing reading and writing skills, continuing practice with spoken aspects utilizing tape-intensive preparations with biweekly tutorials. 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.

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 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.

* Course may be repeated if language is different each time.

Czech
(See Critical Languages Program)

Dance (DNC)

Gittings Building, Room 8
(520) 621-4698; FAX: (520) 621-6981
Committee on Dance
Professor Jory Hancock, Chair, John M. Wilson
Associate Professors Nina Janik, Melissa Lowe
Assistant Professors Suzanne Knosp, Michael L. Williams

The Committee on Dance, a division of the School of Music, provides studies in the art, the teaching and the analysis of dance. The dance curriculum offers technique in ballet, jazz dance and modern dance, choreography and ample performing experience, leading to the Bachelor of Fine Arts with a major in dance.

In cooperation with the Department of Theatre Arts, the Committee on Dance offers programs of advanced study which lead to Master of Arts and Master of Fine Arts degrees with a major in theatre arts with a dance concentration. Interested students should consult the listings for Dance and Theater Arts in the Graduate Catalog.

The major: Dance majors must audition for placement in dance technique courses and are required to take a minimum of 6 credits per semester in dance. For information regarding the placement session, please contact the Committee on Dance. The following courses must be taken:

DNC 145, 200, 240a-240b, 241a-241b, 244a-244b, 245a-245b, 301, 340a-340b, 341a-341b, 344a-344b, 370, 401, 440a-440b or 441a-441b or 444a-444b; 343, 394a-394b, 445a-445* or 451a-451b, ** 446, 496d; MUS 101a, 107, 108, or 360 and one unit of applied music; PHIL 111, HUM 260 or any one of T AR 103, 116a, 116b or 220. The B.F.A. degree requires 45 units outside of the major department including the general education requirements (described in the College of Arts and Sciences section of this catalog), and 16 units of combined electives in art, art history, theatre arts, music, media arts, and creative writing. All B.F.A. students are required to take at least one 3-unit course.
focusing on gender, race, ethnicity, or non-Western civilization. The major in dance assumes general knowledge of mathematics. Students must complete 110, 111, 117 or 122. Thirty-seven units in technique and performance, including 4 units in ballet technique, 4 units in modern technique and 4 units in jazz technique; 8 units of dance ensemble, improvisation, floor barre and performance foundations are required. Additional requirements include 2 units of dance project (394a-394b), 21 units in dance studies and 4 units in dance electives. Minimum units required for the BFA degree with the major in dance —125.

*Required for modern or jazz emphasis. **Required for ballet emphasis.

The minor: Students wishing to minor in dance must complete the core curriculum (15 units) and track curriculum (6 units). The core curriculum consists of the following dance courses: DNC 145, one year of ballet or modern dance or jazz 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; or 244a-244b or 344a-344b for jazz dance); 200, 245a-245b, 300 or 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, 301,340a-340b, 343, 391, 439a-439b, 440a-440b), modern dance performance (selection from and placement in 301, 341a-341b, 343, 344a-344b), jazz dance (selection from and placement in 244a-244b, 343, 344a-344b, 444a-444b), composition (six units from 343, 391, 394a, 394b, 445), introduction to teaching (a total of four units from 301, 343, 391, 394a,394b, 495a). Minimum units required for the minor in dance —21.

The Committee on Dance participates in the honors program.

100. Looking at Dance (3) I Origins of dance as human expression in ritual, social, and theatrical context. Twentieth century developments in ballet, modern dance, film, and dance. Open to nondance majors only. Wilson/Faculty

112. Ballet I II S
a. Beginning Ballet (1)
c. Intermediate Ballet (2)

143. Improvisation (1) II Improvisation for non-majors and those students in education desiring certification for teaching dance K-12.

144. Jazz Dance
a. Beginning Jazz Dance (1) [Rpt.] I II 2S.
b. Jazz Dance for Beginners with Limited Experience (1) [Rpt.] I II 2S.
c. Intermediate Jazz Dance (2) [Rpt.] I II 3S.

145. Beginning Improvisation for Dance Majors (1) [Rpt.] I Introduction to principles of improvisation, utilizing basic elements of movement, movement qualities, spatial awareness, vocabulary development and spontaneous creative decision making. Enrollment by audition only. Wilson

152. Modern Dance
a. Beginning Modern Dance (1) I II S
b. Modern Dance for Beginners with Limited Experience (1) I II 2S. P, 152a.
c. Intermediate Modern Dance (2) I II S

175. Theatre Dance (1) I II S Jazz movement styles for the beginning dancer; basic steps, phrases, and performing techniques for musical comedy and media dance entertainment.

176a. Beginning Tap Dance (1) [Rpt./3 units] I II S.

200. History of Dance (3) II 1995-96 History of dance in western civilization from ancient Egypt to the present.

201a. Beginning Alignment-Floor Barre (1) [Rpt./3] I Floor barre for non-majors. Janik

239a-239b. Beginning Ballet Pointe (1-1) [Rpt./1] Strength, stretch, and placement techniques for the beginning student in preparation for ballet pointe; barre and center practice. 2S. P, by audition only. CR, 112 or higher level ballet technique.

240a-240b. Ballet Technique I (2-2) [Rpt.] P, CR, 297. By audition only. Janik

241a-241b. Modern Dance Technique I (2-2) [Rpt.] Foundational studies of human movement as an art form, with focus on developing strength, flexibility and coordination. By audition only. Wilson

243. Creating with Movement and Rhythms (2) II Develops analytical and technical skills that support the student in becoming an interpreter of movement and its relationships to sound. P, 145; 240a or 241a or 244a.

244a-244b. Jazz Dance Technique I (2-2) [Rpt.] By audition only. Williams/Quinn

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. Janik/Faculty

276a-276b. Intermediate Tap Dance (2-2) [Rpt.] I II Expanding fundamental tap technique with a variety of musical styles and rhythmic applications, intermediate tap dance will emphasize basic tap steps and how those basics can augment advanced skills and techniques. Enrollment by audition only. Williams

291. Preceptorship
a. Dance Production (1-3) [Rpt./3] I
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] II 439a: Barre work; continuing development of strength, speed, and stamina. Introduction of advanced barre combinations. Center work; allegro en pointe, also adagio, and pirouettes and consecutive turns. 439b: Continuation of 439a with increasing difficulty and complexity in the enchainments. 2S. P, audition. May be convened with 539a-539b. Lowe

440a-440b. Ballet Technique III (2-2) [Rpt./3] P, 340b. By audition only. May be convened with 540a-540b. Hancock/Lowe

441a-441b. Modern Dance Technique III (2-2) [Rpt./3] By audition only. May be convened with 541a-541b. Faculty

444a-444b. Jazz Dance Technique III (2) [Rpt./3] Continued development of jazz dance technique emphasizing stylistic diversity and technical proficiency including contemporary, lyrical, funky and classical jazz styles. P, 244a-244b, 344a-344b or by audition. May be convened with 544a-544b. Williams

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. Janik/Faculty

446. Careers in Dance (3) III 1996-97 Develops knowledge and skills for management, and pursuit of professional careers in dance. P, consent of instructor for non-majors. Williams

448. Dynamics of Movement (3) [Rpt./1] S Experiential approach to movement training and analysis based on anatomical and psychological principles, including movement,
voice, guided imagery, lecture and hands-on practice. May be convened with 548. Machutt

545b. Advanced Choreography (2-3) [Rpt./12 units]
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. Faculty

546. Careers in Dance (3) II 1996-97 Knowledge and skills to manage and pursue professional careers in dance. (Identical with T AR 546) Williams

548. Dynamics of Movement (3) [Rpt./1] S For a description of course topics, see 448. Graduate-level requirements include additional outside class reading and written assignments. May be convened with 448. Machutt


551a-551b. Ballet Repertoire (2-2) [Rpt./12 units] For a description of course topics, see 451b. Graduate-level requirements include performance of classical repertory at the professional level. P. 340 or by audition. May be convened with 551b. Hancock

559. Colloquium a. Teaching Methods for Dance (3) I P, intermediate level ballet, jazz or modern dance techniques. (Identical with T AR 559a) May be convened with 559a. Brown

561. Critical Issues II [Rpt./1] II P, junior standing. May be convened with 561b. Hancock

570. Seminar a. Critical Issues (2) [Rpt./1] II P, junior standing. May be convened with 570b. Hancock

571. Colloquium a. Teaching Methods for Dance (3) I P, intermediate level ballet, jazz or modern dance techniques. (Identical with T AR 571a) May be convened with 571a. Bergshon

575. Seminar a. Critical Issues (2) [Rpt./1] II Graduate-level requirements include presentation of selected seminar sessions. P, junior standing. May be convened with 575b. Hancock

596. Seminar a. Critical Issues (2) [Rpt./1] II Graduate-level requirements include presentation of selected seminar sessions. P, junior standing. May be convened with 596b. Hancock

597. Workshop a. Concert Production and Choreography (1-4) [Rpt./9 units] I II 4-8S. P. 445.

East Asian Studies (EAS/CHN/JPN)
Franklin Building, Room 404
(520) 621-5452; FAX: (520) 621-1149

Professors Brian E. McKnight, Head, Gail L. Bernstein (History), Marie Chan, Anoop Chandola, Robert M. Gimello, John W. Olsen (Anthropology), Earl H. Pritchard (Emeritus), William R. Schultz (Emeritus), Jing-shen Tao, Allen S. Whiting (Political Science)
Associate Professors Charles H. Hedtke (Emeritus), Ronald C. Miao, Barbara N. Sands (Economics), Chia-lin Pao-Tao
Assistant Professors J. Philip Gabriel, Donald J. Harper, Elizabeth G. Harrison, Kimberly A. Jones, Donald Kirihara (Media Arts), Feng-hsi Liu, James Millward (History)

Lecturer Edward D. Putzar (Emeritus)

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 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: The student's program of study for either major must be devised in consultation with the departmental undergraduate advisor according to departmental guidelines:
1. The major for the Bachelor of Arts degree requires completion of JPN 202 or CHN 402 or the equivalent Chinese or Japanese language, and a minimum of 34 units beyond the first year of language. A minimum of 15 units beyond the first year of language must be in the department.
2. At least 6 units must be at the 400 level, and at least 3 units must be taken outside the department in a discipline related to the student's program. A total of 9 units must have a single disciplinary focus. To provide breadth, a minimum of 9 units must be taken from three of the following fields: Chinese and Japanese history, linguistics, literature, religion and thought.
3. 2 units of EAS 498, Senior Capstone Experience. One unit should be taken during each of the student's final two semesters.
4. East Asian studies majors who receive a score of 1 or 2 on the Upper Division Writing Proficiency Exam are required to take (pass with a C or better) English 397 or (whichever course/s may be advised by the University Composition Board) in order to complete their major in the department. The major assumes general knowledge of mathematics. Students should complete MATH 122 or any higher-level mathematics course.

The undergraduate minor: Completion of 20 units. The program of study must be devised in consultation with the departmental undergraduate advisor according to departmental guidelines. Contact the department for specific requirements.

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, 145, 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 at the University of Arizona and/or placement exams given and evaluated under the supervision of the departmental language coordinators. All students who have taken Chinese and Japanese elsewhere or who have a gap in their Chinese/Japanese language study must take the placement test. Please call the departmental office for information.

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 (3) II (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)

350. Hindu Mythology (3) II S Overview of the traditional Hindu myths. Topics from Vedic, Epic, Puranic and other religious sources; their influence upon culture, philosophy, literature, and folklore. (Identical with HUM 350 and RELI 350)

396H. Honors Proseminar (3) I II

427a. The Prehistory of East Asia (3) I (Identical with ANTH 427a) May be convened with 527a.

445. Hindu Mysticism (3) II Introduction to the major concepts and practices of Hindu mysticism, including yoga techniques, rites, symbols, and myths. (Identical with RELI 445) May be convened with 545.

451. The United States and East Asia: 1840 to the Present (3) II (Identical with HIST 451) May be convened with 551.

452. Hindu Literature (3) I For a description of course topics, see 452. Graduate-level requirements include two research papers or reports approved by the instructor. May be convened with 452.

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.

594. Seminar
   a. Topics in East Asian Buddhism (3) P, reading knowledge of Chinese and/or Japanese; EAS 487a-487b/587a-587b or the equivalent.
   c. Special Topics in Asian Studies (3) [Rpt./4] May be convened with 496c.

695. Colloquium
   g. Advanced Studies in Asian History (3) [Rpt./3] II (Identical with HIST 695g, which is home)

Chinese Studies (CHN)


142. Chinese Humanities (3) II Major trends and traditions in the arts, literatures and languages, religions and philosophies of China. (Identical with RELI 142)


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 varieties of religious practice which developed later. (Identical with RELI 331)

340. Masterpieces of Chinese Literature in English (3) I Early poetry and classical prose.

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, 102


419. Linguistic Structure of Modern Chinese (3) 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) 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 judicial 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.


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.*

475a-475b-475c-475d-475e. Periods in Chinese History (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 200-750 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 China (3) (Identical with HIST 476) May be convened with 576.


475. Modern Chinese Philosophy (3) 

476. Modern Chinese Literature (3) [Rpt.] I I Graduation-level requirements include additional assignments relating to translation skill and research methodology. P, 422/522. May be convened with 423.

477b. The Archaeology of Pre-Han China (3) II (Identical with ANTH 527b) May be convened with 427b.

479. Chinese-American Literature 1960 - Present (3) I For a description of course topics, see 429. Graduate-level requirements include additional reports. May be convened with 430.

564b. Ancient Chinese Philosophy (3) [Rpt./2] I II Graduate-level requirements include additional reports. May be convened with 567a.

565. Modern Chinese History Since 1949 (3) II (Identical with HIST 595r) May be convened with 495r.

572. Languages of the Modern World: Korean (3) May be convened with 483. (Identical with RELI 583)

574. Colloquium I For a description of course topics, see 474. Graduate-level requirements include additional assignments relating to translation skill and research methodology. P, 422/522. May be convened with 423.

579a-579b-579c-579d-579e. Periods in Chinese History (3-3-3-3) [Rpt.] I For a description of course topics, see 479. Graduate-level requirements include additional assignments relating to translation skill and research methodology. P, 422/522. May be convened with 423.

576. Modern China (3) (Identical with HIST 576) May be convened with 476.

582. Social History of China (3) I For a description of course topics, see 482. Graduate-level requirements include additional assignments relating to translation skill and research methodology. P, 422/522. May be convened with 423.

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)

595. Colloquium a. Readings in Chinese History (3) [Rpt./12 units] b. Chinese History Since 1949 (3) II (Identical with HIST 595r) May be convened with 495r.

596. Seminar a. Ancient Chinese Philosophy (3) [Rpt./2] I II b. Ancient Chinese Literature (3) [Rpt./] I II c. Modern Chinese Literature (3) [Rpt.] I II d. Modern Chinese History and Politics (3) [Rpt.] I II e. 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 RELI 144)

145. Popular Culture in Japan (3) I An introductory exploration of religion, literature, art, and language in Japan through primary texts in translation. Enrollment limited to freshmen and sophomores. (Identical with RELI 144)


220. Japanese Religion (3) Introduction to texts, images and activities, both historical and contemporary, that comprise Japanese religion. (Identical with RELI 220)

272. Japanese Civilization (3) I An introductory exploration of religion, literature, art, and language in Japan through primary texts in translation. Enrollment limited to freshmen and sophomores. (Identical with RELI 220)

145. Popular Culture in Japan (3) I An introductory exploration of religion, literature, art, and language in Japan through primary texts in translation. Enrollment limited to freshmen and sophomores. (Identical with RELI 144)


220. Japanese Religion (3) Introduction to texts, images and activities, both historical and contemporary, that comprise Japanese religion. (Identical with RELI 220)

272. Japanese Civilization (3) I The study of the evolution of Japanese social values, aesthetic expression, religion and political institutions, in order to understand Japan's cultural heritage and contemporary society. (Identical with 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. All readings done in English translation. Writing-Emphasis Course*
446a-446b. Classical Japanese Literature (3-3) I 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.*


474a-474b-474c. History of Japan (3-3-3) (Identical with HIST 474a-474b-474c) May be convened with 574a-574b-574c.

495. Colloquium
b. Japan (3) [Rpt./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 For a description of course topics, see 402. Graduate-level requirements include additional readings and reports. (Identical with LING 502 and W S 502) May be convened with 402.

50S. Classical Japanese (3) I Introduction to classical Japanese grammar and to writing styles used from the 8th century through medieval times. P, grade of B or higher in JPN 416/516 or consent of instructor.

511. Introduction to Japanese Linguistics (3) I For a description of course topics, see 411. Graduate-level requirements include a substantial term paper and a class presentation based on that paper. (Identical with LING 511) May be convened with 411.

512. Advanced Japanese Linguistics (3) II For a description of course topics, see 412. Graduate-level requirements include a substantial term paper and a class presentation based on that paper. P, 411 or 511 (Identical with LING 512) May be convened with 412.

515. Advanced Japanese (3) I II For a description of course topics, see 415. Graduate-level requirements include a special projects component consisting of reports on aspects of Japanese grammatical idiom. May be convened with 415.

516. Advanced Japanese (3) I II For a description of course topics, see 416. Graduate-level requirements include a special projects component consisting of reports on aspects of Japanese grammatical idiom. May be convened with 416.

517. Business Japanese (3) II For a description of course topics, see 417. Graduate-level requirements include additional readings, assignments and class presentations. May be convened with 417.


521. Advanced Readings in Japanese (3) [Rpt.] I For a description of course topics, see 421. Graduate requirements include extra readings and an extra translation project. P, 416/516 or instructor's permission. May be convened with 421.

522. Advanced Readings in Japanese (3) [Rpt.] II For a description of course topics, see 422. Graduate-level requirements include extra readings and extra translation project. P, 421/521. May be convened with 422.

536. Japanese Sociolinguistics (3) For a description of course topics, see 436. Graduate-level requirements include extra readings, class presentations, and a substantial term paper. P, 202 consent of instructor. (Identical with LING 536) May be convened with 436.

546a-546b. Classical Japanese Literature (3-3) I For a description of course topics, see 446a-446b. Graduate-level requirements include an extra seminar meeting a week, additional readings, and a research paper. P, 416/516 or consent of instructor. May be convened with 446a-446b.

547a-547b. Modern Japanese Literature (3-3) II For a description of course topics, see 447a-447b. Graduate-level requirements include additional readings and a research paper. P, 416/516 or consent of instructor. 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
a. Masters Colloquium (1) I
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.
b. Topics in Japanese Linguistics (3) [Rpt./2] II P, 411 or 511 (Identical with LING 596c) May be convened with 496c.

696. Seminar
r. Japanese History (3) [Rpt.] I II (Identical with HIST 696r)
The Department of Ecology and Evolutionary Biology provides general and professional education for those intending to pursue graduate study or for those planning a career in fields where training in basic or applied 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 with a major in general biology. The department also administers advanced degrees, the Master of Science and Doctor of Philosophy with majors 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, organic, physiological, ecological, and evolutionary biology. The requirements are: 181R, 181L, 182, 302, 320, 335 and BIOC 460, plus 6 additional upper-division units from the Biology of Organisms list, plus additional upper-division elective biology courses to a minimum total of 35 units. Elective courses 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. A maximum of 6 units of courses numbered 391-399 or 491-499 can be counted in the major. Also required are courses for a supporting major: CHEM 103a-103b, 104a-104b; PHYS 102a-102b, MATH 125a-125b, and either MATH 223 or STAT 263, plus 6 additional units in mathematics or nonbiological science.

Also required are courses for a supporting split-structured minor in chemistry, physics, or mathematics: CHEM 103a-103b, 104a-104b; PHYS 102a-102b, MATH 125a-125b, and either MATH 223 or STAT 263, plus 6 additional units in mathematics or nonbiological science.

The major in ecology and evolutionary biology for the Bachelor of Science degree is designed primarily for students who plan to pursue graduate study in ecology and evolutionary biology or a related science. The requirements for the major are 181R, 181L, 182, 302, 320 and 335 or 435, plus 6 upper-division units from the Biology of Populations and Communities list, plus additional upper-division elective biology units to a minimum total of 35 units in the major. A maximum of 6 units of courses numbered 391-399 or 491-499 can be counted in the major. Also required are courses for a supporting split-structured minor in chemistry, physics, or mathematics: CHEM 103a-103b, 104a-104b; PHYS 102a-102b, MATH 125a-125b, and either MATH 223 or STAT 263, plus 6 additional units in mathematics or nonbiological science.

The major in ecology and evolutionary biology for the Bachelor of Arts degree is designed for students with interests in natural history and the biological sciences who may not wish to continue with graduate study. The requirements for the major are 181R, 181L, 182, 302, 320 or 335, plus 6 upper-division units from the Biology of Organisms list and 6 upper-division units from the Biology of Populations and Communities list, plus additional upper-division elective units in biology to a minimum total of 32 units. A maximum of 6 units of 390-399 or 490-499 can be counted in the major. Also required are courses for a supporting split-structured minor in chemistry, physics, or mathematics: CHEM 103a-103b, 104a-104b; PHYS 102a-102b, MATH 117, 118, and either MATH 123 or 125a, and either MATH 119 or STAT 263.

Biology secondary education teaching major: The requirements for the major are 181R, 181L, 182, 302 or PL S 312, 401, and BIOC 433 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 sub-major areas: (1) biological perspectives; (2) cell/molecular; (3) organismic; (4) ecology/evolution. Three units must be taken from area 1, with 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: PHIL 421, ECOL 479, MCB 404. The associated structured minor builds on the interdisciplinary prerequisite courses involved 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, 263.
plants, plants and industry, plants in textiles and other manufacturers. May be convened with 512.
411. 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.

415R. Insect Biology (3) I (Identical with ENTO 415R) May be convened with 515R.
415L. Insect Biology Laboratory (1) I (Identical with ENTO 415L) May be convened with 515L.

416. Computer Analysis of Sequences (3) II (Identical with MCB 416). May be convened with 516.

420. 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.
421. Philosophy of the Biological Sciences (3) 1995-96 (Identical with PHIL 421) May be convened with 521.
422. Cytogenetics (3) II Investigation into the structure and function of chromosomes and their role in heredity and evolution. 2R, 3L, P, MATH 125a. May be convened with 522.
423. Microbial Genetics (3) II (Identical with PL P 428).

423. Human Genetics (3) I (Identical with GENE 433) May be convened with 533.

434. Population Interactions (4) [Rpt.] II 1996-97 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.

435. Evolution II (4) I A thorough coverage of the empirical and theoretical foundations of modern evolutionary thought. The fossil record and associated conceptual issues are explored in detail. The heart of the course is the theoretical (mathematical), experimental, and analytical logic necessary to understand processes of evolutionary change at molecular, population, life history, species, and phylogenetic levels. The course is most appropriate for undergraduate and graduate students intending to pursue advanced study and research involving evolutionary questions in biology. P, 320, MATH 125a, P or CR 125b. (Identical with GENE 435) May be convened with 535. Writing emphasis course.


438. Biogeography (3) II The role of historical events and ecological processes in determining the past and present geographic distribution of plants and animals. P, 182 or GEOS 225. (Identical with GEOS 438) May be convened with 538.

439. Animal-Human Communication (3) II Survey of animal-human communication studies. Critical discussion of papers describing the rationale, design and success of projects involving nonhuman primates, marine mammals, and a parrot, supplemented by films and videos. Background material on animal-animal communication and animal intelligence. Emphasis on what can be learned about human and nonhuman capacities from studying how animals acquire and use human communication systems. P, 487 or equivalent, or instructor's permission. (Identical with PSYC 439) May be convened with 539.

440. Oceanography (2) I 1996-97 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.

441. Limnology (4) I (Identical with WPSC 441) May be convened with 541.

442. Marine Ecology (6) S A field introduction to basic concepts in marine ecology with emphasis on the behavior and ecology of invertebrates and fishes and the factors affecting the diversity and community structure of marine communities. The entire course is conducted at selected sites in the Gulf of California. Optional travel fee. Consult instructor before enrolling. May be convened with 542.

444. Insect Ecology (3) I (Identical with ENTO 444) May be convened with 544.

445. Professional Skills (2) I (Identical with ENTO 455) May be convened with 555.

459. Comparative Vertebrate Histology (4) I (Identical with V SC 459) May be convened with 559.


466. Physiology Laboratory (3) II Emphasis on data analysis, interpretation. Laboratory techniques and investigation of physiological mechanisms. 2R, 4L, P, either 437, 466; V SC 400a-400b, or PSIO 480. (Identical with MCB 466, PSIO 466, TOX 466, V SC 466) May be convened with 566.

468. Comparative Physiology (3) II The responses of physiological systems to the environment; energy exchanges, respiration, thermal and osmotic regulation, locomotion, behavioral regulation, and integration of responses. P, either 437, 468, V SC 400a-400b, or PSIO 480. (Identical with PSIO 468 and V SC 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 sper-
matophytes; systems of classification; collection and identification of local flora. 2R, 6L. May be convened with 572.

475. Freshwater Algae (4) II 1995-96 Systems, ecology, and evolution of planktonic and benthic species; field techniques and lab. culture. 2R, 6L. Field trips. P, 4 units of biology or plant sciences. (Identical with SW 475 and WFSC 475) May be convened with 575. Writing-Emphasis Course.*

476A-476B. Analysis of Biological Diversification (3-2) 476A: I Patterns of biological diversity and the history of diversification and extinction. Phylogenetic analysis will be introduced to address issues in ecology, paleobiology, development and genetics. One Saturday field trip. P, 181 and 182 and either an evolution or paleobiology course or permission of instructor. Writing-Emphasis Course.* 476B: II Explores approaches to studying biological diversification, integrating phylogenetic biology, ecology, population genetics, developmental biology and molecular biology. P, 335 or permission of instructor. (Identical with GEOS 476a-476b and MCB 476a-476b) May be convened with 576a-576b.

478. Global Change (3) II (Identical with GEOS 478) May be convened with 578.

479. Art of Scientific Discovery (3) [Rpt.] I 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.


485. Mammalogy (4) I Systematics, ecology, and evolution of the amphipods and reptiles. 2R, 6L or field work. (Identical with WFSC 485) May be convened with 585.

486. Ornithology (4) II Natural history of birds and its bearing upon the problems of animal behavior, distribution, and evolution. 2R, 2L. Field trips. P, one basic biology course. (Identical with WFSC 486) May be convened with 586. Writing-Emphasis Course.*

487R. Animal Behavior (3) I Concepts and principles of the mechanism, development, function and evolution of behavior, with emphasis on its adaptiveness. P, 8 units of biology. May be convened with 587R. Writing-Emphasis Course.*

487L. Animal Behavior Laboratory (1) I Exposure to current topics in behavior and process of behavioral research through video presentations, demonstrations of live animals and readings. May be convened with 587L.


489. Selected Studies of Birds (2) [Rpt.] I Recent advances in ornithology. 1R, 3L or field trip. P, 484. (Identical with WFSC 489) May be convened with 589.

496. Seminar d. Selected Topics in Marine Biology (1-4) [Rpt./6 units] II Field trips. Fee. P, junior or senior ecology majors. May be convened with 596d. Writing-Emphasis Course only if taken for 3-4 units.*

514. Plants of the Desert (2) S For a description of course topics, see 414. Graduate-level requirements include a research paper on a relevant topic. May be convened with 414.

515R. Insect Behavior (3) I (Identical with ENTO 515R) May be convened with 415R. Insect Biology Laboratory (1) I (Identical with ENTO 515L) May be convened with 415L.

516. Computer Analysis of Sequences (3) II (Identical with MCB 516). May be convened with 416.

520. Evolutionary Quantitative Genetics (4) II 1995-96 For a description of course topics, see 420. Graduate-level requirements include a research paper. P, Calculus. May be convened with 420.

521. Philosophy of the Biological Sciences (3) 1995-96 (Identical with PHIL 521) May be convened with 421.

523. Cytogenetics (3) II For a description of course topics, see 423. Graduate-level requirements include an in-depth research paper on a current problem in cytogenetics. P, 320. (Identical with GENE 523) May be convened with 423.

524. Theoretical Population Genetics (3) I Mathematical theory of modern population genetics developed from first principles, with emphasis on evolutionary implications and the historical development of ideas. P, 320, MATH 223. (Identical with ANTH 524, INSC 524 and GENE 524)

525. Speciation (2) [Rpt.] II Mechanisms of evolution in the formation of races and species of animals and plants. P, 320. (Identical with GENE 525)

533. Human Genetics (3) I (Identical with GENE 533) May be convened with 433.

534. Population Interactions (4) [Rpt.] II 1996-97 For a description of course topics, see 434. Graduate-level requirements include independent study of a model or data ecological system to be specified by the professor. P, 302, two semesters of calculus. May be convened with 434.

535. Evolution II (4) I For a description of course topics, see 435. Graduate-level requirements include two term papers, the subject to be determined by the professor. P, 302, 320; MATH 125a, P or CR, 125b. (Identical with GENE 535) May be convened with 435.

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 GENE 538) May be convened with 438.

539. Animal-Human Communication (3) II For a description of course topics, see 439. Graduate-level requirements include a research paper. (Identical with PSYC 539) May be convened with 439.

540R. Oceanography (2) I 1996-97 For a description of course topics, see 440R. Graduate-level requirements include an additional literature paper on a modern aspect of oceanography. May be convened with 440R.

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.

544. Insect Ecology (3) I 1996-97 (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 355) (Identical with MATH 550)

555. Professional Skills (2) I (Identical with ENTO 555) May be convened with 455

559. Comparative Vertebrate Histology (4) II (Identical with V SC 559) May be convened with 459.

560. Current Advances in Plant Physiology (3) I (Identical with PL S 560)

565. Phylogenetic Biology (3) I 1996-97 For a description of course topics, see 465. Graduate-level requirements include a more in-depth term paper. P, 320, 435, 467 or other course in evolution, or permission of instructor. (Identical with ENTO 565 and GEOS 565) May be convened with 465.

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 466.

568. Comparative Physiology (3) II For a description of course topics, see 468. Graduate-level requirements include an additional literature review paper on a modern aspect of comparative physiology. P, 181, 182. (Identical with PSIO 568 and V SC 568) May be convened with 468.

570. Plant Diversity and Evolution (4) I For a description of course topics, see 470. Graduate-level requirements include a research paper on a relevant topic. Field trips. P. 4 units of biology or plant sciences. May be convened with 470.

571. Human Embryology (4) I (Identical with ANAT 571) May be convened with 471.

572. Systematic Botany (4) II For a description of course topics, see 472. Graduate-level requirements include either an additional research project or literature review paper on a modern aspect of systematic biology. May be convened with 472.

575. Freshwater Algae (4) II 1995-96 For a description of course topics, see 475. Graduate-level requirements include a special topic report on an aspect of freshwater algae. Field trips. P. 4 units of biology or plant sciences. (Identical with WFSC 575) May be convened with 475.

576a-576b. Analysis of Biological Diversification (3-2) II For a description of course topics, see 476a-576b. 576a: Graduate-level requirements include a term paper based on original research. 576b: Students will explore the literature to supply a bibliography to the class. (Identical with GEOS 576a-576b and MCB 576a-576b) May be convened with 476a-476b.

578. Global Change (3) II (Identical with GEOS 578) May be convened with 478.

579. Art of Scientific Discovery (3) [Rpt.] I For a description of course topics, see 479. Graduate-level requirements include use of all techniques in a semester-long research project and final paper. P, consult with department before enrolling. May be convened with 479.

580. Invertebrate Zoology (4) I For a description of course topics, see 480. Graduate-level requirements include an in-depth research project on a modern aspect of invertebrate zoology. P, 182. May be convened with 480.

582. Ichthyology (4) 1995-96 I For a description of course topics, see 482. Graduate-level requirements include an in-depth research project on a single aspect of the course topic. P, 182. (Identical with WFSC 582) May be convened with 482.

583. Herpetology (4) II For a description of course topics, see 483. Graduate-level requirements include an in-depth paper. P, 304. (Identical with WFSC 583) May be convened with 483.

584. Ornithology (4) II For a description of course topics, see 484. Graduate-level requirements include an oral presentation of the results of an independent research project. Field trips. P. one basic biology course. (Identical with WFSC 584) May be convened with 484.

585. Mammalogy (4) I For a description of course topics, see 485. Graduate-level requirements include an exercise in mammalian taxonomy and a higher level of performance. P, 304. (Identical with WFSC 585) May be convened with 485.

586. Biological Scaling (2-3) I 1996-97 Evolution of body size and the scaling of physiological, morphological, and ecological requirements, biomechanics, functional morphology, and dimensional analysis. P, 302. 587R. Animal Behavior (3) I For a description of course topics, see 487R. Graduate-level requirements include and organizing and leading of group discussion. May be convened with 487L.

587L. Animal Behavior Laboratory (1) I For a description of course topics, see 487L. Graduate-level requirements include term paper involving hands-on research. P. 8 units of biology. May be convened with 487L.

588. Arizona Mammals (3) S For a description of course topics, see 488. Graduate-level requirements include an in-depth research paper. P, 182. May be convened with 488.

589. Selected Studies of Birds (2) [Rpt.] I For a description of course topics, see 489. Graduate-level requirements include an in-depth presentation of a single aspect of the course topic. P, 484. (Identical with WFSC 589) May be convened with 489.

596. Seminar A. Evolutionary Ecology (1-2) [Rpt./5] I

b. Population Biology (1) [Rpt./6] I II Open to majors only.

d. Selected Topics in Marine Biology (1-4) [Rpt./6 units] II Field trips. P. junior or senior ecology majors. May be convened with 496d.

j. Plant Population Ecology (1-3) [Rpt./5] I, P. some introductory botany, ecology, and permission of instructor. May be convened with 496j.

m. Conservation Biology (1) [Rpt./6 units] II Field trip. (Identical with RNR 596m)
p. Macroevolution (2) [Rpt./6 units] I II (Identical with GEOS 596p) May be convened with 496p.

r. Species Diversity (2) II 1995-96 P, 302. May be convened with 496r.

610a-610b. Research in Ecology and Evolution (1-1) [Rpt.] I II Introduction to the research currently being pursued by faculty and staff in the department. Open to majors only.

623a-623b. Biology Update 1-2 (2-2) S (Identical with BIOC 623a-623b)

670. Recent Advances in Genetics (2) I (Identical with GENE 670)

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**Economics (ECON)**

McClelland Hall, Room 401
(520) 621-6224; FAX: (520) 621-8450


Associate Professors John Z. Drabicki, Donald G. Hecker, Kenneth F. Kroner, James C. McBrearty, Barbara N. Sands, Gerald J. Swanson

Assistant Professors Bruno Broseta, Diego Moreno, James D. Ratliff, Kroner, James C. McBrearty, Barbara N. Sands, Gerald J. Swanson

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 Admini-
The major in economics consists of a minimum of 30 units, including 200 or 201a-201b or 210; 332; 361; 397 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, 453, 460, 461, 481, 482, 484, 485, 486 and 489. Students who take 200 are strongly encouraged to complete 225 before enrolling in 332 or 361. The major in economics assumes more than a moderate knowledge of mathematics. All majors are required to complete MATH 123 or 124 or 125a (which are a prerequisite for 332 and 361). Students with a substantial background in mathematics are encouraged to substitute MATH 464 and 466 for 399, and to include 411, 418 and 421 in the major. Such students should take, at a minimum, MATH 125a-b 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; 300 (or 361); 330 or 332 and other electives needed to meet minor requirements of the student's college.


Three introductory offerings are available: 200, 210, or the sequence 201a-201b. Students may take only one of these three introductory options.

195. Colloquium
   a. Economics (1) I Open to freshmen only.
   b. Basic Economic Issues (3) I II S CDT National and international economic issues. An introduction to economic analysis. Not available to students who have completed or are enrolled in 201a, 201b, or 210.
   c. Principles of Economics (3-3) I II S CDT 201a: Nature of economics, price theory for the product market, factor prices, international economics. 201b: Introduction to the theory of national income and employment, money and banking, economic growth and stabilization. P, 201a. Not available to students who have completed or are enrolled in 200 or 210.
   d. Survey of Economic Theory (3) I II S Introduction to current economic theory. P, 6 units of calculus. Not available to students who have completed or are enrolled in 200, 201a, or 201b.
   e. Resource and Environmental Economics (3) I (Identical with AREC 217)
   f. Contemporary Economic Problems (3) I II S Analysis of various problems such as poverty, crime, discrimination, and unemployment facing individuals, institutions, and society using various methodologies of economics. Not available to students who are enrolled in or have completed any upper-division economics class. P, 200 or 201a-201b or 210.
   g. World Food Economy (3) II (Identical with AREC 242)
   h. Microeconomic Analysis for Business Decisions (3) I II S Examination of industrial structure; theory of prices under varying market conditions; applications to business problems. P, 200 or 201a-201b or 210. For nonmajors. Not available to students who have completed or are enrolled in 316.
   i. History of Economic Thought (3) I The origins and evolution of contemporary economic doctrines; classical, socialist, Keynesian and neoclassical thought in past and present social contexts. P, 200 or 201a-201b or 210.
   j. Soviet Economic System (3) I Marxist-Leninist foundations of Soviet economic policy; economic management and planning mechanisms; problems of international trade and integration; economic reform and prospects. P, 200 or 210. (Identical with RUS 305)
   k. Economic History of the United States (3) I Development of economic institutions of the United States. P, 200 or 201a-201b or 210.
   l. Economics of Futures Markets (3) II (Identical with AREC 313)
   m. Macroeconomic Institutions and Policy (3) I II S The study of how the macroeconomy is affected by institutions, technology and other forces, and governmental policies. P, 200 or 201a-201b or 210. For nonmajors. Not available to students who have completed or are enrolled in 332.
   n. Intermediate Macroeconomics (3) I II S Analysis of output, employment, interest rates, and the price level; the effects on these of changes in monetary and fiscal variables. P, 200 or 201a-201b or 210; MATH 123, 124, or 125. Not available to students who have completed or are enrolled in 330.
   o. Economic Statistics (3) II (Identical with AREC 339) Not available to students who have completed or are enrolled in 376.
   p. International Economics and Policy (3) I II S Normative and positive aspects of international trade and international monetary economics, with attention drawn to government policy as it relates to international commercial relations. Not available to students who are enrolled in or have completed either 442 or 443. P, 200 or 201a-201b or 210.
   q. Intermediate Microeconomics (3) I II Determination of prices and quantities in product and factor markets. P, 200, 201a-201b or 210; MATH 123, 124, or 125a. Not available to students who have completed or are enrolled in 300.
   r. Economic Development (3) II Analysis of the economic development process of newly developing nations. P, 200 or 201a-201b or 210.
   s. Economics of Land and Water in the American West (3) I (Identical with AREC 375)
   t. Statistical Inference in Management (3) (Identical with MAP 376) Not available to students who have completed or are enrolled in 339.

382. Labor and Public Policy (3) I Economic and legal analysis of the issues and problems arising out of executive, legislative, and judicial efforts to define the rights, duties, and responsibilities of labor and management in the field of industrial relations. P, 200 or 201a-201b or 210.

383. Labor Arbitration (3) I The place and function of arbitration in the field of labor management relations. P, 200 or 201a-201b or 210.

386. Collective Bargaining (3) I Law of collective bargaining; negotiating and administering the contract; public policy. P, 200 or 201a-201b or 210.

396H. Honors Proseminar (3) II


406. Introduction to Experimental Economics (3) I Lab. experimental studies of economic behavior; applications to monopoly, bilateral bargaining, and competitive markets under various exchange rules; speculation, voting processes, public goods. 2R, 3L, P, 210 or 300 or 361.

407. Studies in Microeconomics (3) I II Studies in microeconomics, such as the economics of imperfect information and uncertainty, externalities and public goods, and imperfect competition. P, 361, MATH 125B. May be convened with 507.

411. Microeconomic Theory and Behavior (3) I Microeconomic theory with an emphasis on the use of experimental laboratory and field methods for testing the behavioral implications of the theory. P, 300 or 361, MATH 125B. May be convened with 511.

418. Introduction to Econometrics (3) 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) I 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.

452* International Macroeconomics (3) I II General equilibrium 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* Environmental Law and Economics (3) I (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) II Macroeconomic aspects of labor economics: unemployment causes and cures; unemployment and inflation; distribution of income. P, 339 or 376; 361.

484* Economics of Fuels and Energy (3) II Analysis of demand/supply, pricing, competitive behavior, transportation, interfuel competition, technical change, and externalities for markets for coal, oil, natural gas, and nuclear power. P, 300 or 361. May be convened with 584.

485* Economics of Non-Fuel Mineral Industries (3) I II Analysis of national and international mineral markets; reserves/deposits, production technologies, market structure and pricing, recycling, and international trade. P, 300 or 361. May be convened with 585.

486* Economics of Minerals, Residuals, Effluents, and the Environment (3) I II Economic aspects and process analysis of mineral production, control and measurement of effluents and residuals for environmental compliance, case studies of production mitigation, competitiveness and technology. P, 300 or 361. May be convened with 586.

487* Public Choice (3) 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) I S 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 credit available for nonmajors only. P, 361 or 500. May be convened with 405.


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.

511. Microeconomic Theory and Behavior (3) II For a description of course topics, see 411. Graduate-level requirements include a research paper or additional problem sets, depending on exact content. P, 521. May be convened with 411.

512. 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) II (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) II For a description of course topics,
see 421. Graduate-level requirements include a research paper or additional problem sets, depending on exact content. May be convened with 421.


524. International Historical Development (3) I 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.

526. Health Economics (3) I (Identical with PA 526)

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 Macroeconomics (3) I 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, 530, 532, or 510. May be convened with 442.

543. International Trade Theory (3) 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, 530, 532, or 510. May be convened with 442.


553. Business and Economic Forecasting (3) II 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, 530 or 500; MKTG 552. May be convened with 453.

560. 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 industry performance. Advanced degree credit available for nonmajors only. P, 530 or 500; 339 or 376 or MKTG 552. May be convened with 460.

561. Economics of Regulated Industries (3) II For a description of course topics, see 461. Graduate-level requirements include a case of regulation/deregulation or other approved research project in regulatory theory or policy. Advanced degree credit available for nonmajors only. P, 500 or 361 or 500; 339 or 376 or MKTG 552. May be convened with 460.


568. Environmental Scanning and Business Strategy (3) I II (Identical with MKTG 568)

575. Economics of Natural Resource Policy (3) I II (Identical with AERC 575)

576. Advanced Natural Resource Economics (3) I (Identical with AERC 576)

577. Advanced Topics in the Economics of Environmental Regulation (3) I II (Identical with AERC 577)

580. Mathematics for Economists (2) I (Identical with AERC 580)

584. Economics of Fuels and Energy (3) II For a description of course topics, see 484. Graduate-level requirements include a research project and different tests. Advanced degree credit available for nonmajors only. P, 300, 361, 500, 501a or AERC 504. May be convened with 484.

585. Economics of the Non-Fuel Mineral Industries (3) I II For a description of course topics, see 485. Graduate-level requirements include a research project and different tests. Advanced degree credit available for nonmajors only. P, 300, 361, 500, 501a, or AERC 504. May be convened with 485.

586. Economics of Minerals, Residuals, Effluents, and the Environment (3) II For a description of course topics, see 486. Graduate-level requirements include a research project and different tests. P, 300, 51a or AERC 504. May be convened with 486.

589. Public Choice (3) II For a description of course topics, see 489 (Identical with POL 589) May be convened with 489.


676. Economic Dynamics and Natural Resource Use (3) I 1995-96 P, graduate student standing with one year of graduate microeconomic theory. (Identical with AREC 676)


Education (EDUC)

Education Building, Room 201 (520) 621-1462; FAX: (520) 621-9271 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) and admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education 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 and descriptive statistics. P, 500.

601. Qualitative Methods in Education (3) I II S Introduction to theory and methods of conducting research through extended participant observation in school or community settings; field work, ethnography, case study, qualitative methods. P, 500.

602. Research Design and Techniques in Education (3) I II S In-depth explorations of various research paradigms in educational inquiry and their research designs; critical analysis of the structure and logic of 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 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 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 The historical development of western educational thought from its origins to the present.

614. History of Education in the United States (3) I II The development of American educational thought from its colonial origin to the present.

615. Educational Sociology (3) I II 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 Administration and Higher Education (ED A/H ED)

Education Building, Room 321
(520) 621-7951; FAX: (520) 621-9271

Professors Larry L. Leslie, Program Head (Higher Education), Donald C. Clark, Program Head (Educational Administration), Waldo K. Anderson (Emeritus), Henry E. Butler, Jr. (Emeritus), Robert G. Grant (Emeritus), Fred Hargrood (Emeritus), Lawrence O. Nelson (Emeritus), F. Robert Paulsen (Emeritus), Macario Saldate, IV, T. Frank Saunders (Emeritus), Sheila Slaughter, Marsden B. Stokes (Emeritus), Dudley B. Woodard, Jr.
Associate Professors Gary Rhoades, John S. Levin

The department offers programs leading to the Master of Arts and Doctor of Philosophy degrees with a major in higher education and the Doctor of Education degree with a major in educational administration. At the time of catalog production, the Doctor of Education with a major in educational administration was under revision. The Education Specialist degree with a major in educational administration and the Master of Arts and Doctor of Philosophy with a major in foundations of education were under review at the time of the catalog production. Consult the department head for current information.

Concentrations are available within major programs 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 Teacher 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. The meeting of standards does not guarantee admission.

Educational Administration (ED A)

497. Workshop
a. Trends in Educational Leadership (3) [Rpt./12 units] I II S May be convened with 597a.

597. Workshop
a. Trends in Educational Leadership (3) [Rpt./12 units] I II S May be convened with 497a.
b. School Evaluation/Accreditation: Problems and Procedures (3) I II S

660. Leadership and the Educational Environment (3) I II S Introduction to educational leadership; overview of administration within school contexts and larger societal environment; organizational and leadership theories.

661. Administration of Bilingual Education Programs (3) I S Dynamics of the administration of educational programs for the bilingual learner including socio-political realities, mandated federal and state funded educational programs, and effective community participation.

662. Educational Law: Policy and Practice (3) I 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 Techniques for using computers to make school administration more efficient; using computers to enhance the management of information. P, 660 or CR.

665. Supervision of the Instructional Program (3) II S Purposes of instructional supervision; organization, techniques and skills for supervisory competency. P, 660.

668. Managing Curriculum Change (3) II Techniques for administrators to use in analyzing the quality of the curriculum in schools as well as the appropriateness of instructional techniques used to support the curriculum. P, 660 or CR.

671. School Finance (3) I Historical background of the financing of education in the United States; economics and principles; sources and distribution of funds for education; budgeting, accounting, and reports. P, 660, 661 or CR.

682. School Business Management (3) II The general management of school business; administration and accounting of school funds; administration of equipment and supplies; other business operations. P, 660 or CR.

675. Theory and Behavior in School Organizations (3) 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) II Functions and activities of building-level administrators, with emphasis on instruction, staff development, student services evaluation, and operational services. P, 693a and 15 units of educational administration, CR 693b.

682. The Superintendency (3) II S Functions and responsibilities of the chief school executive and central office staff, with emphasis on external and internal system relationships in policy formation and decision making. P, 693a, 693b or CR.

693. Internship a. Educational Leadership (2-3) [Rpt./4 units] II S P, 660, 661, 662 or CR. b. Advanced Educational Leadership (3-4) [Rpt./8 units] II P, 693a and 15 units of educational administration, CR 681 or 682.

695. Colloquium a. Issues in Educational Leadership (1-3) [Rpt./12 units] II

696. Seminar a. Topics in Educational Leadership (1-3) [Rpt./12 units] II

697. Workshop a. Problems in Educational Leadership (1-3) [Rpt./12 units] II

Higher Education (H ED)

Education Building, Room 301
(602) 621-7234

561. The Community College (3) I The scope, objectives, and educational functions of the community college, patterns of community college programs.

601. 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.

608. 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 various higher education institutions; patterns of governance and policy development.

617. 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 trends.

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.

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

696. Seminar c. Topics in Higher Education (1-3) [Rpt./12 units] I II

Educational Psychology (ED P)

Education Building, Room 602
(520) 621-7825; FAX: (520) 621-2909


Associate Professors Harley D. Christiansen (Emeritus), Joseph D. Guillo (Emeritus), Mary McCaslin, Valerie F. Reyna

Assistant Professor M. Virginia Gonzalez

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 educational technologies. The Ed.S. degree is available only in school psychology and educational technologies concentrations.

300. Development of Life Science (3) II Life science 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. P, admission to the College of Education; see "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog.

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. P, admission to the College of Education (see "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).

340. 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 F S 403) May be convened with 503.

411. Computer Applications in Education (3) I Essentials of computer operations; presentations software; software evaluations; telecommunications; computer-based diagnosis; application to instruction. May be convened with 511.

423. Socio-Cultural Context of Human Development (3) I II (Identical with F S 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 F S 500)
501. Advanced Child Development (3) 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 F S 503) May be convened with 403.

510. Learning Theory in Education (3) II Major theories of learning and motivation; emphasis on relationships between theory and practice in the schools.

511. Computer Applications in Education (3) I For a description of course topics, see 411. Graduate-level requirements include a substantial multimedia production project. May be convened with 411.

517. Classroom Application of Behavior Modification Techniques (3) 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) I II Descriptive, correlational, and inferential procedures for presenting and analyzing school and research data. For students in all fields. 3R, 1L.

557. Design of Questionnaires and Scales (3) I II Emphasis on theoretical and methodological issues related to the development of survey and rating scales, sampling procedures, and response bias.

558. Educational Tests and Measurements (3) I Theoretical and practical application of psychometric techniques to test construction, analysis, and interpretation of test results. P, 541.

559. Testing of Minorities (3) I 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) 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) I Provides an understanding of and facility with research application of multivariate correlational techniques, such as multiple regression, discriminant function, canonical correlation, and factor analysis. P, 640.


658. Theory of Measurement (3) I II Advanced topics in theoretical and practical issues in psychometrics. P, 558; 640 or CR.

673. Theories of Intellectual Assessment (3) I II Various theories and models of human ability and their implications for intellectual assessment. P, 556 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) I II Techniques for assessing personality and social behavior; practice in implementing programs derived from assessment techniques. 2R, 3L. Majors only or permission of instructor. P, 674b.

679. Psychoeducational Assessment in the Schools (3) I Psychoeducational assessment techniques; practice in prescribing remedial programs. 2R, 3L. Open to majors and minors only. P, 673, 674b.

682. Educational Program Evaluation Principles and Techniques (1-3) [Rpt./1] Development and current viewpoints, political context, 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 practices, theories, and research related to child behavior disorders. P, 530.


693. Internship a. Research/evaluation (1-3) [Rpt.12 units] I II S.

Electrical and Computer Engineering (ECE)

ECE Building, Room 230 (520) 621-2434; FAX: (520) 621-8076


Assistant Professors Jo Dale Carothers, Pamela A. Delaney, Steven L. Dvorak, Ming-Kang Liu, Michael Marefat, Mark A. Neinfeld, Jeffrey J. Rodriguez, Indra Widjaja, Arthur F. Witulski

The Department of Electrical and Computer Engineering in the College of Engineering and Mines offers the degrees
of Bachelor of Science in Electrical Engineering, in Computer Engineering, and in Optical Engineering, and Master of Science and Doctor of Philosophy with a major in electrical engineering.

All three of the undergraduate curricula have the goal of educating immediately productive engineers who are also qualified to pursue further education as necessary to keep pace with these rapidly changing areas. The electrical engineering program prepares students for careers in such areas as electronics, microelectronics, communications, controls, electromagnetics, and signal processing. The computer engineering program prepares students for computer-related careers including microcomputer-based design, computer-aided VLSI design, computer networks, and artificial intelligence applications. The optical engineering program, offered in cooperation with the Optical Sciences Center, supports careers in areas involving optical design, optical fabrication and testing, lasers, optical detectors, optical instrumentation, optical fiber communications, etc. See the College of Engineering and Mines section of this catalog for specific undergraduate program requirements.

The department participates in the honors program. For graduate admission and degree requirements, consult the Graduate Catalog.

207. Elements of Electrical Engineering (3) I II S CDT Introductory survey of electrical engineering, with emphasis on electric power. 3ES, P, MATH 125a, PHYS 241.

208. Elements of Electronics (3) I II S CDT Introductory survey of electronic principles and instrumentation. 3ES, P, 207.

210. Geometrical Optics (3) I (Identical with 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 241, MATH 223. 220b: Transient and sinusoidal analysis of linear circuits with laboratory. 2R, 1D, 3L. 3ES, 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.

226. Physical Optics (3) II (Identical with OPTI 226)

226L. Physical Optics Laboratory (3) II (Identical with OPTI 226L)

247. Digital Logic (3) I II S CDT Number systems and coding, logic design, sequential systems, register transfer language. 2ES, 1ED. P, CR, PHYS 241.

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.


453. Design-Oriented Analysis of Electronic Circuits (3) I Emphasis on obtaining analytical approximations for maximum insight into circuit behavior. Extra element theorem, feedback theorem, low-entropy design equations, frequency-domain measurement of loop gains, impedances. 1.5ES, 1ED. P, 351a-351b, 352. May be convened with 553.

455. Elementary Digital Circuit Design (3) II Emphasis on first-order analysis and design; integrated bipolar and MOS digital circuits. 0.5ES, 2.5ED. P, 351a-351b.

456. Optoelectronics (3) I Properties and applications of optoelectronic devices and systems. Topics include radiation sources, detectors and detector circuits, fiber optics, and electro-optical components. 1.5ES, 1.5ED. P, CR, 352, 381. May be convened with 556.

457. Integrated Circuit Laboratory (3) I 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.

458. 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 1995-96 (Identical with CHEE 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, 275, 372.


470a-470b. Optics Laboratory (3-3) (Identical with OPTI 470a-470b)

471. Engineering Software Design (3) I II Object oriented programming languages, Scheme, C++, class library development and use, object behavior and system testing. 2R, 3L. 1.5ES, 1.5ED. P, 274, C SC 227.


473. Software Engineering Concepts (3) II In-depth consideration of each of the phases of the software project life code. Object-oriented design and programming. Includes a large-scale software development project involving groups of students. 2R, 3L. 1.5ES, 2ED. P, 275. May be convened with 573.

474a-474b. Computer-Aided Logic Design (3-3) I II 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, 274. 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.

476. Fundamentals of Computer Networks (3) I Introduction to computer networks and protocols. Study of the ISO open systems interconnection model, with emphasis on the physical, data link, network, and transport layers. Discussion of IEEE 802, OSI, and Internet protocols. 2ES, 1ED. P, 275, 372, SIE 305. May be convened with 576.

477. 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, 275, 473. May be convened with 579.

478. Electromagnetics (3) I II Electromagnetic waves in complex media, waveguides, cavity resonators, and antennas. 1.5ES, 1.5ED. P, 381 or PHYS 415a.

484. Antenna Theory and Design (3) II Introduction to the fundamentals of radiation, antenna theory and antenna array design. Design considerations for wire, aperture, reflector and printed circuit antennas. 1.5ES, 1.5ED. P, 381.

485. Radio Waves and Telemetry (3) I Principles and properties of electromagnetic propagation through the atmosphere and space including terrain effects. Applications to telemetry, with emphasis on microwave and satellite transmission, frame and packet construction, data synchronization, link characterization and systems considerations. 1.5ES, 1.5ED. P, 381, 431. May be convened with 585.

486. Microwave Engineering (3) I Review of transmission lines and waveguides; microwave network analysis; impedance transformer designs; filter design; microwave amplifiers; microwave integrated circuits. 1.5ES, 1.5ED. P, 482.

487. Fiber Optics Laboratory (3) I (Identical with OPTI 487) May be convened with 587.

493. Internship

a. Manufacturing (3) I II S P, junior standing.

494. Practicum

a. Senior Practicum in Design (3) I II 0.5ES, 2.5ED. P, 302. Writing-Emphasis Course.*

495. Colloquium


*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, state-variable models, analysis methods-stability, controllability and observability, state feedback techniques, design of feedback controllers and observers.


504. Random Processes for Engineering Applications (3) I II Probability, random variables, stochastic processes, correlation functions and spectra with applications to communications, control, and computers. P, SIE 305.

522. Analog Signal Processing and Filtering (3) I For a description of course topics, see 422. Graduate-level requirements include additional homework and a term project. May be convened with 422.

524. Active RC Filters (3) I 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) I 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.
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 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 Digital image analysis, including feature extraction, boundary detection, segmentation, region analysis, mathematical morphology, stereoscopy and optical flow. P. 340. (Identical with OPTI 532)
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, SEE 305. 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, SEE 274 and 305. 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, SEE 305 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) III 1995-96 (Identical with MATH 539)
540. Advanced Microelectronic Processing (3) I Theory of diffusion, oxidation, deposition and processing, etc. and process integration. P, 438.
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 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) II (Identical with NEE 547) May be convened with 447.
549. Continuous-System Modeling (3) I For a description of course topics, see 449. Graduate-level requirements include more difficult homework and separate grade normalization. (Identical with CSE 549.) May be convened with 449.
552. Solid-State Devices (3) II Basic semiconductor physics and materials, PN junctions, metal semiconductor junctions/contacts. BJTs and MOSFETs, device operation, terminal behavior and frequency response, device models. P, 352, 451.
553. Design-Oriented Analysis of Electronic Circuits (3) I For a description of course topics, see 453. Graduate-level requirements may include additional homework, different test problems. May be convened with 453.
554. Electronic Packaging Principles (3) I II Introduction to problems encountered at all levels of packaging: thermal, mechanical, 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) II 1995-96 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 consultation 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.
562. Engineering Applications of Graph Theory (3) I Topics and 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.
565. Modern Computer Architecture (3) I Overview of uniprocessor architectures, introduction to parallel processing, pipelining, vector processing, multi-processing, multiprocessor systems, memory design for parallel com-
puters, cache design, communication networks for parallel processing, algorithms for parallel processing. P, 369.


571a. Digital Systems Design (3) Computer organization and architecture; control unit design, microprogramming, input-output. (Identical with C SC 571a)

572. Continuous-System Simulation (3) II For a description of course topics, see 472. Graduate-level requirements include more difficult homework and separate grade normalization. (Identical with C SC 572) May be convened with 472.

573. Software Engineering Concepts (3) II For a description of course topics, see 473. Graduate-level requirements include additional homework and a term project. May be convened with 473.

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 design evaluation, learning and creativity in design systems. A large terminal project is central to the course. P, 479, 473.


578. Fundamentals of Computer Networks (3) I For a description of course topics, see 478. Graduate-level requirements include additional homework and assignments. May be convened with 478.

579. Principles of Artificial Intelligence (3) I For 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: Time-harmonic fields; fundamental theorems and concepts; applications; transmission lines; radiators; antennas; wave propagation; electromagnetic waves; electromagnetic fields; scattering; absorption; interference. P, 502 or MATH 422b; 482 or PHYS 415b. 581b: Fundamental principles of electromagnetism; electromagnetic waves; wave propagation; scattering; absorption; interference. P, 502 or MATH 422b; 482 or PHYS 415b.

582. 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 ATM 583)

583. Advanced Antenna Theory and Design (3) II Electromagnetic radiation and diffraction; dipole, 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 and Telemetry (3) II For a description of course topics, see 485. Graduate-level requirements include a research report on a topic selected by the instructor from the course material. P, 485. May be convened with 485.

587. Fiber Optics Laboratory (3) I (Identical with OPT 587) May be convened with 487.

589. Atmospheric Electricity (3) I II 1995-96 (Identical with ATM 589)

631. Neural Networks (3) I Theory and application of parallel distributed computation via elementary processing elements; PE models and neural analogies; statistical classification, supervised/unsupervised; neural net models; associative memories; training algorithms.

632. Information Theory (3) I II 1996-97 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)


659. Advanced Topics in Microelectronics and Solid-State Devices (3) I (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.

674. Test Generation for Automata (3) I Fault modeling; Boolean differences; D-algorithm, branch and bound searching, partitioning and state assignment for sequential circuits, iterative networks, fault simulation, built-in self-test. P, 574a. (Identical with C SC 674)

678. Integrated Telecommunication Networks (3) I Analysis and design of integrated voice, data, and image networks for integrated telecommunication applications. Protocols for LANs, ISDNs, WANs, MANs and interoperable networks. ISO-based network software design for applications. P, 566, 673.


Engineering and Mines (ENGR)

Harshbarger Building, Room 134
(520) 621-6032; FAX: (520) 621-9995

Listed below are courses which are common to all degrees offered by the College of Engineering and Mines, and others that are available to all university students.

102. Introduction to Engineering (3) I II Engineering design, effective team participation and career preparation. Students are expected to participate in hands-on design projects, develop education/career plans and initiate development of the personal and management skills necessary for lifelong learning 2ED, CR, MATH 124 or 125a.

109. Technology and Society: An Historical Perspective (3) I (Identical with NEE 109)
English (ENGL)

Modern Languages Building,
Room 445
(520) 621-1836; FAX: (520) 621-7397


Assistant Professors Laura Barry, Meg Lota Brown, Daniel Cooper Alarcon, Naomi Miller, Alice M. Senob (Emeritus), Virginia Stein

Lecturers Christopher Carroll, Tom J. Collins (Emeritus), Ruth M.B. Gardner (Emerita)

The Department of English 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, fantasy, 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 department courses (Area D, below, requires 33 units of upper-division courses plus ENGL 255) divided into two groups of 18 units. The 18-unit "core" requires ENGL 370a, 370b, 427, 431a or 431b, 444 and one seminar (496). The other 18 units must be chosen from one of four concentrations: (A) British literature, (B) American literature, (C) literature and composition, and (D) language and literature. British concentrators (A) must take four courses in British literature (including one in British literature before 1800), one course in American literature, and one upper-division department elective. American concentrators (B) must take four courses in American literature and two upper-division department electives. Literature and composition concentrators (C) must take 306, 419a or 419b, one English language course (355, 405, 406, or 421), one applied rhetoric course (301, 401, 414, or 419a or 419b), a course in writing about literature (380 or another 496), and an upper-division department elective. Concentrators in language and literature (D) must take ENGL 255, 355, 405, 462, 406 or 421, and 3 units at the 300 or 400 level in language, literature, composition, or creative writing. Majors must also take as a prerequisite either HUM 250a or ENGL 251a (which may also be used in partial fulfillment of the general education requirement in Western Civilization). All majors are required to fill out a plan of study with the department's Director of Undergraduate Studies or an Associate Advisor in English. The major assumes general knowledge of mathematics. Students should complete MATH 117 or 122 or any higher-level mathematics course.

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: 33 units, including 209, 210, 370a-370b; 3 units from 261, 265, 267, 380; 3 units from 301,
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 Exposition for advanced students. P, 103H.
106. English Composition for ESL Students (3) I II Elements of expository prose 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 Critical papers on selected subjects for ESL students.* P, 107.

*NOTE: All entering international 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.
   b. Encounters in World Literature (1) I II [Rpt.?]

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)

250. Critical Themes in Western Literature and Culture (3) A critique of fundamental themes in the Western tradition, with attention to some other forms of both elite and popular culture and to some non-Western examples for comparison.


255. Introduction to the English Language (3) I Basic concepts in the study of the English language: history, semantics, phonology, morphology, syntax, and discourse. English in its social context: regional and social varieties, language acquisition, and English as an international language. Application of basic concepts to English literature, composition, and creative writing.

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.

267. Continental Literature (3) I II Great works of the western literary tradition with emphasis on style, theme and cultural context. Non-European works will occasionally be included for contrast.

270. Approaches to Literature (3) I II Examines literary works for aesthetic qualities, for understanding of the historical conditions which produced them, and for insights into our contemporary world. Emphasizes major authors, major works, genres, or themes.

277. Eroticism and Love in the Middle Ages (3) I II S (Identical with GER 277)

285. Introduction to Humanities Computing (3) S (Identical with GER 285)

290. Politics and the Novel (3) I II (Identical with POL 290)

295. Colloquium
   a. British Life and Culture (3) I II q. 10Q4 Creativity: A Class in Self Expression (3) I II S GRD (Identical with HUM 295Q)

300. Literature and Film (3) I II Comparative study of literature and cinema as aesthetic media.

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.
310. Studies in Literary Genre (3) [Rpt./1] I II The origin and evolution of the following literary genres: the novel, lyric poetry, science fiction and fantasy, the short story.
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.
346. African Literature in Translation (3) II 1994-95 (Identical with FREN 346)
350. Oral Tradition (3) I II A study of oral tradition, with an emphasis on American Indian myth, legend and lore. (Identical with AINS 350)
355. English Sociolinguistics (3) I II Examine variation in English form and use as it relates to interaction factors (such as age, gender, ethnicity, role and status) utilizing both quantitative and qualitative analytic approaches. Includes world Englishes and social and regional variation as represented in literature. P, 255 or introductory course in linguistics.
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 II S P, for students whose performance on the upper-division writing-proficiency examination is unsatisfactory.
b. Writing Workshop for International Students (1) [Rpt./3 units] I II S P, for international students whose performance on the upper-division writing-proficiency examination is unsatisfactory.
400. Themes in Literature and Film (3) [Rpt.] I II Special topics or themes in literature and film. P, 300.
401. Advanced Creative Nonfiction Writing (3) [Rpt./24 units] I II P, 301 or 306, and consent department before enrollment. Writing-Emphasis Course for creative writing majors.* May be convened with 501.
404. Advanced Fiction Writing (3) I II P, 304. Writing-Emphasis Course for creative writing majors.*
405. History of the English Language (3) I II The evolution of English sounds, inflections, and vocabulary from earliest times to the present, with attention to historical conditions. (Identical with GER 405) May be convened with 505.
406. Modern English Grammar (3) I II An 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 II Methodology for the teaching of English as a component of bilingual education. (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. Advanced Literary Analysis (3) I II What literature is and does, as expressed in theories of writing and in literary works.
418. Women and Literature (3) [Rpt./1] I II Analysis of selected writings by women, as well as representations of women in literature, with attention to social and intellectual contexts. (Identical with W S 418)
419a-419b. Non-fiction Prose (3-3) 419a: The essay in English. 419b: Other prose forms. P, 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.
424. Studies in Southwest Literature (3) I II (Identical with AINS 424) May be convened with 524.
425a-425b. Old English (3-3) 425a: Introduction to the language and literature. 425b: Beowulf. Study of the poem in the original language. P, 425a or equivalent. (Identical with GER 425a-425b) May be convened with 525a-525b.
426. Medieval English Literature (3) I II Survey of Old and Medieval English literature (exclusive of Chaucer), with some use of modernized or glossed versions. May be convened with 526.
427. Chaucer (3) I II The Canterbury Tales and other poems, read in Middle English. May be convened with 427.
429. Chinese-American Literature 1960 - Present (3) (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 tragicomedies from the period 1601-1613. 431a is not prerequisite to 431b.
432. Renaissance Drama (3) I 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 Metaphysicists; Milton.
443. Mexican-American Literature in English (3) I II Study of the literature, in English or English translation, by Mexican-American authors, or important to the development of Mexican-American literature. P, upper-division standing. May be convened with 543.
444. Milton (3) I II Survey of Milton’s English poetry, with emphasis on Paradise Lost.
445. Introduction to TESL: An Overview (2) I Development of the field 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 II Critical and historical study of major plays from Dryden to Sheridan (1660-1780).
448. The Theory and Practice of Writing (3) I II 1996-97 (Identical with FREN 448) May be convened with 548.
449a-449b. Folklore (3-3) 449a: Forms of verbal folklore; 449b: non-verbal folklore and
material culture (identical with AINS 449a-449b, ANTH 449a-449b and CCLS 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, Burney, and Austen. 458b: Scott, the Brontës, 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.

462. Linguistics and the Study of Literature (3) Linguistic methods in the analysis of literature and implications of literary language for linguistic theory; detailed consideration of prosody, metaphor, narrative technique and irony. (Identical with CCLS 462 and LING 462) May be convened with 562.

465. Victorian Literature (3) I Major poetry, nonfictional prose, and fiction.

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, 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 Drama (3) I II Development of modern drama from 1875 to the present.

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, Frenau, Crevecour, 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.

486. Topics in American Literature (3) I Rpt./1 I II A consideration of important authors, works, and themes in American literature.

487. Colonial and Post-colonial Literature (3-3) I II The autobiographical or fictional representation of personal lives and political-economic issues in one or more of the former colonial and/or post-colonial territories of the British empire.

488a-488b. American Poetry (3-3) I II To 1900. 488b: Modernism.


495. Colloquium I I Honors for Juniors (3) II Honors for Seniors (3) I II

496. Seminar I I Studies in Authors, Periods, Genres and Themes (3) I I Rpt./1 I II NOTE: Seminars serve as writing-emphasis courses for literature majors.

Note: Seminars serve as writing-emphasis courses for literature majors.*

*Writing-Emphasis Courses. P, Satisfaction of the upper-son writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

501. Advanced Creative Nonfiction Writing (3) I II For a description of course topics, see 401. Graduate-level requirements include an extra paper. For M.F.A. candidates working on personal essays, or consult department before enrolling. May be convened with 401.

502. Professionalizing Presentation Skills (1) I I (Identical with BIOC 502)

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 I S II For a description of course topics, see 406. Graduate-level requirements include an in-depth outside paper. P, LING 500. May be convened with 406.

508. English as a Second Language in Bilin-gual Education (3) I I 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, 405/505, 406/506. May be convened with 412.

513. Poetry in Forms (3) I Rpt./1 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.

515. History of Criticism and Theory (3) I Rpt./1 I II A systematic introduction to the history of criticism and/or modern and contemporary critical 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.

518a-518b. Psychoanalytic Literary Theory (3-3) 518a: Introduction to Psychoanalytic Theory. 518b: Psychoanalysis and Literature. P, consult department before enrolling. 518a is not prerequisite to 518b.

520. The History of the German Language (3) I II 1995-96 (Identical with GER 520)

521. American English (3) I 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.

525a-525b. Old English (3-3) I II For a description of course topics, see 425a-425b. Graduate-level requirements include an in-depth paper. (Identical with GER 525a-525b) May be convened with 425a-425b.

526. Medieval English Literature (3) I II For a description of course topics, see 426. Graduate-level requirements include an in-depth paper. May be convened with 426.

527. Chaucer (3) I II For a description of course topics, see 427. Graduate-level requirements include an in-depth paper. May be convened with 427.

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) I Rpt./1 I

534. Advanced Studies in Milton (3) I

541. Studies in the Restoration and Eighteentht Century (3) I Rpt./1 II

543. Mexican-American Literature in English (3) I Rpt./1 II For a description of course topics, see 443. Graduate-level requirements include an extra paper and leading a class discussion. May be convened with 443.

545. Introduction to TESL: An Overview (2) I For a description of course topics, see 445.
Graduate-level requirements include an in-depth paper. May be convened with 445.

548. Theory and Practice of Writing (3) II 1996-97 (Identical with FREN 548) May be convened with 445.

549a-549b. Folklore (3-3) For a description of course topics, see 449a-449b. Graduate-level requirements include an in-depth paper. (Identical with AINS 549a-549b, ANTH 549a-549b and CCLS 549a-549b) May be convened with 449a-449b.

550. Contemporary Theories of Cultural Studies (3) (Identical with CCLS 550)

554. Feminist Theories (3) II (Identical with W S 554)


562. Linguistics and the Study of Literature (3) For a description of course topics, see 462. Graduate-level requirements include a greater number of assignments and a higher level of performance. (Identical with CCLS 562 and LING 562) May be convened with 462.

565. Studies in American Literature to 1900 (3) [Rpt./3] I Reading course in American literature before 1900.


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) May be convened with 477.

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 (1-6) 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. British Literature (3) [Rpt./8] I II
b. Studies in Colonial and Post-colonial Literature and Theory (3) [Rpt./3] II
f. American Literature (3) [Rpt./8] I II
g. Comparative Literature (3) [Rpt./4] I II (Identical with CCLS 596g)
h. Modern Literature (3) [Rpt./24 units] I II Open to creative writing majors only.
i. Germanic Linguistics (3) [Rpt./4] I II P, 506
j. 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 AINS 596m)

n. Discourse Analysis (3) [Rpt./3] I
o. Topics in Second Language Teaching (3) [Rpt./9 units] II P, 613 or equivalent. May be repeated only when topic changes.
p. Contrastive Rhetoric (3) [Rpt./2] I II P, graduate standing
q. Women's Studies (3) [Rpt./2] I II (Identical with W S 599w)

597. Workshop
a. Southern Arizona Writing Project (3-9) [Rpt./12 units] I II S (Identical with LRC 597a)
b. The Teaching of English (3) I II S [Rpt./3] (Identical with LRC 597o)
c. Research and Composition (3) II

604. Writing Project in Fiction (1-6) [Rpt./24 units] I II For M.F.A. candidates working toward book-length writing project in fiction.

609. Writing Project in Poetry (1-6) [Rpt./24 units] I II For M.F.A. candidates working toward book-length writing project in poetry.


613. Methods of Teaching English to Speakers of Other Languages (3) I Foundations, theory, and methodology in English as a second language. (Identical with LRC 613)


615. Second Language Acquisition Theory (3) I Survey of major perspectives on second language acquisition processes, including interlanguage theory, the Monitor Model, acculturation/ pidginization theory, cognitive/ connectionist theory, and linguistic universals. Analysis of research from the different perspectives includes consideration of grammatical, pragmatic, and sociolinguistic dimensions of language learning. P, 506 and 613.


693. Internship

696. Seminar
a. Linguistics (2 to 4) I II (Identical with GER 696b)
b. History of Rhetoric (3) [Rpt./6] I II
c. Studies in Rhetoric and Composition (3) [Rpt./6] I II S

Entomology (ENTO)

Forbes Building, Room 410
(520) 621-1151; FAX: (520) 621-1150

Professors Henry H. Hagedorn, Head, Elizabeth A. Bernays, William S. Bowerson, Reginald F. Chapman (Neurobiology), George W. Cupp (Veterinary Science), René Feyereisen, John G. Hildebrand (Neurobiology), Roger T. Huber, Leon Moore (Emeritus), José M.C. Ribeiro, Nicholas J. Strausfeld (Neurobiology), Donald M. Tuttle (Emeritus), George W. Ware (Emeritus), Theo F. Watson

Associate Professors Nancy A. Moran (Ecology and Evolutionary Biology), Robert L. Smith, Diana E. Wheeler (Ecology and Evolutionary Biology), Martin F. Taylor

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 407, 408, 411, 415, 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.

151R. Insects and Society (3) I Introduction to the biology, ecology, and management of insects affecting man and his interests. Intended for non-majors. Olson

151L. Insects and Society Laboratory (1) I Provides hands-on experience with arthropods introduced in 151R, including basic disciplines and practical applications in urban, medical and agricultural entomology. Collection, field trips. Olson


195. Colloquium
a. Exploring Biology (1) Hagedorn, Feyereisen
b. Agriculture as a Science (1) II (Identical with PLS 195b) Feyereisen

English—Entomology 205
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202. Applied Entomology (3) [Rpt./I] 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: Focus on Pesticides (3) [I] (Identical with AGTM 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.

405. Aquatic Entomology (3) [I] 1996-97 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

407L. Insect Physiology Laboratory (1) [I] 1996-97 Modern methods of physiological experimentation. P, 201; CR, 407L; biochemistry recommended. May be convened with 507R. Chapman/Hagedorn

407R. Insect Physiology (3) [I] 1996-97 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. Chapman/Hagedorn

408. Insect Toxicology (3) [I] 1995-96 Interaction to the interactions of insects with natural and synthetic toxins; 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. Feyereisen

411. Insect Behavior (3) [I] 1995-96 The evolution of arthropod behavior in ecological context. Ultimate causation with some consideration of phylogenetic and morphological constructs. 2R, 3L, Field trips. (Identical with ECOL 411) May be convened with 511. Smith/Papaj


415R. Insect Biology (3) [I] I Insects and other land arthropods, their functional anatomy, perception of the environment, relationships to other animals and plants. Insect classification and taxonomy to order and major families. P, ECOL 182. (Identical with ECOL 415R) May be convened with 515R. Chapman

415L. Insect Biology Laboratory (1) [I] Survey of insect diversity through identification, classification, morphology and anatomy. P, ECOL 182. (Identical with ECOL 415L) May be convened with 515L. Wheeler


Practice in identification of adult and immature insects, especially those from Arizona 3R, 3L. Field trips. May be convened with 516. Maddison

427. Insect Chemical Ecology (4) [I] 1995-96 The chemistry of relationships regulating insect growth, development, reproduction, dispausation and communication. Derivation of biocidal methods of insect control. Laboratory includes experience with modern instrumentation focused on the isolation, identification and biological assay of natural products. 3R, 3L, P, 201, 507 or equivalent, and 3 units of organic or biochemistry. (Identical with V SC 427) May be convened with 527. Bowers

433. Teaching Biology Labs (2) [I] (Identical with BIOC 433) May be convened with 533.

444. Insect Ecology (3) [I] 1996-97 The study of how variation in the environment, interactions with other species and the special features of insect "design," 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) [Rpt./I] 1995-96 Survey of arthropods of public health and veterinary importance, with emphasis on transmission dynamics of pathogenic, biomicros 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

455. Professional Skills (2) [I] 1996-97 Development of oral, visual and written communication skills. Includes writing scientific papers and grants, giving talks and developing posters, as well as discussion of scientific ethics with emphasis on problems that affect every scientist. (Identical with ECOL 455) May be convened with 555.


468. Insect Pest Management (3) [I] 1996-97 Principles underlying the management of arthropods in agricultural systems. P, 201R. May be convened with 568. Watson

470. Biological Control (3) [I] 1995-96 Principles of the biological control of arthropod pests and weeds, emphasizing their application to agricultural and rangeland entomology. P, 444 and 468. May be convened with 570. Watson

496. Seminar a. Entomology (1) [Rpt./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./I] II May be convened with 596c.
   d. Plant-Insect Interactions (1) [Rpt./I] II (Identical with PL 596d. May be convened with 596d.
   e. Insect Physiology, Biochemistry, Toxicology (1) [Rpt./I] II May be convened with 596e.
   f. Topics in Pest Management (1) [Rpt./I] II May be convened with 596f.

499. Seminar

502. Agriculture and the Environment: Focus on Pesticides (3) [I] (Identical with AGTM 502) May be convened with 402. Huber

503R. Biology of Animal Parasites (3) [I] (Identical with V SC 503R) May be convened with 403R.

503L. Parasitology Laboratory (1) [I] (Identical with V SC 503L) May be convened with 403L.

505. Aquatic Entomology (3) [I] 1996-97 For a description of course topics, see 405. Graduate-level requirements include an original research or review paper on some aspect of aquatic entomology agreed upon by the student and the professor. Field trips. P, ECOL 182. (Identical with ECOL 505, INSC 505 and WFSC 505) May be convened with 405. Smith

507R. Insect Physiology (3) [I] 1996-97 For a description of course topics, see 407R. Graduate-level requirements include written literature review. P, 201; biochemistry recommended. 507L is not required for 507R. (Identical with INSC 507R) May be convened with 407R. Chapman/Hagedorn

507L. Insect Physiology Laboratory (1) [I] 1996-97 For a description of course topics, see 407L. Graduate-level requirements include helping to develop a laboratory. P, 201; biochemistry recommended. 507L is not required for 507R. (Identical with INSC 507L) May be convened with 407L. Chapman/Hagedorn

508. Insecticide Toxicology (3) [I] 1995-96 For a description of course topics, see 408. Graduate-level requirements include additional in-depth material. P, 3 units of organic chemistry or biochemistry. (Identical with INSC 508 and TOX 508) May be convened with 408. Feyereisen

511. Insect Behavior (3) [I] 1995-96 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 and INSC 511) May be convened with 411. Smith/Papaj

514. Bee Biology and Pollination (2) [I] 1996-97 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

515R. Insect Biology (3) [I] For a description of course topics, see 415R. Graduate-level requirements include submission of reports on landmark papers in insect biology. P, ECOL 182. (Identical with ECOL 515R and INSC 515R) May be convened with 415R. Chapman

515L. Insect Biology Laboratory (1) [I] For a description of course topics, see 415L. Graduate-level requirements include making a larger insect collection. P, ECOL 182. (Identical with ECOL 515L and INSC 515L) May be convened with 415L. Wheeler

516. Insect Systematics (4) [I] 1995-96 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. (Identical
Environmental Science

Shantz Building, Room 429
(520) 621-1646; FAX: (520) 621-1647

The under-graduate major is interdisciplinary and leads to the Bachelor of Science degree 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, 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 sciences 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.

The Department of Soil and Water Science for a listing of course requirements for the B.S. degree in Environmental Science.

Epidemiology (EPI)

AHSC, Rm. 2332
(520) 626-6379; FAX: (520) 626-6970

Graduate Interdisciplinary Program in Epidemiology

Executive Council:
Professors, M.D. Lebowitz, Chair (Internal Medicine), E. Petersen (Medicine)
Associate Professor Larry C. Clark (Family and Community Medicine)
Assistant Professor D.J. Roe (Family and Community Medicine)
Research Associate Professor D.L. Sherrill (Medicine).
Research Assistant Professor R. Harris (Family and Community Medicine).
Assistant Research Social Scientist A. Estrada (Mexican American Studies).

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 researcher’s 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)

596. Seminar

a. Basic Principles of Epidemiology (3) [Rpt./1] (Identical with PHL 596a)
b. Epidemiologic Methods (3) II

c. Psychosocial Epidemiology (2)

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 rise of disease. 2R, 1L, P, 596a, 596b.

660. Infectious Disease Epidemiology (3) [Rpt./1] II 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 disease causation. P, 596a, 596b. (Identical with ENTO 660, PHL 660, and V SC 660)

670. Chronic Disease Epidemiology (3-4) II Nutritional epidemiology, pharmacoepidemiology, occupational epidemiology and environmental epidemiology. P, 596a, 596b.

680. Respiratory and Environmental Epidemiology (3) I Epidemiological methods and...
The school is organized into two divisions, Family Studies and Retailing and Consumer Studies.

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

Graduate degree programs offered by the School of Family and Consumer Resources include the Master of Science with a major in family and consumer resources or home economics education; the Master of Education with a major in family and consumer resources; and the Master of Home Economics Education with a major in home economics education. For the Master of Science degree with a major in family and consumer resources, concentrations are available in family studies; consumer studies; retailing; 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; retailing; 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 completes two subject areas (21 units each) from within FCR. The student completes a third subject area outside of FCR. All applications must be submitted to an advisor for approval.

Epidemiology—Family and Consumer Resources

The School of Family and Consumer Resources provides instruction, 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.

Research in respiratory diseases and environmentally related diseases, with emphasis on adult and childhood chronic lung diseases, effects of air pollution and occupational exposures. P 596a, 596b, STAT 509.

696. Seminar.

1. Epidemiology (3) I II [Rpt./8 units]

696. Seminar

a. Basic Principles of Epidemiology (3) [Rpt./1]
b. Epidemiologic Methods (3) II
z. Psychosocial Epidemiology (2)

*Available as both 596 and 896

Exercise and Sport Sciences (See Health-Related Professions)

Family and Consumer Resources (FCR/RCS/FS/HE E)

FCR Building, Room 205
(520) 621-1075; FAX: (520) 621-9445

Professors Rodney M. Cate, Director, Victor A. Christopherson (Emeritus), Oscar C. Christensen (Emeritus), Roger J. Daldrup (Emeritus), Kathryn L. Hatch, James R. Hine (Adjunct), Jean Ruley Kearns (Emerita), Amy Jean Knorr (Emerita), Doris E. Manning (Emerita), Shirley O'Brien (Adjunct), Naomi A. Reich (Emerita), Robert R. Rice, Carl A. Ridley, David C. Rowe

Associate Professors Wendy Gamble, Kenneth C. Gehrt, Ellen Goldsberry, SWRC Director, Donna R. Iams, Maureen E. Kelly, Roger M. Kramer, Philip J. Lauver (Emeritus), Mary H. Marion (Emerita), Betty J. Newlon (Emerita), Scyoon Shim, Angela Taylor, Mari S. Wilhelm

Assistant Professors Donna H. Christensen, Mary Ann Eastlick, Susan B. Silverberg

Extension Specialists Sherry L. Betts, Lawrence M. Sullivan, Shirley Jo Taylor, Frank R. Williams

Adjunct Professor Shirley O'Brien

Adjunct Instructor Ruth Ann Fowler

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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 completes two subject areas (21 units each) from within FCR. The student completes a third subject area outside of FCR. All applications must be submitted to an FCR committee for approval.

120. Microcomputing Applications (3) I II (Identical with ABE 120)

195. Colloquium

a. Individual Development and Academic Success (1) I

197. Workshop

a. The Science of Human Development (1) S Field trip. Open to participants in the Horizons Unlimited Summer Program.

297. Workshop

a. Self and the World of Work (1) I II
b. Student Executive Training in Higher Education (2) II
c. Student Assistant in College Residence Halls (1) I

Division of Retailing and Consumer Studies

S. Shim, Chair

The major in retailing and consumer studies (RCS) focuses on business theory and practices of providing consumer products and services through retail channels with an emphasis on meeting consumer interests and needs. The major is offered for the Bachelor of Science in Family and Consumer Resources degree.

Students in the retailing and consumer studies major study the whole spectrum of the industry including retailing of fashion soft goods, food and other consumer goods and services. Three supplemental, specialized certificate programs are available in food retailing, international retailing and visual merchandising.

Coursework for the major, 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 civilization.

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 retailing and consumer studies to establish eligibility for the upper-division level courses in the major. Also important is to note the advanced standing requirements (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 coursework that might be applicable to the upper-division professional core or major requirements taken while enrolled in other colleges or at other universities is subject to acceptance by the School of Family and Consumer Resources for degree certification purposes.
For additional information about the certificate programs, and for specific requirements, consult the Division of Retailing and Consumer Studies.

114. Introduction to Retailing (3) II Introduction to processes used for distributing consumer goods from manufacturers through wholesale and retail channels.

115. Fundamentals of Design (3) I Theory and exploration of design elements and principles; contemporary trends. Open to FCR majors only or consult department before enrolling.

214. Introduction to Consumer Affairs (3) II Overview of the problems and issues facing consumers and roles of consumer affairs professionals.

284. Textile Science (3) I II Survey of the chemical and physical properties used in manufacturing soft goods. Emphasis on end use applications and product specifications.

285. Product Development (3) II Analysis of international consumption patterns and retailing system in the specific geographic region.

310. Consumer Economics (3) II (Identical with AREC 310)

315. Retail Advertising and Promotion (3) II Activities used to influence sale of merchandise and services to promote trends and ideas; promotional plans including advertising, visual display, special events and publicity.

320. Food Retailing Principles (3) II Study of food retailing principles and merchandising techniques unique to food retail establishments; inventory planning and control, buying, pricing, operation, human resources; current global issues affecting the food industry including production agriculture, manufacturing and wholesale distribution; strategic management and food consumption behavior.

335. Hard Goods Evaluation (3) II Study of the hard goods industry including terminology, characteristics, patterns of product and distribution, analysis techniques.

346. International Consumption and Retailing (3) II Analysis of international consumption patterns and retailing system in the global market; culture and politics of global consumer market; importing and exporting systems and procedures of retailing consumer goods.

354. Software Evaluation (3) Understanding price, quality, design and other attributes of software goods and their relationship to product development, specification and buying practices used by retail firms.

376. Consumer and the Market (3) II The buyer-seller relationship, with emphasis on consumer problems, the consumer movement, and business and consumer rights and responsibilities.

384. Professional Development (3) III Preparation for internship programs and careers; topics include development of roles, responsibilities and standards for business and industry personnel; job search methods and skills.

388. Design for Living (3) S Elements and principles of interior design; history of planning for space, personal lifestyle, and budget; lighting, color, materials, and furnishings.

400. Retail Management (3) III Management and planning of merchandising and personnel for various types of retail organizations; topics include: merchandising planning and buying, inventory control, pricing, human resources and customer service.

411. Consumer Issues in Marketing (3) S (Identical with HE 411 and N SC 411)

434. Strategic Retail Management (3) II Application of retail planning and control procedures with emphasis on development and evaluation of retail practices and strategies using the case method.

456. Store Planning and Design (3) II 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.

493. Internship

496a. Seminar

534. Strategic Retail Management (3) II For a description of course topics, see 434. Graduate-level requirements include an in-depth research paper or project.

540. Consumer Concepts and Theory (3) I Decision-making processes as related to business environment.

545. Visual Merchandising and Display (3) S All aspects of displaying merchandise, including window display, interior display, color and lighting techniques, line and composition, three-dimensional presentation, fixtures and systems, planning and layout.

546. Store Planning and Design (3) II Study of the retail environment, the physical and psychological effects that initiate and motivate customer activity.

493. Internship

b. Retailing and Consumer Studies (6-12) [Rpt. /12 units] Open to retailing and consumer studies majors only.

496a. Seminar

a. Topics in Retailing and Consumer Resources (1-3) [Rpt. /9 units]

* Writing-Emphasis Course. P, Satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines of this catalog).

507. Research Methods in Retailing and Consumer Studies (3) II Research literature, methods, techniques, and procedures for conducting research, and analysis and interpretation of data.

534. Strategic Retail Management (3) II For a description of course topics, see 434. Graduate-level requirements include an in-depth research paper or project.

540. Consumer Concepts and Theory (3) I For a description of course topics, see 434. Graduate-level requirements include an in-depth research paper or project.

555. Visual Merchandising and Display (3) S For a description of course topics, see 455. Graduate-level requirements include an in-depth research paper or project.
606. Advanced International Consumption and Retailing (3) 1 1996-97 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] 1995-96 Analysis of current major topics or issues facing merchandising and retailing industries. P, 540, 606.

608. Topics in Consumer Issues and Psychology (3) 1 1995-96 Exploration of new topics, critical examination of current literature and selectively distributed research reports and analysis of studies in consumer issues and psychology. P, graduate statistics and/or research methods.

634. Retail Merchandising Analysis (3) 1 1995-96 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

C. Ridley, 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 and applied knowledge concerned with human development and family relations throughout the life span. Students may elect courses in consultation with faculty members to reflect an emphasis in human development, interpersonal relations, or family life education. The major in home economics education leads to certification for teaching life management in public schools. Majors must not be allowed to register for 300- or 400-level home economics education 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; Approved Course List, 3 units (HEE 428, Family Life Education only); MATH 117R/S; MIS 111. All majors must satisfy a common set of core courses: FS 117, 137, 223, 337; upper-division FS course (not included in concentration); PSYC 230 and 290 or SOC 274 and 275. In addition to the required core, the student must complete specific courses required of each concentration:

- human development: FS 357, 377, 407, 413, 447, 457; NS FS 101; ANTH 310; PSYC 313 or 314; interpersonal relations: FS 316 or 357 or 413; 427 or 423; 423 or 457, 487; FS 466; COMMIT 100; 104 and 417, SOC 321; PSYC 300; ANTH 200 or 403 or 419; JPN 402; 15-18 units should be chosen from the following areas: anthropology, family studies, counseling, and guidance, family and consumer resources, psychology, management and policy (MAP 426, PA 457), sociology, and finance; family life education concentration: HE E 288, 338g, 408, 493; FS 347, 357, 377, 413; HLTH 330; PHIL 113; PA 206 OR 221; ANTH 310, 420; or MAP 330.

The division offers the minor in family studies. Students complete FS 117, 137 and 223. In consultation with an advisor, students take 11-12 additional units of 300 and 400 level courses that meet their needs and objectives.

The major in home economics education: Majors must have a minimum grade-point average of 2.5, on the most recently completed 56 units, pass the College of Education designated admission test, and 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; HE E 428, plus 3 additional communications units; MATH 117R/S; 3 units of computer skills from an approved list. Major requirements include: ED P 310; EDUC 350; LRC 435; HE E 288, 338g, 408, 409, 489; FS 117, 137, 223, 337, 347, 357, 377 or ED P 402; RCS 114, 284; ID 388, 365; SER elective, and N FS 101.

Family Studies (FS)

117. Human Development and Relations (3) I III 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 1995-96 Study of the impact of normative and non-normative family life transitions on individuals and families, and 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.


377. Adolescence (3) I Growth, development and socialization of the child from the middle school years through adolescence. P, 117, PSYC 101.

401. Basic Skills in Counseling (3) S Selected counseling skills and their applications to noncounseling settings. Designed for non-majors needing basic skills in counseling as an adjunct to other primary occupational functions. P, 6 units of social science.

403. Advanced Adolescent Development (3) II (Identical with ED P 403) May be convened with 503.

405. Principles of Adlerian Psychology (3) S Techniques for the study of human behavior; implications for improving adult-child relationships, with emphasis on Adlerian principles. P, 6 units of social science.

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 CERO 413).

421. Techniques of Interviewing (3) I II S Types and functions, process, and application of the interview in various settings. P, 6 units of social science.

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.*
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 447. Writing-Emphasis Course.

457. **Bio-Social Determinants of Socialization (3)** II Bio-social factors, including genetic influences, related to human development, socialization, and cross-cultural patterns of behavior. P, 223; 6 units of child dev. or SOC or 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, 6 units of PSYC. 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.

*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).

500. **Life Span Development (3) II** (Identical with ED P 500).

503. **Advanced Adolescent Development (3) II** (Identical with ED P 503) May be convened with 403.

505. **Principles of Adlerian Psychology (3)** I For a description of course topics, see 403. Graduate-level requirements include an additional research paper dealing with a theoretical aspect of Adlerian psychology.

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.

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.

546. **Foundations of Family and Interpersonal Theory (3)** I Analysis of theories relevant to family behavior including formation, development and internal processes. Course will focus on developing knowledge of world views, assumptions, themes, concepts, and interrelationships of the theories. P, 6 units in family studies, psychology or sociology.

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.

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.

555. **Addictions Counseling (3)** S An analysis of issues in addictions counseling ranging from various theoretical positions, information regarding diagnosis of addictive personality, treatment, and research P, 6 units of counseling or related area.

557. **Methods in Marital Therapy (3)** I Theorizing, principles of counseling for premarital, marital, and group counseling situations.

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, 601b. 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.

570. **Counseling the Adult (3)** I Adult crisis, midlife changes and developmental patterns; counseling techniques and intervention strategies. P, 6 units of counseling or related area.

571. **Counseling Women (3)** I Examination of the counseling needs of contemporary women and current types of intervention designed to meet these needs. P, 6 units of counseling or related area. (Identical with W S 571)

573. **Application of Family and Interpersonal Theory (3)** II Identification of current issues in family and interpersonal relationships and the application of selected theories and research to the analysis of the issues. P, 6 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 extra required readings and an in-depth term paper. P, 601, or SOC 321. 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, 601, or SOC 321. May be convened with 487.

589. **Workshop**

d. Counseling Children and Adolescents
   (3) S
   f. Professional Relationships: Building Cooperation and Mediating Conflict
   (3) S
   g. Anger, Depression and Guilt (3) S P, 6 units of counseling or related area.
   h. Psychodrama
   (3) S P, 6 units of counseling or related area.
   i. Counseling Mexican Americans (3) S (Identical with SER 597m)

601. **Foundations of Counseling (3)** I Relational 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.

607. **Topics in Family Studies (1 to 3) [Rpt./3]** I II Variable content: cognitive development, biological theories of development, role theory, middle childhood, and others.

613. **Family Issues in Aging (3)** II 1996-97 Critical analysis of selected family and social issues, and related current research in gerontology. (Identical with GERO 613)

622. **Appraisal of the Individual (3)** I Methods of appraising and reporting individual behavior, with emphasis on nonpsychometric data.

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)** II Theories of vocational development; types, sources, and use of occupational and educational information in career counseling and decision making. P, 601 or CR.

636. **Economics of Aging (3)** I Analysis of economic issues and policies as they affect the aging individual, family and society. (Identical with GERO 636)

637. **Trends in Human Relations (3)** I Philanthropy, content, and resources for understanding, teaching and working in the field of human relations.

644. **The Counseling Process (3)** I Introduction to theories of counseling; collation and interpretation of counseling data; the counseling process; study of cases. P, 601, 622.

645. **Theories of Counseling (3)** I 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)** I 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. P, 601, 622.

683. **Group Counseling (3)** I Theory and process in group counseling; applications in community and mental health settings; lab. experience. P, 644.

696. **Seminar**

e. Ethics and Professional Practice (3) I P, 601, 622, 644.

r. Issues in Counseling Research (3) I P, 601, 622, and 623 or 631.

**Home Economics Education (HE E)**

288. **Observation/Participation in Home Economics and Family Life Education (3)** II 1994-95 Functions and characteristics of home economics and family life educators in school- and community-based programs; structuring learning settings to meet student/client needs. 2R, 3L.
386g. Teaching Home Economics (4) I (Identical with TTE 386g) 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 NCS 411)

428. Professional Presentations and Techniques (3) I II Theory and practice of educational techniques in non-formal settings in positions in business, government and human services. 2R, 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 Life Management (12) II Teaching vocational home economics under supervision in approved programs in secondary schools in Arizona. Preregistration first semester of the junior year. P, 228, 338g; CR, 408, 428. Only pass/fail grade available.

493. Internship  
e. Family Life Education (1 to 8) [Rpt./2] II Open to family life education majors only.

509. Occupational and Family Life Home Economics Programs (3) I 1995-96 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 II 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)  
g. Computer Application in Agricultural and Non-formal Education (1) [Rpt./3] I II (Identical with A ED 597g)  
h. Family Development through Home Economic Programs (1-2)  
  i. Environmental Education in Agriculture (1) [Rpt./3] I II (Identical with A ED 597n)  
  t. Developments in Non-formal Education (1) [Rpt./3] I II (Identical with A ED 597t)

607. Topics in Home Economics Education (1-3) [Rpt./12 units] II S Philosophy, content, and resources for understanding, teaching, and working in home economics education.

610. Investigation and Studies in Home Economics (3) I Study and analysis of research literature, methods, techniques, and procedures for conducting investigations, selecting and developing plans for research problems.

Finance (FIN)

McClelland Hall, Room 315R (520) 621-7554; FAX: (520) 621-1261

Professors Edward A. Dyl, Head, Willard T. Carleton, Nestor R. Roos

Associate Professors Erich K. Bleck (Emeritus), Joseph S. Gerber (Emeritus) Chris Lamournex, Michael Weisbach Assistant Professors Allen B. Atkins, Robin J. Brenner, Corinne M. Bronfman, Simon K. Kwan, Joel S. Sternberg, Jose Suay

Lecturers L. Paige Fields, Thomas C. Moses

 Majors in finance are prepared for corporate financial management, investment portfolio management, brokerage, and investment and commercial banking.

Undergraduate majors in finance are offered through the Bachelor of Science in Business Administration (see the College of Business and Public Administration section of the catalog). Nonbusiness students interested in a minor in one of these areas should contact the department head for information. A Master of Science with a major in finance is available, and the department participates in the Master of Business Administration and the Doctor of Philosophy degrees with a major in business administration.

311.* Corporation Finance (3) I II Financial problems involved in the organization and conduct of business enterprise. P, ACCT 210, ECON 200 or 201b.

313.* Economics of Futures Markets (3) I II (Identical with AREC 313)


421.* Investments (3) I II Operation and analysis of the stock, bond, and commodity markets; theory and practice in construction and management of investment alternatives. P, 311.

431.* Financial Intermediaries (3) I II Financial markets and institutions; effects of economic conditions and government policy on financial institutions, the flow of funds, and interest rates; term structure of interest rates; financial institution management. P, 311, ECON 330.

444.* International Financial Management (3) II (Identical with ECON 444)


484.* Development of New Venture Plans (4) I 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 II 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) I 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) I II (Identical with PA 528)


537. Finance for New Ventures (3) I Value maximization; simulation of value distribution; sources of venture capital; timing of initial public offering; new venture ownership structuring. Open only to students in the entrepreneurship program. P, 511, MKTG 500. (Identical with MAP 537)

539. Planning of New Ventures (3) I II (Identical with MAP 539)
Lecturers Gerard Agnierey, John L. Gesell, Jean Goetinck, Annamaria Kelly (Emerita)

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 and Italian. Study abroad options include programs in Florence and in Paris.

Undergraduate majors in French or Italian attain a knowledge of the language and the culture that can prepare them to teach at the secondary level, 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 (concentrations in language and literature or in Italian studies); 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, Africa — the Maghreb, Sub-Saharan and the Caribbean). A second option at the M.A. level is the program in language and pedagogy, which adds a strong pedagogy component to existing language and literature studies. 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, Italian or English), the requirement will be satisfied through completion of at least one 3-unit course designated as a Writing-Emphasis Course within the department (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). Consult an undergraduate advisor.

The department participates in the honors program and offers honors sections of selected courses. Inquire with the departmental honors advisor.

French (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 coursework. 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 350, 370a-370b, 375a-375b, 401, 416, 430b. No fewer than 24 units must be from upper-division coursework. 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. 20 units above 102, at least 9 of which must be upper division.

Unless otherwise specified, in a course sequence a-b, a is 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.

103. Elementary French III (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.

104. 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.)
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: 213 "Intensive" covers the same materials as 212 "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.

284. French Theater in Translation (3) Representative masterpieces of French theater from its origins in the Middle Ages to the contemporary. Includes medieval religious and profane pieces, classical theater of 16th and 17th centuries, etc. Taught in English. Does not count toward fulfillment of language requirement or the major or minor in French.

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.

346. African Literature in Translation (3) II 1995-96 Introduction to Francophone African literature coming from the Western part of the African continent, which forms a geographical and cultural entity. Taught in English. French majors will read French texts in the original and will write assignments in French. (Identical with AAS 346 and ENGL 346)

349. Images of Africa (3) I 1996-97 Introduction to African life and culture through explorations in the following areas: history, geography, institutions, the arts, and language and literature. Taught in English. (Identical with AAS 349)


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 supplement is taken at the final exam and if a grade of B or better is obtained.

370a-370b. Business French (3-3) The basic workings of the French economy and the essential vocabulary and style specific to French business. P. 305b. 370a is prerequisite to 370b.


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 Seminar (3)

401. French Literature of the 19th and 20th Centuries (3) Survey of French literature of the period with focus on mainstream literary genres and intellectual currents since Romanticism. P. 350.

402. French Literature of the 17th and 18th Centuries (3) I 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) I (Identical with TIE 414)


416. Translation (3) II Theory and practice of translation (French/English; English/French). Literary and technical. P. 375b or 370b.

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.

448. The Theory and Practice of Writing (3) I 1996-97 An experiment in writing, concerning the means, the raw material at our disposal, and the different literary devices that allow us to achieve it. French students will write in French and English students will write in English. (Identical with ENGL 448) May be conceded with 548.


455. Introduction to Romance Philology (3) I 1996-97 (Identical with SPAN 455)

470. Advanced Grammar and Usage (3) II Structural analysis of spoken and written French, with emphasis on structural patterns and attention to contrasts with English. P. 305b.


510. Introduction to Graduate Study in French Language and Literature (3) I 1995-96 Preparation and method 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. Taught in English.

511. Topics in Literary History, Criticism, and Theory (3) [Rpt./3] II 1995-96 Current, recent, and traditional ways of analyzing and interpreting literary texts and the cultural contents in which they are produced, with emphasis on French, and attention to understanding various means by which knowledge of literary issues is transmitted to others. May be repeated when topics vary.


516. Literature of the 16th Century (3) [Rpt.] Studies in the French Renaissance, including theater, fiction, poetry, essay: Analysis of the main literary, artistic, and socio-cultural movements in France during the 16th century-the French Renaissance. P. graduate standing.

517. Literature of the 17th Century (3) [Rpt.] Main literary movements in France during the 17th century. Theater, poetry, novel, philosophical thought. Cultural context: architecture, painting, religious currents, philosophy. P. graduate standing.

518. Literature of the 18th Century (3) [Rpt.] Studies in the French Enlightenment, including theater; fiction; poetry; essays: Analysis of the main literary, artistic, and socio-cultural movements in France and in Europe during the 18th century-the French Enlightenment. P. graduate standing.

519. Literature of the 19th Century (3) [Rpt.] Examines various aspects of literary works ranging from poetry, the theater, the novel and critical essays. Studies in French Romanticism and Realism. P. graduate standing.

520. Literature of the 20th Century (3) [Rpt.] Studies in contemporary French literature, including theater, fiction, poetry, essays. Analysis of the main literary, artistic, and socio-cultural movements in France and Europe during the 20th century-the French Enlightenment. P. graduate standing.

548. Theory and Practice of Writing (3) I 1996-97 For description of course topics, see 448. Graduate-level requirements include more the-
theoretical reading and assignments. (Identical with ENGL 548) May beconvened with 448)

550. French Literature of Black Africa and the Caribbean (3) II 1996 -97 For a description of course topics, see 450. Graduate-level requirements include more demanding readings and other assignments. May be convened with 450.

552. French Literature of Quebec (3) I 1995-96 For a description of course topics, see 452. Graduate-level requirements include more demanding readings and assignments. May be convened with 452.

553. Culture and Civilization of North Africa (3) I II 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) II 1995-96 For a description of course topics, see 454. Graduate-level requirements include more demanding readings and other assignments. May be convened with 454.

579. Problems in Teaching College French (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 Language and Literature (3) [Rpt./J] I II *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 201-202 and completion of courses for one of the following options:

Language and literature option: 305a-305b (or 305c), 400a-400b and 12 units at the upper-division level. Italian studies option: 300a-300b and 18 additional upper-division units. Up to 6 units may be taken from courses offered by other departments provided the courses focus primarily on an aspect of Italian culture and is approved in advance by the major advisor in Italian.
The minor: 20 units (in addition to 101 and 102), including 201-202 and completion of courses for one of the following options:

Language and literature option: 305a-305b (or 305c) and 400a-400b. Italian studies option: 300a-300b and 6 additional units of Italian course offerings. All upper-division courses count toward either option available within the major or minor; however, students selecting the language and literature option are expected to do their coursework (reading and writing) in Italian. For this purpose, courses taught in English have bilingual texts for the literature component. Students selecting the Italian studies option may complete all upper-division courses in English. Courses taught in Italian, however, apply to either option as do courses taught in the Arizona Program in Italy. There are no prerequisites for upper-division courses taught in English, which may be taken in conjunction with ITAL 201-202.

101. Elementary Italian I (4) I II S CDT Listening, speaking, reading, and writing; and introduction to the basic structures and vocabulary of Italian. (Does not count toward the Italian major or minor) Also see 102z.

102. Intermediate Italian II (4) I II CDT Listening, speaking, reading and writing; an introduction to the basic structures and vocabulary of Italian, continuation. P, 101 or placement. (Does not count toward the Italian major or minor). Offered each semester. Also see 102z.

102z. Intensive Elementary Italian (4) I P, language major or demonstrated language proficiency. Corresponds to 101 and 102.

201. Intermediate Italian I (4) I II CDT Continued skill development; reinforcement of basic language skills. P, 102 or placement. Also see 202z.

202. Intermediate Italian II (4) I II CDT Continued skill development; reinforcement of basic language skills. P, 201 or placement. Also see 202z.


300a-300b. Western Culture: The Italian Perspective (3-3-3) I II 300a: From antiquity through the Middle Ages. 300b: From the Renaissance to the present. Counts toward the major or minor in Italian or Italian studies. Taught in English.

305a-305b-305c. Advanced Italian (3-3-3) 305a: Composition and Conversation. Emphasis on improving listening, comprehensihon, speaking and writing. 305b: Advanced Composition and Conversation. 305c: Business Italian. P, 202 or consult department before enrollment. Counts toward the major or minor in Italian or Italian Studies. Taught in Italian.


430. Renaissance Studies (3-3-3) Comprehensive study of a particular aspect of Italian culture. 450a: Mussolini, Fascism and the Partisan Resistance. 450b: Italian Cinema and Literature. 450d: Women in Italian Society. 450a, 450c and 450d all count toward the major or minor in Italian or Italian Studies. Taught in English.

455. Introduction to Romance Philology (3) I 1996 -97 (Identical with SPAN 455)

General Biology

Ph.D. Program

Biological Sciences West
Room 347
(602) 621 -5903

Master of Science in General Biology

Committee:
Professor Walter Doyle (Teaching and Teacher Education)
Associate Professors Martinez J. Hewlett (Molecular and Cellular Biology), Thomas J. Lindell (Molecular and Cellular Biology), David J. Vleck (Ecology and Evolutionary Biology)

Assistant Professor Martha L. Narro, Chair (Biochemistry)

The departments of biochemistry, ecology and evolutionary biology, and molecular and cellular biology offer a program leading to a Master of Science degree with a major in general biology. This program is designed for middle and high school biology teachers who desire advanced, specialized training in the biological sciences to enhance their classroom teaching methods.

The Master of Science in General Biology degree is a summer-oriented, 32-unit program of course work and research units. The curriculum consists of: Biology Update I (BIOC 623a), Biology Update II (BIOC623b), Secondary Biology Laboratory Curricula (BIOC 633), Biology Lesson Development (BIOC 643) and electives, independent study, research, preceptorship and thesis units.

Participants take 6 units of graduate electives in the biological sciences and an additional 3 units in any approved science, math or education course. A maximum of 3 units of BIOC 597a may be used to fulfill the elective requirements. Six units of research are required, 4 of which must be in a biology field; the other 2 units may be in biology, science education or science issues.

Participants take 3 units of independent study: 1 unit to follow up on coursework resulting from BIOC 633; 1 unit to...
prepare for research units; 1 unit for the purpose of field testing lessons developed through research and BIOC 643. A 1-unit preceptorship to disseminate scientific knowledge, curriculum materials and teaching approaches among the participants' peers is required, along with a written thesis, oral presentation and a final oral examination over the thesis.

For course descriptions, see Biochemistry (BIOC) course listings in the Departments and Courses of Instruction section of this catalog. Applicants are required to submit a completed program application (available in the Master's in General Biology Program office located in the Department of Biochemistry) and official transcripts of all college work. Call the program office at 621-5903 for application due date. Applicants must have a minimum of one year's classroom teaching experience at the high school or middle school level. In addition, applicants must have completed a minimum of 18 units of college-level biological science courses with a grade-point average of 3.0 or better. Applicants without this background may be required to complete additional undergraduate course work.

Genetics (GENE)

Forbes Building, Room 319A
(520) 621-7511

Graduate Interdisciplinary Program in Genetics

Committee:

Professors Harris Bernstein (Microbiology and Immunology), Daniel L. Brower (Molecular and Cellular Biology), Robert P. Erickson (Pediatrics, Molecular and Cellular Biology), William B. Heed (Emeritus), Conrad Isstok (Ecology and Evolutionary Biology), Margaret G. Kidwell (Ecology and Evolutionary Biology), Brian A. Larkins (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), Hans VanEtten (Plant Pathology), Samuel Ward (Molecular and Cellular Biology)

Associate Professors Kenneth A. Feldmann, Chair, (Plant Sciences), Sue K. DeNise (Animal Sciences), Carol L. Dieckmann (Biochemistry), Jennifer D. Hall (Molecular and Cellular Biology), H. Eugene Hoyer (Pediatrics, Pathology, Obstetrics and Gynecology), Christina K. Kennedy (Plant Pathology, Molecular and Cellular Biology), Dennis T. Ray (Plant Sciences), Steven E. Smith (Plant Sciences), J. Bruce Walsh (Ecology and Evolutionary Biology)

Assistant Professors Alison E. Adams (Molecular and Cellular Biology), Lynn J. Manseau (Molecular and Cellular Biology), Marc J. Orbach (Plant Pathology), Roy Parker (Molecular and Cellular Biology), Leland Pierson III (Plant Pathology), Linda L. Restifo (Neurobiology/Neurology), Mary C. Rykowski (Anatomy), Scott B. Selleck (Neurobiology, Molecular and Cellular Biology), Martin F. Taylor (Entomology)

Clinical Assistant Professor Randall A. Heidenreich (Pediatrics)

Geneticists 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.

416. Computer Analysis of Sequences (3) II (Identical with MCB 416) May be taken with 516.

423. Cytogenetics (3) II (Identical with ECOL 423) May be taken with 523.

433. Human Genetics (3) I Genetic theory and technique, as applied to man; methods of analysis of genetically determined characteristics and biochemical differences in individuals and populations. 3R, 3L. P, ECOL 320. (Identical with ECOL 433) May be taken with 533. Ward.

435. Evolution II (4) I (Identical with ECOL 435) May be taken with 535.

473. Recombinant DNA Methods and Applications (4) II (Identical with MCB 473).

501. Molecular and Medical Genetics (3) I (Identical with PED 501)

509. Statistics for Research (4) I II (Identical with STAT 509)

512. Medical Ethics (1) [Rpt. /9] Ethical issues in genetic counseling, genetics testing and gene therapy. The student will prepare a paper suitable for publication on a selected topic.

513. Quantitative Genetics (3) I 1996-97 (Identical with ANS 513)

516. Computer Analysis of Sequences (3) II (Identical with MCB 516) May be taken 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 taken 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, 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.

568. Nucleic Acids (4) I (Identical with BIOC 568)

570. Molecular Genetics & Evolution (3) I 1996-97 (Identical with MBIM 570)

574. Advances in Mammalian Genetics (3) I (Identical with BIOC 574)

581. Genetic Counseling (1) [Rpt./6] I II Principles of genetic counseling, general topics related to issues raised during genetic counseling such as coping with chronic illnesses, and specific genetic counseling issues related to unique disorders encountered in the genetics clinic and other genetic counseling situations. Such disorders include prenatal, pediatric and adult genetic conditions. Limited to students in the genetic counseling training program except by permission of instructor.

589. Cancer Genetics and Cytogenetics (3) I 1995-96 (Identical with CBIO 589)

595. Colloquium a. Genetics (1) [Rpt.] I II

596. Seminar j. Genetic Counseling (1) [Rpt./6] I II Limited to students in the genetic counseling training program except by permission of instructor.

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.

627. Advanced Genetics (3) II 1996-97 (Identical with PLS 627)

655. Survey Physical Anthropology (3) I (Identical with ANTH 655)

666. Human Microevolution (3) II 1996-97 (Identical with ANTH 666)

670. Recent Advances in Genetics (2) I Recent advances in the field of genetics. (Identical with ECOL 670)

695. Colloquium e. Science, Society and Ethics (1) II (Identical with MCB 695e)

Geography and Regional Development (GEOG)

Harvill Building, Room 409
(520) 621-1652; FAX: (520) 621-2889

Professors David A. Plane, Head, Michael E. Bonine (Near Eastern Studies), Terence Burke, Robert D. Carpenter (Emeritus), Lay J. Gibson, Lawrence D. Mann, Janice J. Monk (Southwest Institute for Research on Women), Gordon F. Mulligan, Leland R. Pederson,
Richard W. Reeves, Thomas F. Saarinen (Emeritus), Arthur L. Silvers (Public Administration), Dan Stanislawski (Emeritus), Andrew W. Wilson (Emeritus), Ervin H. Zube (Renewable Natural Resources)

Associate Professors D. Robert Altschul, Adrian Esperza, Lisa J. Graumlich (Dendrochronology), Charles F. Hutchinson (Arid Lands Resource Sciences), Katherine K. Hirschboeck (Climatology), Stuart E. Marsh (Arid Lands Resource Sciences), Sallie A. Marston, Brigitte Waldorf, Marvin Waterstone

Assistant Professors Andrew C. Comrie, Beth A. Mitchneck

Curricula in geography and regional development are designed to contribute to general education; to provide a 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 regional development 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 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 102a-102b, 103a-103b, 104a-104b, 357; at least 3 units from 330, 357, 381, 417, 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.

The department recommends that students take MATH 117, not 122, to satisfy their General Education requirement in mathematics.

A maximum 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 minor in geography or regional development.

The teaching major in geography: 30 units, including 151, 497a, at least three units from 102a-102b, and at least four units from 103a-103b, 104a-104b.

The teaching minor in geography: 18 to 24 units, depending upon major and electives, including at least three units from 102a-102b, and at least four units from 103a-103b, 104a-104b. 497a is strongly recommended.

The department participates in the honors program.

Note: 103a-103b and 104a-104b are the only geography courses which may be applied to the Biological and Physical Sciences Study Area of the College of Arts and Sciences' general education requirements.

102a-102b. Human Geography (3-3) Introduction to the main fields of human geography, with emphasis on world patterns of distribution and regional examples. 102a is not prerequisite to 102b. Both 102a and 102b are offered each semester. An honors section of 102a is available. Gibson/Esparza

103a-103b. 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 103a and 103b are offered each semester. 103a is not prerequisite to 103b. Reeves/Comrie/Altschul

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.

110. Regional Land Use (3) I 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 (Identical with ATMO 171)
408. Arizona and the Southwest (3) I The changing character of the land and man's occupancy 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 RSET 409) May be convened with 509. Mitchneck Writing-Emphasis Course*

410. 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. 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. 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. Writing-Emphasis Course*

415. Introduction to Water Resources Policy (3) II (Identical with HWR 415) May be convened with 515.

417. Introduction to Geographic Information Systems (3) II (Identical with RNR 417) May be convened with 517.

418. Advanced Geographic Information Systems (3) II (Identical with RNR 418) May be convened with 518.

421. Physical Climatology (3) II (Identical with ATMO 421)

430. The Climate System (3) I Systematic examination of processes and circulations comprising Earth's climate. Emphasis on circulations influencing geographic processes using examples of atmospheric environmental issues. P, 103a or ATM/O/GEOG 171. May be convened with 530. Comrie

431. Global and Regional Climatology (3) II 1994-95 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/TOEG 171 or GEOG 103a. May be convened with 531.

450. Geomorphology (4) I (Identical with GEOS 450)

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 studies. (Identical with PLNG 459) May be convened with 559. Mann

461. Population and Resources (3) 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. Reeves Writing-Emphasis Course*

469. Geography of the Middle East (3) I Physical environments and cultural areas of Southwest Asia, with emphasis on people-environment interaction, relationships, 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 ARBC 471 and PLNG 471) May be convened with 571. Mitchneck Writing-Emphasis Course*

476. The Land Development Process (3) [Rpt./1] 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. T, 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*

496. Seminar a. Geography for Teachers (3) S May be convened with 597a.

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

500. Current Geographical Research (3) I Major trends and issues in human and physical geography. Marston

504. Public and Policy Economics (3) II (Identical with PA 504)

505. Principles of Economic Geography (3) II Survey of micro- and macro-level theory in economic geography, location theory, central place theory, spatial behavior and interaction, development issues, impact models, and project evaluation. Mulligan

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. Mitchneck

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 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.
512. South America (3) I For a description of course topics, see 412. Graduate-level requirements include three tutorial sessions and a research paper. (Identical with LAS 512) May be convened with 412.

513. Africa (3) II For a description of course topics, see 513. Graduate-level requirements include the completion and oral presentation of an original research paper on an approved topic. May be convened with 413.

515. Introduction to Water Resources Policy (3) II (Identical with WHR 515) May be convened with 415.

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.

530. The Climate System (3) I For a description of course topics, see 430. Graduate-level requirements include the completion of a term paper. (Identical with AR L 530) May be convened with 430. Comrie

531. Global and Regional Climatology (3) II 1994-95 For a description of course topics, see 431. Graduate requirements include an additional term paper. May be convened with 431.

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. Land Use and Growth Controls (3) II For a description of course topics, see 453. Graduate-level requirements include the completion of an original research paper on an approved topic. (Identical with PLNG 553) May be convened with 453. Mulligan

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)

563. Perception of Environment (3) II Examination of interdisciplinary research on environmental perception; consideration of social and behavioral variables at all scales of environmental perception and planning. (Identical with PLNG 563)

564. The Arid and Semi-arid 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 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

571. Problems in Regional Development (3) II For a description of course topics, see 471. Graduate-level requirements include the completion of an original research paper on an approved topic. (Identical with AREC 571 and PLNG 571) May be convened with 471. Mitchneck

576. The Land Development Process (3) [Rpt./1] II S For a description of course topics, see 476. Graduate-level requirements include the completion of a series of research projects. (Identical with PLNG 576) May be convened with 476. Mann

578. Global Change (3) II (Identical with GEOS 578) May be convened with 478.

581. Computer Cartography (3) II For a description of course topics, see 481. Graduate-level requirements include the completion of a project report. (Identical with PLNG 581) May be convened with 481.

583. Geographic Applications of Remote Sensing (3) II For a description of course topics, see 483. Graduate-level requirements include the completion of a project report. Field trip, P, two units of remote sensing or equivalent experience. (Identical with PLNG 583) May be convened with 483. Marsh

596. Seminar
k. Risk and Society (3) I (Identical with ANTH 596k, HWR 596k) Waterstone
u. Interdisciplinary Environment-Behavior-Design (3) II (Identical with PSYC 596u)

597. Workshop
a. Geography for Teachers (3) S May be convened with 497a.

605. Planning Theories and Perspectives (3)
I A critical examination of normative and methodological assumptions of alternative planning models, with emphasis on developing a perspective on contemporary planning issues. (Identical with PLNG 605) Mann

611. Projects in Regional Planning (1 to 5) [Rpt./5 units] II Lectures, laboratory, and field projects covering various aspects of professional practice. P, 605, 24 units toward a graduate degree in planning. Field trips. (Identical with PLNG 611) Mann

617. Spatial Analysis (3) II Formal analysis and modeling of spatial structures and processes; conceptual evaluation of point patterns, networks, surfaces and interaction. P, 457 or 557. (Identical with PLNG 617) Mulligan/Comrie


695. Colloquia
a. Current Research (3) I II [Rpt./7] Required of all graduate students each semester in residence.

696. Seminar
a. Economic Geography (3) [Rpt./2] I II
b. Cultural Geography (3) [Rpt./2] I II
c. Physical Geography (3) [Rpt./2] I II
e. Area Study (3) [Rpt./3] I II
f. Research Methods (3) [Rpt./2] I II
g. Urban Geography (3) [Rpt./2] I II

Geological Engineering
(See Mining and Geological Engineering)

Geosciences (GEOS)
Gould-Simpson Building, Room 208
(520) 621-6024; FAX: (520) 621-2672


Associate Professors Andrew W. Cohen, Peter G. DeCelles, George E. Gehrels, Roy A. Johnson, Randall M. Richardson

Assistant Professors Suzanne Baldwin, L. Susan Beck, Jay Quade

Senior 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), Jeffrey S. Dean, Harold C. Fritts (Emeritus), William J. Robinson (Emeritus), Charles W. Stockton, Marvin A. Stokes (Emeritus)

Associate Professor Lisa J. Graumlich, Katherine K. Hirschboeck, Steven W. Leavitt, 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 chemi-
cal, 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 and environmental reconstruction at archaeological sites. The Laboratory of Tree-Ring Research, in association with the department, offers undergraduate and graduate courses in dendrochronology using tree-rings to study climatic, ecological, environmental and archaeological problems.

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 majors 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 Arts and Sciences, the following courses are required: GEOS 101 or 110 or 112, 102, 103, 104, 209, 225, 256, (or other approved computer course) 302, 315, 321, 322, an advanced petrology course (igneous, metamorphic or sedimentary), any four 400-level GEOS courses and a field program (GEOS 412 and 413 or equivalent). The major in geosciences assumes substantial knowledge of mathematics; students must complete MATH 124 or 125a or ECO 104a; PHYS 141, 142, 223, 254 and 322, 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 Arts and Sciences, the following courses are required: GEOS 101 or 110 or 112, 102, 103, 104, 209, 225, 256, (or a computer science course approved by the advisor), 321, 322, 412, 416, 448, and 419 or 424 or 432 or 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, 302, AM 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.

For students majoring in earth sciences, 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. For secondary education not majoring in earth sciences education, the teaching minor requires 20 units of approved earth science courses including GEOS 101, 102, 103, 104; ASTR 110a or 110b and ATMO 171.

Students also must satisfy 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, archaeogeology, geochemistry, geophysics, mineralogy and paleontology. A split minor also is an option. An advisor in the student's field of interest will assist in selecting courses.

The department participates in the honors program.

101. Introduction to Physical Geology (3) I II SSI Earth's materials; surface and internal geologic processes; development of plate tectonics model. CR, 103.

102. Historical Geology (3) I II SSI Geologic history of the earth with emphasis on North America; Modern concepts on the origin of life and evolution. P, 101, CR, 104; Kresan/McMullough


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) II (Identical with HWR 107b).

110. Introduction to 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. 3R, 3L. Field trips. Primarily for nonmajors. Kresan/Quade/McCullough

112. Introduction to Oceanography (3) II Introduces the oceans and their geological, physical, chemical, and biological processes with emphasis on their history and formation and the interactions of humans with the marine environment. Students are encouraged to take 103 as a related laboratory. Cohen/Richardson/Chase

195. Colloquium

d. A Sense of Place (1) I

209. Introduction to Mineralogy and Geochemistry (5) II An integrated treatment of the condensed materials that constitute the earth. Review of chemical principles, the origin and distribution of the elements. Crystallography, physical properties, and crystal chemistry of minerals. Systematic treatment of the crystal chemistry and physical properties of rock-forming silicate and non-silicate minerals. Equilibrium relations among geological solids and fluids. Distribution of elements in surficial, crustal, oceanic and mantle minerals, rocks and fluids. Geochronal cycles. Identification of minerals in hand specimen, chemical calculations. 3R, 6L. P, 101, 102, 103, 104; CHEM 103a, 104a; Barton/Ruiz/Patchett

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

256. Computer Applications in Geosciences (3) I II Emphasizes computer skills in the Macintosh and Unix environments specific to geosciences. Students will become familiar with spreadsheets, graphics applications, mathematical tools and geologic databases. 2R, 3L. P, 101.

280. History of Life (2) II Scenarios for major events in the history of life from the origin of the Earth to the evolution of humans. Lindsay

302. Principles of Stratigraphy and Sedimentation (3) I GRD Basic principles and methods of stratigraphic analysis; sedimentation and depositional environments, facies relations, evaluation of unconformities, stratigraphic classification and nomenclature, correlation, and dynamics of basin fill. 3R, 3L. Field trips. P, 209; Cohen/DeCelles 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. Introduction to Field Methods (1) II Introduction to methods of field geology. Review of basic mapping techniques. Construction and interpretation of geologic maps, cross-sections and geological histories from limited observations. Several required field trips. P, 321. Barton/Parrish

315. Introduction to Petrology and Optical Mineralogy (5) Introduction to methods of optical mineralogy and petrography. Classification, compositions, structure, distribution, and origin of igneous, sedimentary, and metamorphic rocks. Rocks in their tectonic setting. Petrologic evolution of rocks through time. Examination of rocks in hand specimen and thin section. 3R, 6L. P, 209. Barton/Baldwin

321. Structural Geology (4) II GRD Descriptive and analytic study of structural geology. Map analysis of and description of geologic structures of deformed rocks. Examination of rocks in field trips. May be convened with 321. Barton / Parrish

322. Introduction to Geophysics (3) I GRD Physical principles applied to problems in earth science including seismology, gravity, magnetics, heat flow, plate tectonics. P, PHYS 182 and 241. Butler

330. Introduction to Remote Sensing (3) I (Identical with GEOG 330)

346. Mineral and Energy Resources (3) II 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

346H. Mineral and Energy Resources (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

397. Workshop
   a. Teaching Geosciences (2-3) [Rpt./3] I II P, consult department before enrolling.

400. Introduction to Geochemistry (3) I Nuclear systemsatics and thermodynamics with applications to geologic processes. P, 101, 103; CHEM 103b, 104b. May be convened with 500. Ruiz

401. Earth Science Teaching Methods and Materials (3) II Instructional methods in laboratory and classroom, resources development, curriculum planning and assessment. Field trips. P, 22 units in earth sciences. May be convened with 501. McCullough


406. Conservation Biology (3) II 1996-97 (Identical with ECOL 406) May be convened with 506.

407. Photogeology (3) II (Identical with G EN 407) May be convened with 507.

408. Mammalian Phylogeny and Evolution (3) II 1996-97 A study of the mammalian fossil record, with emphasis on taxonomy and morphological evolution of selected mammal orders. 2R, 3L. Field trips. May be convened with 508. Lindsay

409. Magmatic and Metamorphic Processes (3) II An integrated quantitative approach to process oriented problems in igneous and metamorphic petrology, especially in dynamic environments, through the applications of physico-chemical principles and experimental data to geological observations. P, 315 or equivalent, calculus. May be convened with 509a. Ganguly

411. Geology of the Solar System (4) I 1996-97 (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) I Physical mechanisms of sedimentary basin formation, including flexure, thinning and thermal contraction of the lithosphere; isostasy; subsidence analysis; sequence stratigraphy; paleocurrents and sediment provenance; tectonics of sedimentary basins. P, 302 or 544. May be convened with 517. DeCelles

418. Advanced Mineralogy (3) I II Principles of crystallography and crystal chemistry; thermodynamic and kinetic of minerals; macroscopic treatment and atomistic basis; phase transformations; systematic mineralogy. P, 209 or consult department before enrolling. May be convened with 518. Barton/Ganguly

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 142 (Identical with PTYS 419) May be convened with 519. Richardson/Clase

423. Regional Structural Geology (3) [Rpt./3] 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/G. Davis

424. Paleomagnetism: Principles and Applications (3) I Physical basis for remnant magnetism in rocks, techniques of sample collection, measurements, and statistical treatment; review of polarity time scale, ap- parent polar wander, plate tectonics. P, PHYS 132 or 241. 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. Plate tectonic regimes and kinematics. May be convened with 526. Gehrels

430. Chemical Evolution of the Earth (3) I Chemical differentiation and evolution of Earth's mantle and crust according to major element, trace-element and isotopic characteristics of neodymium, hafnium, strontium, lead and other isotopes. May be convened with 530. Patchett

431R. Hydrogeology (3) I II (Identical with HWR 431R) May be convened with 531R. Zreda

431L. Hydrogeology Laboratory (1) I II (Identical with HWR 431L) May be convened with 531L. Zreda

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

433. Mine Investment Analysis (3) I Economic factors, including taxation, mineral depletion allowance, and finance in the mining industry; includes fundamentals of engineering economics, capital budgeting, and risk analysis. May be convened with 533. Harris


438. Biogeography (3) I (Identical with ECOL 438) May be convened with 538.

440. Geodynamics (3) I 1995-96 [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. Clase


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; carbonate rocks and associated evaporites; cherts, iron-rich rocks, and phosphorites. 2R, 6L. Field trips. P, 302, 315. May be convened with 551. DeCelles

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


454. Low Temperature Geochronology (3) I Equilibrium and kinetic chemical processes producing soils, natural waters, and chemical sediments. P, 101, 103, 400/500 or CHEM 480a. (Identical with HWR 457) May be convened with 557. Long

455. Geochronology (3) I Introduction to geochronologic methods used in the geological sciences including K-Ar, **AR/**AR, Rb-Sr, Sm-Nd, U-Th-Pb, and fission track techniques. Application of isotopic dating techniques to the study of crustal dynamics. May be convened with 558. Baldwin

456. Thermochronology (3) I Closure temperature theory and methods used to determine temperature - time histories of igneous and metamorphic rocks. Applications of thermochronology and P-T-t paths of crustal terranes. May be convened with 559. Baldwin


473. Geology and the Urban Environment (3) I Geologic processes that result in loss of life and/or property damage; emphasis on case studies of urban areas in the Southwest. Implications for policy. 2R, 3L. All-day field trips. (Identical with PLNG 473) May be convened with 573. McCullough

476a-476b. Analysis of Biological Diversification (3-2) I II (Identical with ECOL 476a-476b) May be convened with 576a-576b. Bronstein/McDade/Cohen/Moran

478. Global Change (3) I Analysis of the entire Earth system through an examination of how its component parts and their interactions have changed in the past and may be expected to change in the future. P, upper-division standing; introductory course work in biological and physical sciences. (Identical with ECOL 478, GEOG 478, HWR 478 and RNR 478) May be convened with 578. Graumlich

482. Paleoclimatology (3) I 1995-96 Topics in paleoclimatology including prediction of paleoclimatic patterns, proxy paleoclimatic indicators, and paleoclimatic cycles. May be convened with 582. Parrish


496. Seminar p. Macroevolution (2) [Rpt./6 units] I II (Identical with ECOL 496p, which is the home). May be convened with 596p.

497. Workshop c. Dendrochronology (2) 3L. (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, CHEM 104b. May be convened with 400. Ruiz

501. Earth Science Teaching Methods and Materials (3) I II For description of course topics, see 401. Graduate-level requirements include two additional projects. May be convened with 401. McMullough

502. Statistical Analysis of Geological Data (3) I For a description of course topics, see 402. Graduate-level requirements include an additional term project on an approved topic. P, MATH 124, 125b. May be convened with 402. Harris


505. Applied Multispectral Imagery (3) I (Identical with G EN 505)


507. Photogeology (3) I (Identical with G EN 507) May be convened with 407.

509. Magmatic and Metamorphic Processes (3) I 1995-96 For a description of course topics, see 409a. Graduate-level requirements include an in-depth research paper on a topic selected by the student and the instructor. Field trips. May be convened with 409a.

509b. Conditions and Rates of Metamorphic Processes (3) I 1995-96 An advanced treatment of the topic based primarily on the principles of classical thermodynamics, reaction-, order-disorder- and diffusion-kinetics, and heat transfer. P, 409a, 509a or 583 or consent of instructor. Ganguly

510. Principles of Cosmochemistry (3) I 1996-97 (Identical with PTYS 510)

514. Late Quaternary Geology (3) I Paleoenvironment and geochronology of Late Quaternary alluvium as read from the stratigraphic records and geomorphology at key localities in North America, including selected archaeological sites. The interaction of fluvial and aeolian processes in the eastern Sahara will be evaluated using enhanced LANDSAT and Shuttle Imaging Radar. Domestic field trips. Enrollment limited to 10 students. P, 102, 104. (Identical with ANTH 514) Haynes

516. Field Studies in Geophysics (3) I II S (Identical with G EN 516) May be convened with 416.

517. Sedimentary Basin Analysis (3) I For a description of course topics, see 417. Graduate-level requirements include an independent research project. P, 302 or 544. May be convened with 417. DeCelles

518. Advanced Mineralogy (3) I II For a description of course topics, see 418. Graduate-level requirements include an independent research report. P, 299 or consult department before enrolling. May be convened with 418. Barton/Ganguly

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 142. (Identical with PTYS 519) May be convened with 419. Richardson/Chase

520. Meteorites (3) I II 1996-97 (Identical with PTYS 520)

522. Well Logging Interpretation (3) I II (Identical with G EN 522)
523. Regional Structural Geology (3) [Rpt./3] I For a description of course topics, see 423. Graduate-level requirements include additional reading assignments on structural processes and regional geology. Field trips. P, 413. May be convened with 423. Gehrels/G. 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 132 or 241 May be convened with 424. Butler

525. Regional Tectonics (3) I For a description of course topics, see 425. Graduate-level requirements include a research paper on topical or regional tectonics. May be convened with 425. Coney

526. Cordilleran Tectonics (3) II For a description of course topics, see 426. Graduate-level requirements include final report concerning some aspect of the tectonic evolution of western North America. May be convened with 426. Gehrels

527. Orogenic Systems (3) 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 Phanerzoic, Proterozoic, and into Archean time. Coney


530. Chemical Evolution of the Earth (3) I For a description of course topics, see 430. Graduate-level requirements will include an additional paper. (Identical with PTYS 530) May be convened with 430. Patchett

531R. Hydrogeology (3) II (Identical with HWR 531R) May be convened with 431R. Zreda

531L. Hydrogeology Laboratory (3) I II (Identical with HWR 531L) May be convened with 431L. Zreda

532. Introduction to Seismology (3) I For a description of course topics, see 432. Graduate-level requirements include a term paper. P, MATH 254. May be convened with 432. Wallace

533. Mine Investment Analysis (3) I For a description of course topics, see 433. Graduate-level requirements include an in-depth research paper on a single aspect of mineral investment to be approved by the instructor. May be convened with 433. Harris

534. Exploration Geophysics: Seismic Methods (3) II For a description of course topics, see 434. Graduate-level requirements include a special research project. P, MATH 254. May be convened with 434. Johnson

535. Advanced Subsurface Hydrology (3) II (Identical with HWR 535)

536. Ground Water Resource Evaluation (3) II (Identical with HWR 536)

537. Economics of Mineral Resource Development and Production (3) II Concepts and methods of mineral economics; analyses of selected mineral and energy commodities, current economic and political issues and investment strategies in selected mineral industries. P, ECON 201a or 210 or equivalent. Harris

538. Biogeography (3) II (Identical with ECOL 538) May be convened with 438.


540. Geodynamics (3) [Rpt.] I 1995-96 For a description of course topics, see 440. Graduate-level requirements include a quantitative modeling project in some aspect of tectonics and a publication-format paper. P, 20 units of geology, including 321, 3 units geophysics, MATH 254; consult with department before enrolling. May be convened with 440. Chase

541. Soil Genesis (3) II 1996-97 (Identical with S W 541)


543. Mathematical Theory of Magma-Hydrothermal Systems (3) I Dynamics and chronology of natural systems are reconstructed using mathematical systems and computer models to represent the redistribution of thermal and mechanical energy around magma chambers. Norton

544. Advanced Physical Sedimentology (3) I First half of course deals with mechanics of flows and sediment transport, oscillatory and unidirectional flows, waves and wave theory, bedforms and flow regimes, sediment gravity flows, liquefaction and fluidization. Second half covers physical processes and facies in alluvial fan, fluvial, eolian, deltaic, nearshore, shelf, slope and turbidite fan systems. Emphasis is on elastic systems. Field trips. P, 302, MATH 254 or consent of instructor. DeCelles

545. Geochemical Processes in Magma-Hydrothermal Systems (3) II Migration of chemical components in nature fluids-rock systems are analyzed using the geochemical theory that represents irreversible, equilibrium and advection mass transfer. Norton

546. Economic Mineral Deposits (3) II GRD For a description of course topics, see 446. Graduate-level requirements include an independent study project. P, 209, 321. May be convened with 446. Titley/Barton

547. Industrial Minerals and Rocks (3) I 1996-97 For a description of course topics, see 447. Graduate-level requirements include a term paper. P, 446. May be convened with 447.

548. Geophysical Exploration and Engineering (3) I (Identical with G EN 548) May be convened with 448


550. Geomorphology (4) I For a description of course topics, see 450. Graduate-level requirements include panel leaderships on environmental discussion sessions, and additional lab exercise questions. 3R, 3L. P, 101, 103. (Identical with AR L 550) May be convened with 450. Bull

551. Sedimentary Petrology (4) I For a description of course topics, see 451. Graduate-level requirements include a research paper in publication format on a topic selected by the student and instructor. 2R, 6L. Field trips. P, 302, 315. May be convened with 451. DeCelles

552. Petroleum Geology (3) I For a description of course topics, see 452. Graduate-level requirements include a term paper regarding some aspect of a major course topic. 2R, 3L. May be convened with 452. Nagy

553. Glacial and Quaternary Geology (3) II For a description of course topics, see 453. Graduate-level requirements include an independent research project or a term paper in publication format. P, 102, 104. May be convened with 453. Baker

554. Evolution of Planetary Surfaces (3) II 1996-97 (Identical with PTYS 554)


556. Low Temperature Geochemistry (3) II For a description of course topics, see 457. Graduate-level requirements include an independent research project or term paper in publication format. P, 101, 103, 400/500 or CHEM 480a. (Identical with HWR 557) May be convened with 457. Long

558. Geochronology (3) 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. Baldwin

559. Thermochronology (3) 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. Baldwin

560. Electrical Exploration Methods (3) I (Identical with G EN 560)

561. Paleosolndian Origins (3) I (Identical with ANTH 561)

562. Introduction to Quaternary Ecology (3) I For a description of course topics, see 462. Graduate-level requirements include a term paper in publication format. Field trip. P, 101. May be convened with 462. O. Davis

563. Isotope Hydrology (3) I Theory and application of light stable and cosmogenic isotopes to hydrological and paleoenvironmental problems. Radiometric dating of ground water. (Identical with HWR 563) Long

564. Introduction to Dendrochronology (4) I 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. Swetnam


567. Inverse Problems in Geophysics (3) Linear and nonlinear inverse theory, including least squares, generalized and maximum likelihood methods. P, MATH 422b. (Identical with ATMO 567 and PTYS 567) Richardson
568. Advanced Seismology (3) II 1995-96
Computation techniques in seismology. The application of synthetic seismograms to model source processes and complex structure. P, 432/532; MATH 422b. Wallace

569. Seismic Data Processing (3) I For a description of course topics, see 469. Graduate-level requirements include a special research project. P or CR, 434, MATH 422a. May be convened with 469. Johnson

570. Terrestrial Planets (3) I 1995-96 (Identical with PTYS 571)

571. Global Biogeochemical Cycles (3) I (Identical with GC 572)

572. Geology and the Urban Environment (3) 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

576a-576b. Analysis of Biological Diversification (3-2) I II (Identical with ECOL 576a-576b) May be convened with 476a-476b. Bronstein/McDade/Cohen/Moran

578. Global Change (3) II For a description of course topics, see 478. Graduate-level requirements include an in-depth research paper on a topic selected by the student and instructor. P, graduate standing; introductory course work in biological and physical sciences. (Identical with ECOL 578, GEOG 578, HWR 578 and RNR 578) May be convened with 478. Graumlich

581. Quaternary Palynology and Plant Macrofossils (2-4) II For a description of course topics, see 481. (Identical with ANTH 581) May be convened with 481. O. Davis

582. Paleoclimatology (3) I 1995-96 For a description of course topics, see 482. Graduate-level requirements include an additional research project. May be convened with 482. Parrish

583. Thermodynamics in Geosciences (3) 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 124, MATH 119 and/or consult with department before enrolling. (Identical with PTYS 583) Ganguly

588. Soil Geochemistry (3) I 1995-96 For a description of course topics, see 488. Graduate-level requirements include an in-depth research paper project on a single aspect of the course topic. P, 101, 103, CHEM 103b and CHEM 104b. May be convened with 488. Quade

589. Quaternary Geochemistry (3) I 1996-97 For a description of course topics, see 489. Graduate-level requirements include an in-depth research paper project on a single aspect of the course topic. P, 101, 103, CHEM 103b and CHEM 104b. May be convened with 489. Quade


595. Colloquium
b. Global Climate Change (2) [Rpt./1] I 1996-97 (Identical with ATMO 595b)
c. General Circulation Observation and Modeling (3) II (Identical with ATMO 595c)
e. Dendrochronology: Physical Applications (3) [Rpt./2] I II Use of tree-ring data to study past climatic, hydrologic and geomorphic variation. (Identical with WS M 595e)
f. Dendrochronology: Biological Applications (3) [Rpt./2] I II Discussion of wood features that are interpretable in terms of environmental processes; application of tree-ring data to ecological problems; biological basis of wood formation. (Identical with WS M 595f)
g. Dendrochronology: Chronometric Applications (3) [Rpt./2] I II Application of tree-ring dating to archeological and environmental problems. (Identical with WS M 595g)

596. Seminar
a. Petrography-Petrology (1-4) [Rpt./6 units] I II
b. Structural Geology (1-4) [Rpt./6 units] I II
c. Mineral Deposits (1-4) [Rpt./6 units] I II
d. Petroleum Geology (1-4) [Rpt./6 units] I II
e. Tectonics (1-4) [Rpt./6 units] I II
f. Mineralogy-Crystallography (1-4) [Rpt./6 units] I II
h. Vertebrate Paleontology (1-4) [Rpt./6 units] I II
h. Paleontology (1-4) [Rpt./6 units] I II
i. Paleoclimatology-Paleoenvironments (1-4) [Rpt./6 units] I II
j. Geomorphology (1-4) [Rpt./6 units] I II
k. Geophysics (1-4) [Rpt./6 units] I II
l. Geomathematics (1-4) [Rpt./6 units] I II
m. Sedimentology (1-4) [Rpt./6 units] I II
n. Stratigraphy (1-4) [Rpt./6 units] I II
o. Regional Tectonics (1-4) [Rpt./6 units] I II
p. Microevolution (2) [Rpt./6 units] I II
q. General Geochronology (1-4) [Rpt./6 units] I II
r. Quaternary Geochronology (1-4) [Rpt./6 units] I II
s. Sedimentary Petrography (1-4) [Rpt./6 units] I II
t. Organic Geochemistry (1-4) [Rpt./6 units] I II
u. Inorganic Geochemistry (1-4) [Rpt./6 units] I II
v. Dendrochronology (1-4) [Rpt./6 units] I II
w. Palynology (1-4) [Rpt./6 units] I II
x. Paleobotany (1-4) [Rpt./6 units] I II
y. Role of Water in Geologic Processes (1-4) [Rpt./6 units] I II
z. Topics in Geophysics (1-4) [Rpt./6 units] I II

597. Workshop
c. Dendrochronology (2) [CR]. May be convened with 497c. (Identical with ANTH 597c and WS M 597c)

646a-646b. Advanced Ore Deposit Geology (4-4) Geology, characteristics and origins of ore deposits in igneous, sedimentary, and metamorphic rocks. Labs. include field trips, analytical techniques, problem solving. 2R, 6L. P, 446/546, CHEM 480a or CR. Tilley/Barton


651. Climatic Geomorphology (3) I 1995-96 Effects of climatic changes on geomorphic processes, landforms, and soils; paleoclimatic and earthquake-hazards interpretations. 2R, 3L. Field trips. Bull


German Studies (GER)

Modern Languages Building, Room 571
(520) 621-7385; FAX: (520) 621-7385

Professors David H. Chisholm, Albrecht Classen, Max Dufner (Emeritus), Louis F. Helbig, Steven D. Martinson, Renate A. Schulz, David J. Woloshin (Emeritus)

Associate Professors Thomas Kovach, Head, Dennis I. Greene (Emeritus), Babette Luz (Emerita), Kamakshi P. Murti, Roland Richter (Emeritus), Mary Wildner-Bassett

Assistant Professors Barbara Kosta, C. Jane Rice

Lecturer John R. Wendel

The Department of German Studies provides instruction designed to develop fluency in oral and written communication, knowledge of German literature, and insights into German cultural history. A study-abroad exchange program at the University of Tübingen is available for qualified students. A major in German, by itself or in combination with another field, can open the door to careers in education, international business, the foreign service and many other professions.

The degrees available are Bachelor of Arts and Master of Arts with a major in German, and Bachelor of Arts in Education and Master of Education with a teaching major in German.

The major: 27 units beyond 200-level courses, including 302a-302b, 315a-315b, 400a-400b, and 410a-410b. GER 307a-307b is highly recommended. The major in German assumes general knowledge of mathematics; students must complete MATH 122.

The supporting minor must be selected with the assistance and approval of the major advisor.

The German minor: includes 201, 202, 302a-302b, 314a-314b, 315a-315b, 307a or 307b.
The German minor with an emphasis in German Culture: includes 8 units of language study beyond 102 and 15 units selected from the following 272, 275, 276, 278, 325, 375, 410a-410b and 455. Not available to students pursuing a B.A./B.S. in Education.

The teaching major: includes 302a or 302b, 315a-315b, 400b, 410a-410b, 475a or 475b, 479 and 480. Candidates must demonstrate oral proficiency in German at the level of ACTFL/ETS Oral Proficiency Advanced or the equivalent. The work done in the College of Education will include TTE 493b, which carries up to 10 units of credit. The student may proceed to student teaching after demonstrating the required level of oral proficiency. The major in German assumes general knowledge of mathematics; students must complete MATH 122.

The teaching minor: includes 302a or 302b, 314a-314b, 315a-315b, 475a or 475b, 479 and 480. A minimum of 9 upper-division units must be taken in the Department of German Studies. Candidates must demonstrate oral proficiency in German at the ACTFL/ETS Oral Proficiency Intermediate High Level or the equivalent.

For graduation and degree requirements, consult the Graduate Catalog. The department participates in the honors program.

In addition to the courses listed below, the Department of German Studies faculty is prepared to offer courses in the following areas, subject to faculty availability and student interest: Special Topics in German Literature; Linguistic and Computer-Assisted Approaches to Literature; German Philology, Scandinavian Literature in English Translation; German Cinema; German Reading for Graduate Students; and Second Language Acquisition, Teaching and Testing.

101. Elementary German I (4) CDT Both 101 and 102 are offered each semester.
101i. Elementary Intensive German (6) CDT Offered during Summer Session I only.

102. Elementary German II (4) CDT Both 101 and 102 are offered each semester.
195. Colloquium
   a. Learning Foreign Languages: Windows to the World (1) (Identical with LING195a)
   b. Culture (3) [Rpt./2] I II P, 315b.
   c. Translation (3) [Rpt./2] I II P, 315b.

201. Intermediate German I (4) CDT Speaking, understanding, writing, and reading German. P, 102 or 101i. Both 201 and 202 are offered each semester.
201i. Intermediate Intensive German (6) CDT Offered during Summer Session II only. P, 102 or 101i.
202. Intermediate German II (4) CDT Speaking, understanding, writing, and reading German. P, 201. Both 201 and 202 are offered each semester.

203. Intensive Intermediate German (8) I CDT Intensive intermediate German for students to proceed at an accelerated pace to cover a greater variety of materials and topics than offered in German 201 and 202. An honors section is available. Enrollment contingent upon personal interview and an exam given in the first week of class. 8R, 2L P, honors program requirements; consult department before enrolling.
207a-207b. Conversation (2-2) CDT Intermediate course for students who wish to concentrate on spoken German. P, 102. 207a is not prerequisite to 207b.
272. Staging Twentieth-Century Germany (3) I Explores the many changes in German society during the past century through the lens of twentieth-century German plays and theater productions. Readings and class discussions in English.
275. Culture (3) [Rpt./2] I II P, 315a-315b. Advanced course for students who wish to concentrate on spoken German. P, 202. 302a is not prerequisite to 302b.
276. Challenges to Traditions (3) I I S Examines texts from the turn of the 20th century to the Third Reich which reveal an explosion of creativity across boundaries: literature, fine arts, popular culture, architecture, film.
277. Eroticism and Love in the Middle Ages (3) I II S 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 relationships, and eroticism will be highlighted. (Identical with ENGL 277 and SPAN 277)
278. Medieval Answers to Modern Questions (3) II S Discussion of essential texts from the Middle Ages which offer fundamental answers to existential problems people have faced at all times.
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, LING 285, RUSS 285, SPAN 285)
302a-302b. Topics in German Literature (3-3) Close readings of literary expression of German thought, life and cultural development. P, 202. 302a is not prerequisite to 302b. Consult 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.
314a-314b. Business German (3-3) Specializes in typical business situations and German business culture. Emphasis on practical career-usable language competence. P, 202 or 207b. 314a is not prerequisite to 314b.
315a-315b. Oral Expression and Written Composition (3-3) CDit Review and practical application of important grammatical principles; vocabulary building. P, 202 or 207b. 315a is not prerequisite to 315b.
325. History of German Cinema (3) I The important films in the development of German cinema of the pre-1945 period and the cinema of the Federal Republic of Germany after 1945 to the present. (Identical with AR 325)
373. Women's Fictions in Twentieth-Century Germany (3) I Introduction to a variety of twentieth-century women writers and film makers in German-speaking countries. Texts will range from literary works to essays, films, and videos of theater performances. Readings and class discussions in English. (Identical with WS 373)
375. Love, Madness and Decay in fin-de-siècle Vienna (3) I II S Explores the themes of love, madness, decay and death as they appear in the works of major writers, artists, composers and thinkers associated with Vienna at 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 development from the beginning to the modern period; lectures in German, alternating with conferences in English. P, 6 units of upper-division German. 400a is not prerequisite to 400b. Consult department before enrolling.
405. History of the English Language (3) I II (Identical with ENGL 405) May be convened with 505.
410a-410b. Cultural Development of Germany (3-3) Social, political, religious, and artistic elements entering into the growth and development of Germany; lectures in English. 410a is not prerequisite to 410b. 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).
425a-425b. Old English (3-3) (Identical with ENGL 425a-425b) May be convened with 525a-525b.
455. Music and German Literature (3) 1994-95 The interrelationship between music and German literature from the 18th through the 20th century. Concentrates on major works of German music and poetry and their in-depth exploration and their musical settings. Lectures in English. Readings primarily in English, some German. P, 202. (Identical with MUS 455) May be convened with 555.
475a-475b. Advanced 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) I II Issues in and methods of applied linguistics with emphasis on Germanic languages. May be convened with 580.
496. Seminar
   a. Translation (3) [Rpt./2] I II P, 315b.
   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 May be convened with 597a.
   b. Pedagogy (1-5) [Rpt./5 units] I II May be convened with 597b.
   c. Culture (1-5) [Rpt./5 units] I II May be convened with 597c.
   d. Linguistics (1-5) [Rpt./5 units] I II May be convened with 597d.
   e. Translation (1-5) [Rpt./5 units] I II May be convened with 597e.

500. Intensive Reading German for the Sciences and Humanities (4) 5 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 1996-97 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 1995-96 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. Erziehung und Bildung in German Culture (3) II 1995-96 Investigates theories of education and their reflection in literary works. The Bildungswoman, 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 I (Identical with ENGL 505) May be convened with 405.

506. Representing the "Other" (3) II 1995-96 Explores narratives that construct the Other, the foreigner, and the outsider; discusses 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 1996-97 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.

509. Traditions and Modernism (3) I 1995-96 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.

510. Repression, Revolution, Revision (3) I 1996-97 Maps various movements and literatures that resist the repressing of history and stories. Focuses on narrative, memory and the construction of personal and national identities. P, 6 units of upper-division German.

511. Communication and Miscommunication in Middle High and Later German Literatures (3) II 1996-97 Explores the way German writers have dealt with basic issues of human communications. P, 302b, 315b.

520. History of the German Language (3) II 1995-96 Examination of the semantic, socio-historical and structural development of German from the age of migrations to the present. P, 8 units of upper-division German. (Identical with ENGL 520)

525a-525b. Old English (3-3) (identical with ENGL 525a-525b)

555. Music and German Literature (3) I 1996-97 For a description of course topics, see 455. Graduate-level requirements include two oral reports or lectures-recitals on a specific topic. P, 202. (Identical with MUS 555) May be convened with 455.

575a-575b. Advanced 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.

579. Issues in Foreign Language Teaching (3) I For a description of course topics, see 479. Graduate-level requirements include an in-depth research paper on an important issue of foreign language teaching. May be convened with 479.

580. Applied Linguistics for Foreign Language Teaching (3) II For a description of course topics, see 480. Graduate-level requirements include an in-depth research paper on an aspect of applied linguistic research. May be convened with 480.

585. Linguistic and Computer-Assisted Approaches to Literature (3) [Rpt./6 units] I For a description of course topics, see 485. Graduate-level requirements include an 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.

587. Testing and Evaluation in Foreign/Second Language Programs (3) 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).

594. Practicum
   a. Literature (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.
   b. L2 Acquisition and Teaching (1-5) [Rpt./5 units] I II
   c. Culture (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.
   d. Linguistics (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.
   e. Translation (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.

596. Seminar
   a. Literature (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.
   b. L2 Acquisition and Teaching (1-5) [Rpt./5 units] I II
   c. Culture (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.
   d. Linguistics (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.
   e. Translation (1-5) [Rpt./5 units] I II P, competency at fourth year undergraduate level or pass departmental placement examination.

601a-601b. Approaches to German Studies (3-3) An overview of research materials, methods, theories and issues from which individual interests and concentrations in German studies can develop. Provides for the selection of faculty mentors.

696. Seminar
   a. Literature (2-4) [Rpt.] I II
   b. Linguistics (2-4) I II (Identical with ENGL 696b, which is home)
   c. Culture (2-4) [Rpt.] I II
   d. L2 Acquisition and Teaching (2-4) [Rpt.] I II
   e. Translation (2-4) [Rpt.] I II

Gerontological Studies (GERO)

Geronimo Hotel
800 East University Boulevard
Suite 340
(520) 622-9092

Graduate Interdisciplinary Program in Gerontology

Committee:
   Keith E. Meredith, Chair
Professors Audrey L. Holland (Speech and Hearing Sciences), Alfred W. Kaszniaik (Psychology), Theodore H. Koff (Public Administration and Policy)
Associate Professors Patricia C. Fairchild (Exercise and Sports Sciences), Donna Iams (Family Studies), Roy B. Verderery (Medicine)
Assistant Professor Wanda H. Howell (Nutritional Sciences)
Senior Lecturer Patricia A. King (Nursing)

Because of its multidisciplinary nature, gerontological studies serves several ed-
ucational purposes. At the undergraduate level, students in Arts and Sciences may minor in gerontology or select gerontology as one of the three subject areas in the interdisciplinary studies major. Graduate students may pursue a Master of Science with a major in gerontology, a doctoral minor or a graduate certificate in gerontology. In addition to these formally structured academic programs, gerontological studies plays a facilitating role in the coordination and development of aging studies and will guide students interested in incorporating a gerontological emphasis into their own chosen field.

The undergraduate arts and sciences minor consists of 20 units; the interdisciplinary studies major subject area requires 24 units. A gerontological studies advisor is available to aid the student in the selection of courses.

The doctoral minor requires 15 units and is particularly appropriate for students in areas such as education, administration, policy, social welfare, health, nutrition and other disciplines in the social and behavioral sciences.

The Graduate Gerontology Certificate Program offers formal recognition for gerontological study in an 18-unit structured course of graduate study that offers a foundation of gerontological knowledge and theory and an opportunity for the application of knowledge through field work. The program is designed to supplement an undergraduate or graduate degree. It is particularly appropriate for individuals planning to enter or to continue in a profession that involves provision of services and/or administration of programs for the aged, and is well-suited for the working adult. Fifteen units of coursework and 3 units of internship are required. A 3.0 grade-point average is necessary for admission.

The 48-unit Master of Science with a major in gerontology is comprised of 21 units of core courses, a concentration in a related field, internship and electives. Students may elect to complete a thesis or a master's project. Each student's study plan is individually designed to meet the student's special interests and professional objectives. Applicants to the Master of Science program must submit scores from the Graduate Record Exam, three letters of recommendation and a statement of intent. For full standing, a 3.0 grade-point average is required.

Many courses in the curriculum are offered in other departments. These include: EXSS 566, FS 413, 613, 636; PA 424/524, 427/527; PSYC 421, 521, 427/527; SER 455/555. Courses originating in gerontological studies and courses cross-listed with gerontology include:

- 427. Aging and Public Policy (3) I I (Identical with PA 427) May be convened with 527.
- 447. Perspectives in Geriatrics Laboratory (1) I I (Identical with PHPR 447) May be convened with 547.
- 448. Perspectives in Geriatrics (2) I (Identical with PHPR 448) May be convened with 548.
- 457. Law of the Elderly (3) I II 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 PA 457) May be convened with 557.
- 459. Adult Development and Aging (3) I (Identical with PSYC 459) May be convened with 559.
- 470a. Human Adaptability (3) I (Identical with ANTH 470a) May be convened with 570a.
- 527. Aging and Public Policy (3) I I (Identical with PA 527) May be convened with 427.
- 547. Perspectives in Geriatrics Laboratory (1) I I (Identical with PHPR 547) May be convened with 447.
- 548. Perspectives in Geriatrics (2) I I (Identical with PHPR 548) May be convened with 448.
- 557. Law of the Elderly (3) I II For a description of course topics, see 457. Graduate-level requirements include an in-depth research paper utilizing legal material and a class report on that research. (Identical with PA 557) May be convened with 457.
- 559. Adult Development and Aging (3) I (Identical with PSYC 559) May be convened with 459.
- 570a. Human Adaptability (3) I (Identical with ANTH 570a) May be convened with 470a.
- 589. Health of the Older Adult (3) I (Identical with NURS 589).
- 636. Economics of Aging (3) I (Identical with FS 636).

Greek
(See Classics)

Health Education
(See Health-Related Professions)

Global Change (GC)
The Institute for the Study of Planet Earth offers a minor in global change for students pursuing the Ph.D. degree. For information consult the graduate catalog or the Institute for the Study of Planet Earth at 1439 E. Helen St., Tucson, Arizona 85719. Phone (520) 621-9010.

572. Global Biogeochemical Cycles (3) I Study of processes affecting global chemical fluxes. Particular attention to current global concerns, i.e., ozone hole, carbon cycle, climate warming, atmospheric oxidation, hydrologic cycle. (Identical with GEOS 572 and HWR 572)

Graduate Interdisciplinary Programs
1010 N. Martin Avenue
(520) 621-8368; FAX: (520) 795-0996
Graduate interdisciplinary 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
Epidemiology
Genetics
Gerontological Studies
Global Change
Insect Science
Latin American Studies
Neuroscience
Nutritional Sciences
Optical 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 "Graduate Interdisciplinary Programs" under The Graduate College section elsewhere in this catalog.

*Affiliate Program

Italian
(See French and Italian)

Japanese
(See East Asian Studies)

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.

At the time this catalog was being edited, the School of Health Related Professions and its major programs were undergoing review and reorganization. All current and prospective students considering application to one of the undergraduate programs or graduate majors offered by the School should check with the academic advisors for that major.

Community and Environmental Health

1435 N. Fremont Ave., Room 111
(520) 882-5852

Associate Professors Richard L. Papenfuss, Kam Nasser
Assistant Professor Scott J. Leischow
Clinical Assistant Professors Clifton D. Crutchfield (Family and Community Medicine), Mark D. Van Ert (Family and Community Medicine)
Clinical Instructor Sheila H. Parker (Family and Community Medicine)

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, 400, 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 (2) 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) 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 II 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 S Open to pre-med students only.

400. Contemporary Community Health Problems (3) II Analysis of the concept of community health services, human ecology, and conservation of human resources, with emphasis on modern illnesses 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 For description of course topics, see 430. Graduate students will be required to write an in-depth research paper. May be convened with 430.

530. Theory-based Approaches in Health Education/Health Promotion (3) I For description of course topics, see 430. Graduate students will have the additional responsibility of writing a mock grant proposal. May be convened with 432.

532. Program Planning and Education in Health Education/Health Promotion (3) I 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) II 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 instruments and strategies, quality control, and statistical analysis, with emphasis on instrument selection and calibration. 2R, 3L. P, 486. CHEM 322, 323. May be convened with 502. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog). May be convened with 502.

410. Physical Exposures (3) II Recognition, evaluation, and control of physical exposures, including radiation, noise, vibration, and heat stresses. Student is required to recognize potential exposures, use correct instrumentation to collect and evaluate data, and develop controls. 2R, 3L. P, 486. Identical with TOX 410. May be convened with 510.

454. 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, 486.
Exercise and Sport Sciences (EXSS)

Ina E. Gittings Building, Room 101
(520) 621-6989

Professors Anne E. Atwater, Interim Head, Timothy G. Lohman, Donna Mae Miller (Emeritus), Frederick B. Roby (Emeritus), Mary P. Roby (Emerita), Charles M. Tipton, Jean M. Williams

Associate Professors Boyd B. Baker, Gary D. Delforge, Patricia C. Fairchild, Ralph F. Fregosi, Bruce A. Larson, Richard A. Munroe (Emeritus), Kathryn R.E. Russell, Darrell G. Simko Assistant Professor Erik J. Henriksen

Lecturers Judy A. Sorensen, Ronald A. Sutherland

Adjunct Lecturers Thomas L. Akers, Michael E. Haddow

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.

Students pursuing the interdisciplinary studies majors or other majors in Arts and Sciences may elect to take at least 24 EXSS approved units as Subject Area III or minor. Students must receive written approval for their selected study program from the College of Health Related Professions advisor.

The athletic coaching minor (available only students majoring in secondary education via the College of Education): 285, 360, 373, 374, 377, 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 for 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, 394b. A departmental skills requirement must be satisfied through a 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 2-day field trip.
110. Badminton (1) I II
a. Beginning Badminton
b. Intermediate Badminton
114. Basketball (1) I II
c. Intermediate Basketball
116. Body Dynamics (1) I II
120. Human Physiology: The Facts of Life (4) II Introduction to human biological function ranging from the cellular to the organ system level with a focus on situations encountered in daily life. (Identical with MCB 120)
123. Country Swing (1) I II S
125. Cycling (1) I II
132. Fencing (1) I II
a. Beginning Fencing
b. Intermediate Fencing
136. Beginning Folk Dance (1) S Daily, group instruction in folk dances of different regions of Mexico. Offered in Guadalajara only. 55.
137. Golf (1) I II S Fees.
a. Beginning Golf
b. 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
a. Beginning Karate
b. Intermediate Karate P, 148a
225. Soccer (1) I II

221. Women’s Gymnastics (1) II

218. Football (1) II

213. Basketball (2) I II

211. Badminton (1) I II

164. Soccer (1) I II
  a. Beginning Soccer
  b. Intermediate Soccer

165. Social Dance (1) [Rpt./2 units] I II

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 P, 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
  b. Intermediate Volleyball
  c. Advanced Volleyball

184. Weight Training (1) I II S
  a. Beginning Weight Training

Anatomy and Physiology

201. Human Anatomy and Physiology I (4) I S
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 S
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. P, 201.

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

221. Women’sGymnastics (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

229. Swimming—LifeGuard Training (2) I*

230. Tennis (2) I II

231. Track and Field (2) II

232. Volleyball (2) 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, Lifeguard Training, and Lifeguard Training Review courses. 4S. P. 150. Sutherland

263. 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.

279. Motor Development (2) I II
Developmental changes in motor patterns of children and adults; methods of diagnostic evaluation of motor skill performance and the selection of appropriate movement experiences.

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. 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.

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 philosophical thought and influences on current practices. Simko

294. Practicum

308. Introduction to Exercise Sciences (2) I
Introduction to the interdisciplinary nature of the exercise sciences; historical perspectives, areas of research, and career opportunities. P, 201, 202. Henriksen

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 the knowledge and skill competencies necessary for teaching fundamental movements, rhythms and dance, gymnastics, games and sports to children. Open to physical education majors only.

351. Elementary School Physical Education (2) I II S
Purposes and practices of physical education at the elementary school level; instruction in recommended activities; teaching and evaluation techniques; class organization.

354. Theory of Coaching (2) I II
Advanced instruction in sports common to secondary school curricula; teaching and coaching principles, advanced techniques, and organizational and practice methods. P. 285 (not required for athletic coaching minor).

355. Physical Education Instruction Strategies (2) I
Analysis of alternative models of teaching physical education; research of teaching physical education; and systematic analysis of physical education teacher effectiveness. Open to majors only. P. 285, 394b or CR.

360. Functional Kinesiology (3) I II
Anatomical and mechanical factors affecting human movement, particularly in sport and exercise situations. Open to physical education majors only. P, 201, 202, MATH 117R/S.

371. Special Physical Education (3) I II
Designed to provide the knowledge and experience necessary for the physical education and recreation of persons having various handicaps. Three hours per week of related experiences by arrangement required. P. 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. Open to physical education majors only. P, CHEM 103a-103b, 104a-104b, EXSS 201, 202.

374. Physiological Basis of Physical Education and Athletics Laboratory (1) I P, CR 373.
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. Delforge


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. Fairchild

385. Principles of Athletic Coaching (3) II Duties, responsibilities and ethics of the athletic coach; the role of interscholastic sport in public school settings with emphasis on administrative 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.

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, BIOC 460 or 462a, CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b, EXSS 201, 202, MATH 117R/S, 118, PHYS 102,103. May be convened with 520. Fregosi

421. Exercise Physiology Laboratory (2) I P, CR, 420. May be convened with 521.

440. Nutrition in Exercise and Sport (3) I II Integration of current concepts and principles in nutrition with known biochemical and physiological responses to acute and chronic exercise. P, 420 and N SC 208. May be convened with 540. Tipton

445. Evaluation and Regulation of Body Build and Composition (3) I Laboratory and field assessment of body fat, lean body mass and comatotype, anthropometry; 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) II Theory and methods of providing movement experiences for young children; emphasis placed upon curriculum development, methods of teaching, class organization, and management. Practical experiences at the elementary level. Open to physical education majors only. P, 221, 231, 285, 350.

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. P, 201, 202, 462, MATH 124 or 125a, PHYS 102, 103, 181, 182. May be convened with 560. Atwater


477. Advanced Sport Injury Management (3) II 1995-96 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 exercise science majors only. P, 420, 421. May be convened with 595a. Writing-Emphasis Course for exercise sciences majors. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog).
b. Biomechanics (2) [Rpt./1] I P, 462. May be convened with 595b.
c. Current Issues in Space Physiology (2) [Rpt./1] I II P, 420. May be convened with 595c.
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 P, 420. May be convened with 595f.
g. Kinesiology (2) [Rpt./1] I II P, 462. May be convened with 595g.

496. Seminar
b. Introduction to Microcomputers (1) I May be convened with 596b. Atwater

497. Workshop
a. Physical Education Student Teaching Forum (1) I II Open to physical education majors only. CR, TTE 493a or 493b.

502. Principles of Neuroanatomy (4) II (Identical with CBA 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-review paper on an approved topic. P, BIOC 460 or 462a, CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b, EXSS 201, 202, MATH 117R/S, 118, PHYS 102, 103. May be convened with 420. Fregosi

521. Exercise Physiology Laboratory (2) I Graduate-level requirements include additional laboratory reports. P, CR, 520. May be convened with 421.


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. (Identical with PHL 527) Williams

528. Stress Management for Performance and Health (3) I Examines within a biopsychosocial framework the concept 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 application 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 others interested in various functions involved in the conduct of sport programs. Baker

540. Nutrition in Exercise and Sport (3) I II For a description of course topics, see 440. Graduate-level requirements include an in-depth research paper on an approved topic. P, 520 and N SC 208. May be convened with 440. Tipton

545. Evaluation and Regulation of Body Build and Composition (3) I For 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) II For a description of course topics, see 460. Graduate-level requirements include a research project. P, 201, 202, 562, MATH 124 or 125b, PHYS 102, 103, 181, 182. May be convened with 460. Atwater

562. Neuromechanical Kinesiology (3) II For a description of course topics, see 462. Graduate-level requirements include a research paper. P, 201, 202, MATH 118, PHYS 102, 103, 181, 182. May be convened with 462.

566. Physical Activity in Aging and Chronic Diseases: Psychosocial Aspects (3) I Psychological dimensions of exercise programs designed for populations with chronic disease 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. 

571. Laboratory in Research Design for Exercise and Sport Sciences (1) Laboratory experiences in literature retrieval systems; data analysis procedures by calculator, microcomputer, and mainframe computer; critical analysis of research articles, and participation in a 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 emphasis on appropriateness of selected designs and interpretation of various data analysis procedures. Statistical power, reliability, covariance and multiple regression techniques and uses of micro- and mainframe data analysis software. P, 570 and 571. 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, 377; 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; negligence theory; common defenses; product liability; insurance; legal implications for program development and methodology. Baker

588. 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

593. Internship
- b. Sport Psychology (1-3) [Rpt./6 units] I II S P, 528 or 529.

595. Colloquium
- a. Research in Exercise Sciences (1) [Rpt./1] I II. Open to majors only. May be convened with 495a.
- b. Biomechanics (2) [Rpt./1] I P, 562. Graduate-level requirements include a literature review paper. May be convened with 495b.
- c. Current Issues in Space Physiology (2) [Rpt./1] I P, 520. Graduate-level requirements include leading discussion of one of the colloquium topics and preparation of a report summarizing the physiological data obtained from one of the NASA space missions. May be convened with 495c.
- 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 495e.
- f. Integrative Cardiorespiratory Physiology (2) [Rpt./1] I P, 520. May be convened with 495f.
- g. Kinesiology (2) [Rpt./1] I II P, 562. Graduate-level requirements include leading discussion of one of the colloquium topics and preparation of a mini-grant proposal on a colloquium topic. May be convened with 495g.

596. Seminar
- a. Introduction to Microcomputers (1) I II May be convened with 496b. Atwater

597. Workshop
- a. Biofeedback: Theory and Application (1)
- b. Laboratory Rotations (1-3) I II S 3-9L. Open to majors only. P, 570, 571.

691. Preceptorship
- a. Laboratory Rotations (1-3) I II S 3-9L. Open to majors only. P, 570, 571.
- b. Motor Control (2) [Rpt./8 units] II P, PSIO 480 and consult department before enrolling. (Identical with NEUR 573.)
- c. Preceptorship
- d. Intensive Care (2) [Rpt./1] II Lectures encompassing the fundamentals of critical care medicine including pathophysiology with emphasis on the management of critically ill patients. P, CR, 475R.
- e. Prevention and Management of Acute Cardiac Conditions (2) [Rpt./1] II Lectures on the clinical management of acute cardiac conditions. P, CR, 475R.
- f. Management of Acute and Chronic Lung Disease (2) [Rpt./1] II Lectures on the management of acute and chronic lung disease. P, CR, 475R.
- g. Cardiovascular Physiology (2) [Rpt./1] II Lectures in cardiac function and regulation. P, CR, 475R.

791. Internship
- a. Sport Psychology (1-3) [Rpt./12 units] I II S 5, 528 or 529.

Medical Technology (MEDT)
232 Health Related Professions

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). Post-baccalaureate students who meet certain minimum requirements may apply for the professional training to become M.T. certification eligible. Students in this category should contact the Program Office for more information.

195. Colloquium
- a. Introduction to Clinical Laboratory Medicine (1) II Course offered superior/pass/fail

387. Contemporary Perspectives of the Medical Technology Professions (3) I [Rpt./1] History and current social and economic issues facing the profession of medical technology. Effects of recent legislation on laboratory management. P, consult program director before enrolling.

471R. Lectures in Clinical Hematology (5) [Rpt./1] II Lectures in basic hematology and hematological procedures including cell structure and function, inherited and acquired anomalies, hemostasis, cell enumeration and differentiation, cytogenetics, P, consult program director before enrolling. May be convened with 571R.

471L. Fundamental Laboratory Techniques in Clinical Hematology (2) [Rpt./1] II Basic laboratory techniques in clinical hematology with emphasis on manual and automated hematological procedures. Instruction includes proper procedural methodologies, quality control, the use of controls and standards, and interpretation of laboratory test results. P, CR, 471R/571L, consult program director before enrolling. May be convened with 571L.

472R. Lectures in Clinical Immunology and Immunohematology (4) [Rpt./1] I Lectures in serological methods used in the clinical laboratory and interpretation of results; blood banking procedures. P, consult program director before enrolling. May be convened with 572R.

472L. Fundamental Laboratory Techniques in Clinical Immunology and Immunohematology (2) [Rpt./1] II Basic laboratory techniques in serological procedures and blood banking. Emphasis will be placed on procedural methodologies, quality control, the use of controls and standards, and interpretation of laboratory test results. P, CR, 472R/572R, consult program director before enrolling. May be convened with 572L.

473R. Lectures in Clinical Chemistry (5) [Rpt./1] II Lectures encompassing the fundamental concepts of clinical laboratory chemistry including pathophysiology and clinical correlations, P, consult program director before enrolling. May be convened with 573R.

473L. Fundamental Laboratory Techniques in Clinical Chemistry (2) [Rpt./1] II Basic laboratory techniques in clinical chemistry.
Emphasis will be placed on procedural methodologies, quality-control, the use of controls and standards, and interpretation of laboratory test results. P, CR, 473R/573R, consult program director before enrolling. May be convened with 573L.

474R. Lectures in Clinical Bacteriology (5) [Rpt./1] I Lectures relating to laboratory techniques used to safely isolate and identify pathogenic bacteria. Special media/tests, organismal virulence factors, pathologic effects occurring within the host and antibiotic susceptibility testing of bacteria are covered. P, consult program director before enrolling. May be convened with 574R.

474L. Fundamental Laboratory Techniques in Clinical Bacteriology (2) [Rpt./1] I Basic laboratory techniques used in the isolation and identification of bacterial pathogens for humans. Standard and specialized media/biochemical tests are utilized. P, CR 474R/574R, consult program director before enrolling. May be convened with 574L.

475a-475b-475c. Topics in Clinical Microbiology (2-3-1) [Rpt./1] II 475a: Clinical Parasitology. Diagnostic methodologies with emphasis on the laboratory identification of clinically relevant parasites. P, 475b: Clinical Virology. Diagnostic methodologies with emphasis on the laboratory identification of clinically relevant viruses. 475c: Clinical Mycology and Mycobacteriology. Diagnostic methodologies with emphasis on the laboratory identification of clinically relevant fungi and Mycobacterium sp. P, consult program director before enrolling. May be convened with 575a-575b-575c.

476. 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.

481. Clinical Laboratory Hematology (4) [Rpt./1] I For a description of course topics, see 481L. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory hematology. P, consult program director before enrolling. May be convened with 481R.

481L. Lectures in Clinical Hematology (5) [Rpt./1] II For a description of course topics, see 481R. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical hematology. P, CR 481R/571R, consult program director before enrolling. May be convened with 481L.

482. Clinical Laboratory Immunology and Immunohematology (4) [Rpt./1] I For a description of course topics, see 482L. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory serology or blood banking. P, consult program director before enrolling. May be convened with 482R.

482L. Lectures in Clinical Immunology and Immunohematology (5) [Rpt./1] II For a description of course topics, see 482R. Graduate-level requirements include a research paper relating to new laboratory methodologies in clinical serology or blood banking. P, CR 482R/572R, consult program director before enrolling. May be convened with 482L.

483. Clinical Laboratory Microbiology (5) [Rpt./1] I II For a description of course topics, see 483L. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical serology or blood banking. P, CR 483R/573R, consult program director before enrolling. May be convened with 483R.

483L. Lectures in Clinical Microbiology (5) [Rpt./1] II For a description of course topics, see 483R. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical microbiology. P, CR 483R/573R, consult program director before enrolling. May be convened with 483L.

484. Clinical Laboratory Microbiology (5) [Rpt./1] I II For a description of course topics, see 484L. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical microbiology. P, CR 484R/574R, consult program director before enrolling. May be convened with 484R.

475c/575c, 476/576, 496a, consult program director before enrolling. May be convened with 584.

496. 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 committee before enrolling.

571R. Lectures in Clinical Hematology (5) [Rpt./1] II For a description of course topics, see 471R. 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 471R.

571L. Fundamental Laboratory Techniques in Clinical Hematology (2) [Rpt./1] II For a description of course topics, see 471L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical hematology. P, CR 471R/571R, consult program director before enrolling. May be convened with 471L.

572R. Lectures in Clinical Immunology and Immunohematology (4) [Rpt./1] I For a description of course topics, see 472R. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory serology or blood banking. P, consult program director before enrolling. May be convened with 472R.

572L. Fundamental Laboratory Techniques in Clinical Immunology and Immunohematology (2) [Rpt./1] I For a description of course topics, see 472L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical serology or blood banking. P, CR 472R/572R, consult program director before enrolling. May be convened with 472L.

573R. Lectures in Clinical Chemistry (5) [Rpt./1] II For a description of course topics, see 473R. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory chemistry. P, CR 473R/573R, consult program director before enrolling. May be convened with 473R.

573L. Fundamental Laboratory Techniques in Clinical Chemistry (2) [Rpt./1] II For a description of course topics, see 473L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical chemistry. P, CR 473R/573R, consult program director before enrolling. May be convened with 473L.

574R. Lectures in Clinical Bacteriology (5) [Rpt./1] I For a description of course topics, see 474R. Graduate-level requirements include a research paper on selected topics relating to clinical laboratory bacteriology. P, consult program director before enrolling. May be convened with 474R.

574L. Fundamental Laboratory Techniques in Clinical Bacteriology (2) [Rpt./1] I For a description of course topics, see 474L. Graduate-level requirements include a research paper relating to new laboratory methodologies applicable to clinical bacteriology. P, CR 474R/574R, consult program director before enrolling. May be convened with 474L.

575a-575b-575c. Topics in Clinical Microbiology (2-1-1) [Rpt./1] II For a description of course topics, see 475a-475b-475c. Graduate-level requirements include a research paper on selected topics relating to clinical parasitology, virology, mycology or mycobacteriology. P, consult program director before enrolling. May be convened with 475a-475b-475c.

576. 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.

581. Clinical Laboratory Hematology (4) [Rpt./1] II S For a description of course topics, see 481. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical hematology. P, CR 473R/573R, consult program director before enrolling. May be convened with 473L.

582. Clinical Laboratory Immunology and Immunohematology (5) [Rpt./1] III For a description of course topics, see 482. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical immunology. P, CR 471R/571R, consult program director before enrolling. May be convened with 471R.

583. Clinical Laboratory Microbiology (5) [Rpt./1] II For a description of course topics, see 483. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical microbiology. P, CR 471R/571R, consult program director before enrolling. May be convened with 471R.

584. Clinical Laboratory Microbiology (5) [Rpt./1] III For a description of course topics, see 484. Graduate-level requirements include a research paper relating to advanced laboratory methodologies in clinical microbiology. P, CR 471R/571R, consult program director before enrolling. May be convened with 471R.

585a-585b-585c. Topics in Critical Languages Program

591. Hindi-Urdu (See Critical Languages Program)

History (HIST)

Social Sciences Building, Room 215
(520) 621-1586; FAX: (520) 621-2422

Professors Helen Nader, Head, Herman E. Bateman (Emeritus), Gail Bernstein, Robert P. Browder (Emeritus), Paul A.
History explores patterns and processes of change around the world and across time in an effort to demonstrate how diverse societies and cultures have confronted challenges common to the human experience. Rooted in the empirical study of particular areas and periods, the discipline also draws broadly on concepts and theories from the social sciences and humanities. Practical training in historical research promotes skills in writing and critical analysis that are the foundation of contemporary liberal arts education.

The department offers the degrees of Bachelor of Arts, Master of Arts and Doctor of Philosophy with a major in history. A Bachelor of Arts in Education and a Master of Education with a teaching major in history are also available. For information on graduate degrees, please see the Graduate Catalog.

The major: 33 units, including 396a, 3 units in a course dealing with the period before 1500, and 6 units in three of the following areas: United States, Latin America, Europe, 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 major in history assumes moderate knowledge of mathematics. Students must complete MATH 117 or MATH 121 or equivalent.

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 II 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 I II S
The western heritage of ideas, values, and artistic expression in interaction with economic, social, and political processes and experiences.

103. Topical Approaches to Western Civilization (3) I II [Rpt. /9 units] Topical approaches (e.g., slavery, imperialism, environmental history) to issues in civilization. Consult department for details.

107. 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 II (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)

195. Colloquium
a. Debates with Historians (2) I Open to freshmen

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 social, political and economic trends in their historical context. (Identical with MAS 233)

236. Indians in U.S. History (3) History of Indians in U.S. development from 1500 to the present with emphasis on relations between competing Indian groups and between Indians and whites.

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.

249. Technology and the Growth of Civilizations (3) II (Identical with ANTH 249)

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 WS 253a-253b)

270. Modern East Asia (3) II Introductory survey of recent histories of China, Japan and Korea, focusing on the major watershed in these countries' modern experiences. The roles of indigenous culture and forces of change as well as foreign influences will be considered. (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) I (Identical with JPN 272)

315. United States Military History (3) I Survey of American wars from colonial times to the present; military institutions, doctrine, application of the principles of war, campaign strategies and tactics, technology, and leadership.

317. History of Modern Ireland (3) II 1996-97 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) II Survey of the origins and development of the English common law from the Anglo-Saxons to the present.


339. Cultural Traditions, Technology and Business (3) Traces the technological aspects of North Atlantic civilization and culture with emphasis on the role of technology in nineteenth and twentieth century capitalist development.

345. New American West (3) I II 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)

Carter (Emeritus), Richard A. Cosgrove, Leonard Dinnerstein, Richard M. Eaton, Donna J. Guy, Harwood Hinton (Emeritus), Ursula Lamb (Emerita), Oscar Martinez, John V. Mering (Emeritus), Michael C. Meyer, Roger L. Nichols, Heiko A. Oberman, J. Gregory Oswald (Emeritus), Thomas W. Parker (Emeritus), Michael Schallert, Robert Vignery, Donald Weinstein (Emeritus)

Associate Professors Karen S. Anderson, Alan E. Bernstein, George Brubaker (Emeritus), Roger deLaix (Emeritus), Edwin M. Gaines Emeritus), Juan R. Garcia, Kevin Gosner, Frederick Kellogg, Jack D. Marietta, Hermann Rebel, Laura Tabili, Douglas Weiner

Assistant Professors Bert Barickman, John Campbell, Linda Darling, Maureen Fitzgerald, Alison Futrell, Nancy Hunt, James Millward, Katherine Morrissey

For information on graduate degrees, please see the Graduate Catalog.
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 ideologically change on race and class relations in Latin America from the 16th to early 20th century. (Identical with AAS 351 and LA S 351)

352. Slavery in Latin America (3) I A broadly comparative introduction to slavery in Latin America and the Caribbean. Exploration of slavery, the use of slave labor, and the daily lives of slaves and slaveowners in different settings and different cultures. (Identical with LAS 352)

361. The U.S.-Mexico Border Region (3) I Evolution of the borderlands since the mid-nineteenth century, with emphasis on bi-national 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 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, RELI 374 and RSS 374)

375. History of China (3) I (Identical with CHN 375)

376. History of China (3) II (Identical with CHN 376)

377a-377b. Modern Israel (3-3) (Identical with JUS 377a-377b)

381a-381b. History of Muslim Societies (3-3) 381a: Rise of Islam, creation of Islamic society, relationship of religion and politics. 381b: Evolution and global spread of Muslim societies, modernization and its problems (Identical with NES 381a-381b)

384. Topics in African History (3) [Rpt] II Regional and/or thematic topics in precolonial, colonial and postcolonial African history, including oral tradition, slavery, religious movements, health and healing, imperialism, and political economy. P, HIST 190 or consent of instructor (Identical with AAS 384)

396. Proseminar a. Nature and Practice of History (3) I II Open to majors only; exception by permission of department. Writing-Emphasis Course.*

396H. Honors Proseminar (3) I 401. Ancient Mesopotamia (3) I (Identical with NES 401) May be convened with 501.

403a-403b. History of Greece (3-3) 403a: From prehistoric times to the outbreak of the Peloponnesian War. 403b: From the outbreak of the Peloponnesian War to the end of the Hellenistic Age. 403a is not prerequisite to 403b. (Identical with CLAS 403a-403b)

404a-404b. History of Rome (3-3) 404a: The Republic to the death of Caesar. 404b: The Empire through the reign of Constantine the Great. 404a is not prerequisite to 404b. (Identical with CLAS 404a-404b) May be convened with 504a-504b.

405a-405b. Medieval Europe (3-3) Major institutions and trends in Europe from the breakup of the Roman world to the 14th century. 405a is not prerequisite to 405b. P, 3 units of lower-division European history. (Identical with RELI 405a-405b) May be convened with 505a-505b.

406. Medieval England (3) II From the Norman conquest to the Hundred Years War, with emphasis on political, social, and cultural developments. P, 3 units of lower-division European history. (Identical with RELI 406) May be convened with 506.


408. The Renaissance (3) I Europe between the 14th and 16th centuries with special emphasis on Italy as the seat of the Renaissance. Topics include the city states, humanism, the Church in an age of Schism and secularization, Renaissance art, the New Monarchies and European exploration and imperialism. P, 3 units of European history. (Identical with RELI 408) May be convened with 508.

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. Twentieth Century Europe: War, Peace and Social Change (3) II History of twentieth century Europe, examining global processes including imperialism and the two world wars interacting with ongoing changes in domestic politics, society and culture. 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) I 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) 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 RSS 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 RSS 422) May be convened with 522.

423. Intellectual History of Russia (3) II Historical significance of social, political and scientific thought in 19th- and 20th-century Russia. P, 3 units of any history course. (Identical with RSS 423) May be convened with 523.

424. The Modernization of Russia, 1856-1935 (3) I Social history of Russia from the emancipation of the serf to the establishment of the Stalinist system. P, 3 units of any history course. (Identical with RSS 424) May be convened with 524.

425. History of the Soviet Union (3) I The Bolshevik Revolution and problems of Soviet and Russian history from 1917 to the present. P, 3 units of any history course. (Identical with RSS 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 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 survey 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) I 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. 1861-1878 (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.

441. 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 541.

443. History of American Society and Thought Since the Civil War (3) I II The transformation of American minds since the Civil War as expressed in literary, philosophic, religious, and other cultural forms. May be convened with 543.

446. History of Arizona and the Southwest (3) I II Economic, social and political development of the state and region from Spanish times to present. May be convened with 546.

449. History of American Foreign Relations to 1914 (3) I Examine 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) I Examine the pivotal role played by the United States in world affairs since WWI, 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 burning, incarceration and torture; its development; its vicars; New and Old Christians, and witches. (Identical with JUS 454 and RELI 454) May be convened with 554.

455. History of Women in Europe (3) I History of women in Europe covering topics such as women's work in family-based economic systems and in religious, political and cultural life, and the impact of larger historical changes. P, junior standing. (Identical with W S 455) May be convened with 555.

456. 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 556.

458. Topics in Comparative Women's History (3) II Comparative, thematic approaches to the history of women in different regions of the world. Topics may include women and religion; women in public health; women and sexuality. 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 The impact of conquest and the making of the Andean world and of Latin America. P, 3 units of any U.S. history survey course. May be convened with 561.

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.

467. Contemporary Latin America (3) I Revolution, social change and reaction in Latin America from 1930 to the present. P, junior or senior standing. (Identical with LA S 467) May be convened with 567.

468a-468b. Asia and the West (3-3) Processes of interaction between Europeans and the peoples and cultures of the Middle East, South Asia, and East Asia, from the Portuguese explorations to the present. (Identical with NES 468a-468b) May be convened with 568a-568b. Writing-Emphasis Course* for general major.

469. History of Women in Latin America (3) I II Women's history in Latin America from the Conquest to the present. P, junior or senior standing and 3 units of any lower-division Latin American history or women's studies course. (Identical with LA S 469 and W S 469) May be convened with 569.

470. Religious History of India (3) Development of major religious traditions of South Asia: Vedic Religion, Buddhism, Jainism, Hinduism, Sikhism, and Islam. (Identical with NES 470 and RELI 470) May be convened with 570.

472. History of Medieval India (3) I Survey of Indian history from the 7th century to 1750. (Identical with NES 472) May be convened with 572.

473. History of Modern India and Pakistan: 1750-Present (3) II Survey of political, social and economic developments in South Asia from the mid-18th century to the present. (Identical with NES 473) May be convened with 573. Writing-Emphasis Course* for India-Pakistan specialization.

474a-474b-474c. History of Japan (3-3-3) Social, cultural, economic and political history of Japan. 474a: From earliest times to 1500. 474b: 1500-1800. 474c: 1800-present. (Identical with JPN 474a-474b-474c). P, junior or senior standing and 3 units of any history course. May be convened with 574a-574b-574c.

475a-475b-475c-475d-475e. Asia and the West (3-3-3-3-3) Processes of interaction between Europeans and the peoples and cultures of the Middle East, South Asia, and East Asia, from the Portuguese explorations to the present. (Identical with CHN 475a-475b-475c-475d-475e) May be convened with 575a-575b-575c-575d-575e.

476. Modern China (3) I Survey of political, social, economic and cultural transformations undergone by China from ca. 1800 to the present. Provides students with a sense of both the major themes and the substance of the last two centuries of history of one of the world's major civilizations, as well as a better understanding of China's prominent position in the world today. (Identical with CHN 476) May be convened with 576.

477a-477b. History of the Middle East (3-3) (Identical with NES 477a-477b) May be convened with 577a-577b.

478. Modern History of the Middle East (3) I (Identical with NES 478) May be convened with 578.

479. The Ottoman Empire to 1800 (3) I II History of Ottoman Empire from its origins
through the direct Western European impact, focusing on the political and social history of the empire in Europe and Asia. May be convened with 579.

481. Work, Motherhood and Female Identity in America: 1945 to the Present (3) I (Identical with WS 481) May be convened with 581.

482. Social History of China (3) (Identical with CHN 482) May be convened with 582.

483. Gender and African History (3) I II The history of men, women, gender relations, and gender meanings in sub-Saharan Africa. The importance of gender analysis, both sociological and symbolic, to understanding African history. P, 3 units or consent of instructor (Identical with WS 483) May be convened with 583.

488. History of Byzantium (3) II Political, social, and cultural history of Byzantium from A.D. 325 to 1453, including the Byzantine legacy in Europe and the Middle East. (Identical with CLAS 488 and RELI 488) May be convened with 588.

489. Women in East Asia (3) I Women in traditional China and Japan; analysis of changes occurring in the modern period. P, junior or senior standing. (Identical with EAS 489 and WS 489) May be convened with 589.

490. Philosophy of History (3) I Introduction to historical thinking from antiquity to the present, with emphasis on ideas in European and North American historical writings during the modern and contemporary eras. May be convened with 590.

495. Colloquium a. Studies in Early Europe (3) [Rpt./1] I II P, one semester of history. b. Studies in Black America (3) I II (Identical with AAS 495b) c. Chinese History Since 1949 (3) I II (Identical with CHN 495b) May be convened with 595b.

*Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines section of this catalog)

501. Ancient Mesopotamia (3) I (Identical with NES 501) May be convened with 401.

504a-504b. History of Rome (3-3) For a description of course topics, see 404a-404b. Graduate-level requirements include an additional in-depth research paper. May be convened with 404a-404b.

505a-505b. Medieval Europe (3-5) For a description of course topics, see 405a-405b. Graduate-level requirements include an additional work with primary and foreign language secondary sources. 505a is not prerequisite to 505b. May be convened with 405a-405b.

506. Medieval England (3) II For a description of course topics, see 406. Graduate-level requirements include additional work with primary and foreign language secondary sources. May be convened with 406.

507a-507b. Intellectual History of Medieval Europe (3-3) II For a description of course topics, see 407a-407b. Graduate-level requirements include additional work with primary and foreign language secondary sources. 507a is not prerequisite to 507b. May be convened with 407a-407b.

508. The Renaissance (3) I For a description of course topics, see 408. Graduate-level requirements include an in-depth research paper. May be convened with 408.

509. The Reformation (3) II For a description of course topics, see 409. Graduate-level requirements include an in-depth research paper. May be convened with 409.

510. History of Hell in Early Europe (3) II For a description of course topics, see 410. Graduate-level requirements include additional work with primary and foreign language secondary sources. May be convened with 410.

511. European Social and Intellectual History to 1750 (3) I For a description of course topics, see 411. Graduate-level requirements include more advanced readings and an in-depth research paper. May be convened with 411.

512. European Intellectual History: 1750 to 20th Century (3) II For a description of course topics, see 412. Graduate-level requirements include an in-depth research paper. May be convened with 412.

513. Twentieth Century Europe: War, Peace and Social Change (3) II For a description of course topics, see 413. Graduate-level requirements include extra reading, additional papers and extra meetings. May be convened with 413.

514. Cultural History of Germany to 1714 (3) I For a description of course topics, see 414. Graduate-level requirements include a research paper. May be convened with 414.

515. Cultural History of Germany 1714 to 1989 (3) II For a description of course topics, see 415. Graduate-level requirements include a research paper. May be convened with 415.

516. Tudor-Stuart England (3) I For a description of course topics, see 416. Graduate-level requirements include a paper on the historiography of a problem currently debated by historians writing on this period. May be convened with 416.

517. History of Modern Britain (3) II For a description of course topics, see 417. Graduate-level requirements include a paper in the historiography of a problem currently debated by historians writing on this period. May be convened with 417.

518. France under the Old Regime, 1589-1789 (3) I For a description of course topics, see 418. Graduate-level requirements include substantial additional independent reading. May be convened with 418.

519. The French Enlightenment (3) I For a description of course topics, see 419. Graduate-level requirements include an additional, substantial independent reading. May be convened with 419.

520. The French Revolution and Napoleon (3) II For a description of course topics, see 420. Graduate-level requirements include substantial additional independent reading. May be convened with 420.

521. History of Russia: Early Period (3) I For a description of course topics, see 421. Graduate-level requirements include a research paper. May be convened with 421.

522. History of Russia: Modern Period (3) II For a description of course topics, see 422. Graduate-level requirements include a research paper. May be convened with 422.

523. Intellectual History of Russia (3) II For a description of course topics, see 423. Graduate-level requirements include a research paper. May be convened with 423.

524. The Modernization of Russia 1856-1935 (3) I For a description of course topics, see 424. Graduate-level requirements include a research paper. May be convened with 424.

525. History of the Soviet Union (3) I For a description of course topics, see 425. Graduate-level requirements include a research paper. May be convened with 425.

531. Colonial America (3) I For a description of course topics, see 431. Graduate-level requirements include different, additional reading and reports thereon. May be convened with 431.

532. The Era of the American Revolution (3) II For a description of course topics, see 432. Graduate-level requirements include different, additional reading and reports thereon. May be convened with 432.

533. Jefferson and the New Nation, ca. 1790-1828 (3) I For a description of course topics, see 433. Graduate-level requirements include an additional, substantial research or historiographical paper, to be decided on in consultation with the instructor. May be convened with 433.

534. Jacksonian Era, 1828-1856 (3) I II For a description of course topics, see 434. Graduate-level requirements include an additional, substantial research or historiographical paper, to be decided on in consultation with the instructor. May be convened with 434.

535. The Coming of the Civil War, U.S. 1845-1861 (3) I For a description of course topics, see 435. Graduate-level requirements include a research exercise. May be convened with 435.

536. Civil War and Reconstruction, U.S. 1861-1878 (3) I II For a description of course topics, see 436. Graduate-level requirements include a research exercise. May be convened with 436.

537. U.S. 1876-1919: The Gilded Age and Progressive Era (3) For a description of course topics, see 437. Graduate-level requirements include an in-depth research paper. May be convened with 437.

538. U.S. 1918-1945: From World War I through World War II (3) For a description of course topics, see 438. Graduate-level requirements include taking examinations which consist entirely of essay questions, completing a research paper on a topic chosen in consultation with the professor, assisting the professor in leading discussion groups with undergraduate students over the assigned readings, providing questions from those readings for use by the professor in formulating quizzes for the undergraduates, and possibly presenting a lecture to the class if the student is nearing completion of graduate work. May be convened with 438.

540. United States: 1945 to Present (3) I II For a description of course topics, see 440. Graduate-level requirements include an in-depth research paper on a topic approved by the instructor. May be convened with 440.
542. History of American Society and Thought: Pre-Civil War (3) I For a description of course topics, see 442. Graduate-level requirements include an in-depth research paper. May be convened with 442.
543. History of American Society and Thought Since the Civil War (3) II For a description of course topics, see 443. Graduate-level requirements include an in-depth research paper. May be convened with 443.
544. History of Arizona and the Southwest (3) I II For a description of course topics, see 446. Graduate-level requirements include an in-depth research paper and additional course readings. May be convened with 446.
545. History of American Foreign Relations to 1914 (3) I For a description of course topics, see 449. Graduate-level requirements include an in-depth research paper and additional course readings. May be convened with 449.
546. History of American Foreign Relations since 1914 (3) I For a description of course topics, see 450. Graduate-level requirements include an in-depth research paper and additional course readings. May be convened with 450.
547. The United States and East Asia: 1840 to the Present (3) II 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.
548. 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.
549. 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.
550. History of Women in Europe (3) For a description of course topics, see 455. Graduate-level requirements include an additional historical project. (Identical with W S 555) May be convened with 455.
551. 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.
552. Topics in Comparative Women's History (3) II For a description of course topics, see 458. Those graduate students seeking credit will be required to read and write about the field in more depth than is required for undergraduates. May be convened with 458.
553. History of Books and Printing (3) I (Identical with LI S 559)
554. The Ethnohistory of Mesoamerica and the Andes (3) II For description of course topics, see 461. Graduate-level requirements include an additional essay. May be convened with 461.
555. 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.
556. 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.
557. 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.
558. Asia and the West (3-3) For a description of course topics, see 468a-468b. Graduate-level requirements include additional research or writing; see instructor for details. (Identical with NES 568a-568b) May be convened with 468a-468b.
559. 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.
560. 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.
561. History of Medieval India (3) I 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.
562. 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.
563. 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.
564. Periods in Chinese History (3-3-3-3) [Rpt.] (Identical with CHN 575a-575b-575c-575d-575e) May be convened with 475a-475b-475c-475d-475e.
565. Modern China (3) For a description of course topics, see 476. Graduate-level requirements include an in-depth research paper and additional readings. (Identical with CHN 576) May be convened with 476.
566. History of the Middle East (3-3) (Identical with NES 577a-577b) May be convened with 477a-477b.
567. Modern History of the Middle East (3) I (Identical with NES 578) May be convened with 478.
568. The Ottoman Empire to 1800 (3) II For a description of course topics, see 479. Graduate-level requirements include an in-depth research paper. May be convened with 479.
569. Work, Motherhood and Female Identity in America 1945 to the Present (3) (Identical with W S 581) May be convened with 481.
570. Social History of China (3) (Identical with CHN 582) May be convened with 482.
571. Gender and African History (3) II S For a description of course topics, see 483. Graduate-level requirements will include a research paper and additional discussion sessions. (Identical with WS 583) May be convened with 483.
572. 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.
573. Women in East Asia (3) I For a description of course topics, see 489. Graduate-level requirements include an additional research paper. (Identical with EAS 589) May be convened with 489.
574. 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.
575. Colloquium r. Chinese History Since 1949 (3) II (Identical with CHN 595) May be convened with 495r.
576. Seminar m. Mexican-American Heritage Bibliography — A Library Seminar (3) [Rpt./6 units] I (Identical with MAS 596m)
Certain colloquia and seminars in other departments may be used for history graduate credit.
577. Colloquium a. Advanced Studies in United States History (3) [Rpt./10] I II
b. Advanced Studies in Latin American History (3) [Rpt./10] I II (Identical with LA S 695b)
c. Advanced Studies in European History (3) [Rpt./10] I II
d. Advanced Studies in the History of Women (3) [Rpt./10] II GRD (Identical with W S 695e)
578. Advanced Studies in Ancient History (3) [Rpt./10] II Consult department before enrolling. (Identical with CLAS 695f)
g. Advanced Studies in Asian History (3) [Rpt./3] I II (Identical with EAS 695g)
h. Comparative History (3) II [Rpt./6 units]
i. World History (3) II
k. Historiography (3) I II Open to majors only.
579. Seminar a. Colonial U. S. History (3) [Rpt./10] I II
b. Nineteenth-Century U. S. History (3) [Rpt./10] I II
c. Twentieth-Century U. S. History (3) [Rpt./10] I II
d. Ancient History (3) [Rpt./10] I II
e. Medieval Europe (3) [Rpt./10] I II
f. Early Modern Europe (3) [Rpt./10] I II
P. Latin and German required.
g. Nineteenth-Century Europe (3) [Rpt./10] I II
h. Twentieth-Century Europe (3) [Rpt./10] I II
i. Latin America: Modern Period (3) [Rpt./10] I II
j. Medieval Europe (3) [Rpt./10] I II
k. Historical Writing and Editing (3) [Rpt./10] I II
l. Colonial Latin America (3) [Rpt./10] I II (Identical with LA S 696i)
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
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 (1-3) I II Open to select students who wish to work independently under the supervision of an honors faculty member.

Department Course Offerings

Anatomy
Independent laboratory opportunities available.

Anthropology
101.* Introduction to Physical Anthropology and Archaeology (3) II
102.* Introduction to Cultural Anthropology (3) I
111.* Exploring Physical Anthropology (3) II
200.* Cultural Anthropology (3) I
206.* Native People of the Southwest (3) I
396H. Honors Proseminar (3) II

Architecture
452H. Honors Senior Project (6) I

Astronomy
101L.* Astronomy Lab (1) I
396H. Honors Proseminar (3) I
400a.* Theoretical Astrophysics (3) I
400b.* Theoretical Astrophysics (3) II

Biochemistry
181.* Introductory Biology I (4) I
182.* Introductory Biology II (4) II
462a-462b. Biochemistry (30-30) I II

Chemistry
105a-105b. Honors Fundamentals of Chemistry (4-5) I I
106a-106b. Honors Fundamentals of Chemistry (4-4) I I
242a-242b. Honors Lectures in Organic Chemistry (3-3) III
396H. Honors Proseminar (3) II

Civil Engineering
214.* Statics (3) I II
217.* Mechanics of Materials (3) I II

Communication
396H. Honors Proseminar (3) I

Computer Science
433.* Computer Graphics (3) I
453.* Compilers and Systems Software (4) I
460.* Database Systems (3) I

Ecology and Evolutionary Biology
181.* Introductory Biology I (4) II
182.* Introductory Biology II (4) II
206.* Environmental Biology (3) I
320.* Genetics (4) I

Economics
200.* Basic Economic Issues (3)
330.* Macroeconomic Institutions and Policy (3) I III
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)
330.* Development Throughout Life (3) I II
310. Learning in the Schools (3)
358.* Psychological Measurements in Education (3) I II
402.* Early Adolescent Development (3) II

Engineering
102.* Problem Solving and Engineering Design (3) I II
170.* Problem Solving Using Computers (3) II
196a-196b. Honors Proseminar (1-1) I II

English
103H. Freshman Composition (3) I II
104H. Freshman Composition (3) I II
109H. Advanced Freshman Composition (3) I II
397.* Writing the Senior Thesis (1) I II
410.* Teaching of Composition (3) I II
411.* Teaching of Literature (3) I II
412.* Teaching of English Literature (3) I II
486.* Themes in American Literature (3) I II
487.* Major American Author (3) I II

Additional independent research opportunities available.

Home Economics
(See Family and Consumer Resources)

Honors Center (HONR)
Slonaker House
(520) 621-6901; FAX: (520) 621-8655
Associate Professor Patricia MacCorquodale (Sociology), Director
Richard L. Kissling, Assistant Director

The Honors Center provides special opportunities for undergraduate students who demonstrate the highest levels of curiosity, creativity 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 110H) 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 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
Family and Consumer Resources

Family Studies
- 377.* Adolescence (3) I
- 413.* Issues in Aging (3) II
- 457.* Bio-Social Determinants (3) II
- 466.* Family Economics (3) I

Finance
- 412.* Corporate Financial Problems (3) I II
- 421.* Investments (3) I II
- 481.* Finance and New Venture Development (4) I

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

Geography
- 102a.* Human Geography (3) I II
- 101, 102. Introduction to Geology (3 -3)
- 103, 104.* Introduction to Geology Laboratory (1 -1)
- 346.* Natural Resources and Society (3) I
- 396H. Honors Proseminar (3) I
- 397a.* Teaching Geosciences (2 -3)

Geosciences
- 101, 102. Introduction to Geology (3-3)
- 103, 104.* Introduction to Geology Laboratory (1-1)
- 346.* Natural Resources and Society (3) I
- 396H. Honors Proseminar (3) I
- 397a.* Teaching Geosciences (2-3)

Higher Education
- 396. Honors Proseminar (3) I

History
- 102.* History of Western Civilization: Modern World - 1648 (3) I II
- 107.* History of the United States from 1877 to the Present (3) I II
- 369.* Mexico Since Independence (3) I

Humanities
- 250a-250b-250c.* Introduction to Humanities (3-3-3)
- 295Q. 10Q4 Creativity (3) I II
- 396H. Honors Proseminar (3) I

Language, Reading and Culture
- 410.* Foundations of Bilingual Education (3) I
- 428.* Bilingual Curriculum Development (3) I
- 435.* Content Area Literacy in a Multicultural School (3) I II
- 436.* Classroom Communications and Interactions (3) II
- 480.* Children's Literature in the Classroom (3) I II

Linguistics
- 101.* Introduction to Language (3) I II
- 201.* Introduction to Linguistics (3)

Management and Policy
- 305.* Management and Organizational Behavior (3) II
- 320.* Legal, Social and Political Environment (3) II
- 481.* Finance and New Venture Development (4) I

Management Information Systems
- 111.* Introduction to Computing (3)
- 373.* Basic Operations Management (3)

Marketing
- 361.* Introduction to Marketing (3) II
- 440.* Marketing Research (3) I II
- 450.* Buyer Behavior (3) II
- 459.* Product Management (3) II
- 471.* Marketing Policies and Operations (3) II
- 480.* New Venture Marketing and Industry Analysis (4) I

Material Sciences
- 110.* Solid State Chemistry (4) II

Mathematics
- 124.* Calculus with Applications (5) I II
- 125a-125b.* Calculus (3-3) I II
- 215.* Introduction to Linear Algebra (3)
- 223.* Vector Calculus (4)
- 254.* Introduction to Ordinary Differential Equations (3)
- 415.* Introduction to Abstract Algebra (3)
- 473.* Automata, Grammar and Language (3) I

Media Arts
- 200.* Fundamentals of Theory and Aesthetics in Media Arts (3)
- 201a-201b.* Media History (3-3) I II
- 209.* Survey of Film History (3) I
- 221.* American Cinema: Directors and Genres (3) I
- 222.* Major AM Broadcast Genre (3) II
- 304.* Beginning Video Production (4) I II
- 394.* Practicum
- 396. Honors Proseminar
- 421.* Cultural Theory and Criticism of Media (3) I
- 424.* Film Theory and Criticism (3) I
- 427.* Feminist Media Theory (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
- 410.* Cell Biology (3) II

Music
- 120a.* Musical Skills and Structure (3) I

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
- 122.* Philosophical Foundations of Western Civilization: Mind, Matter and God (3) I II
- 123.* Philosophical Foundations of Western Civilization: Science and Inquiry (3) I II
- 396H. Honors Proseminar (3) I

Physics
- 110.* Introductory Mechanics (4) I II
- 121.* Introductory Optics, Acoustics and Heat (2-3) I II
- 116.* Introductory Electricity and Magnetism (4) I II
- 396H. Honors Proseminar (3) I

Planetary Sciences
- 195. Honors Colloquium (1) I

Political Science
- 102.* American National Government (3) I
- 250.* Contemporary National Politics (3) II
- 396H. Honors Proseminar (3) I II
396H. Honors Proseminar (3) II

Women's Studies

10.* Introduction to Women's Studies (3) II

396H. Honors Proseminar

*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.

398H. 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 and departmental honors advisors.

Humanities (HUM)

Harvill Building, Room 347

(520) 621-3933; FAX: (520) 621-1809

Senior Lecturers Mark Lupertz, Richard L. Poss, Donna E. Swaim, Richard H. Wilkinson, Bella Zweig

Lecturers Ann Weekes, Director, Janice Dewey, Peter Foley, Helle Mathiassen, Homer Pettay

The Humanities Program provides interdisciplinary courses designed to deepen consciousness of ethical, cultural, 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 in a variety of old and new world cultures and across the spectrum of disciplines and human endeavor.

The Humanities Program offers a 21-24 unit concentration for the interdisciplinary studies major and a minor in humanities as follows: 250a, 250b, 250c, 260; and selection of 9 to 12 units from the following: 307, 310, 330, 340, 355, 371a-371b, 380, 396H, 420, 451, 452, 454, 498H, or another 300 or 400 level humanities course selected with consent of the Humanities Program; a 300 or 400 level course in art history or philosophy, or a 300 or 400 level literature course from one of the following departments: classics, East Asian studies, English, French and Italian, German, Russian and Slavic languages, Spanish, and Portuguese.

The Humanities Program participates in the Honors Program.

195. Colloquium

a. The Human in Humanities (1) I Open to freshmen and transfer students only.
b. Contemporary Nobel Laureates in Literature (1) II Open to freshman and transfer students only.

245. Race and Ethnicity in the U.S.: A Regional Perspective (3) S CRD Interdisciplinary experience focused on cultural and societal diversity in the Southwest and the U.S.-Mexico borderlands. Open to students enrolled in Transfer Summer Institute.

250a-250b-250c. Introduction to Humanities (3-3-3) II S 250a: Major Ancient Near Eastern and Mediterranean Cultures, from the Sumerian through the early Christian, with emphasis on the Greek and Roman. P, 6 units in first-year composition or CR ENGL 103H or 104H. 250b: European Culture, from the Medieval Period through the Enlightenment. P, 6 units in first-year composition or CR ENGL 103H or 104H. 250c: The Modern Western World: Eighteenth, Nineteenth and Twentieth Centuries P, 6 units in first-year composition or CR ENGL 103H or 104H.

295. Colloquium

q. 10Q4 Creativity: A Class in Self-Expression (3) I II (Identical with ENGL 295q) Fee.

307. Spirituality in the Arts (3) S Traditional and non-traditional concepts of spirituality are explored in the Arts Department. (Identical with RELI 307)

310. Voyage of Discovery (3) S Small group (9-14) travel to cultural centers of Europe to experience major works of art and architecture studied in 250a-250b-250c and 355. P, 6 units chosen from HUM 250a, 250b, 250c, 355.

330. Women in Antiquity (3) (Identical with CLAS 330)

340. The Humanities and Medicine: An Interdisciplinary Experience (3) S Multidisciplinary course, team-taught by faculty in Humanities and Medicine, examines modern world literature, visual art and film in light of scientific and modern values relating to medical ethics, disease, suffering, death and healing.
Hydrology and Water Resources (HWR)

Harshbarger Building, Room 122
(520) 621-5082; FAX: (520) 621-1422

Professors Soroosh Sorooshian, Head
(Systems and Industrial Engineering),
Randy L. Bassett, Nathan Buras,
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),
Austin Long (Geosciences),
William B. Lord (Agricultural and Resource Economics),
Thomas Maddock III, Shlomo P. Neuman, William J. Shuttlesworth,
Eugene S. Simpson (Emeritus),
Ernest T. Smerdon (Civil Engineering)
Associate Professors: Roger C. Bales,
Michael D. Bradley, Mark Brusseau (Soil and Water Science),
Bonnie Colby (Agricultural and Resource Economics),
Katherine Hirschboeck (Tree Ring Lab),
T.-C. Jim Yeh
Assistant Professors: Martha H. Conklin,
Kevin Lasney (Civil Engineering),
Marek Zreda

Hydrology and water resources include the origin, distribution, and properties of the waters of the Earth, as well as the development and management of water resource systems for multiple purposes. The faculty offers competence in hydrogeology, hydrogeochemistry, environmental hydrology, ground-water and surface-water hydrology, hydrometeorology, hydroclimatolgy, water quality, mathematical and statistical methods in hydrology (including numerical modeling), and water resources engineering, 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. The undergraduate major in hydrology assumes substantial knowledge of mathematics. Students must complete MATH 254. 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. Honors students complete an approved senior honors thesis in lieu of the senior internship practicum sequence.

101a-101b. Water and the Environment (4-4) I II Relation of physical and biological sciences to the understanding of the water cycle; humanity'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. Fee. 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/Lavitt

195. Colloquium
a. Water, The Environment and Society (1) I II Freshmen only. Buras

250 R. Principles of Hydrology (2) 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. CR, 250L. Sorooshian

250 L. Principles of Hydrology Laboratory (1) Laboratory techniques complementary to the basic principles of hydrology. Field trips. Fee. CR, 250R. Sorooshian

396. Proseminar
a. Hydrology (1) [Rpt./1] II D. Davis

407. Subsurface Hydrology (3) I Introduction to groundwater flow through saturated and unsaturated soils and rocks and transport governing equations; flow nets; single and multiple borehole hydraulic tests; stream-aquifer interaction. Field methods. P, PHYS 241; MATH 125b, CE 321 or A ME 331a.

408. Vadose Zone Monitoring (2) II 1995-96 Laboratory and field methods for characterizing water flow and contaminant transport through unsaturated geologic media. 6L, P. 407. May be convened with 508.

414. 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; micrometeorological instruments and methods; slope-area method of indirect discharge measurement; flood plain mapping; preparation of hydrologic reports. Daily field work. Fee. P, 250 R and L or 423 or 440. May be convened with 514. Ince

415. Introduction to Water Resources Policy (3) I II Water resources policy including the identification of regional problems of water use, the elements of water planning, water rights, and a consideration of institutional structures and processes. P, MATH 125a. (Identical with GEOG 415) May be convened with 515. Writing-Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic 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) I (Identical with C E 427) May be convened with 527.

431R. Hydrogeology (3) I II Hydrologic and geologic factors controlling the occurrence and dynamics of groundwater on regional and local scales. 431L not a corequisite to 431R for non-majors. P, GEOS 101, 103;
431L. Hydrogeology Laboratory (1 I I Field and Laboratory methods in hydrogeology. Field trips. Fee. CR, 431R. P, GEOS 101, 103. (Identical with GEOS 431L) May be convened with 531L. Zreda

440. Advanced Surface Water Hydrology (3-4) II Theory and selected design problems from fluvial dynamics, flood hydrology, flood routing, and water supply hydrology. 3R. 1D. Discussion section is mandatory for undergraduates. Field trip. P. 250R and 250L or 423, C E 321. May be convened with 540. Ince

443. Quantitative Planning Methods in Water Resources Administration (3) I Applications of quantitative methods to water resource management; benefit-cost analysis; optimization; structure and basis of planning process; risk analysis. P, microeconomics, MATH 125a. May be convened with 543. D. Davis

445. Statistical Hydrology (3) II Application of statistics and probability to uncertainty in the description, measurement, and analysis of hydrologic variables and processes, including extreme events, error models, simulation, sampling, P, statistics or probability theory. May be convened with 545. D. Davis

450a-450b. Environmental Hydrology (3) I I I Chemistry of surface and subsurface water, the predominant chemical processes affecting composition in relation to humanity’s use; classification, identification, and mobility of contaminants; introduction to chemical and transport modeling. 450a (spring semester) focuses on inorganic chemistry. 450b (fall semester) focuses on organic aquatic chemistry. P, 250R and 250L, CHEM 103a-103b, MATH 125b, CR, for 450a, 451; concurrent registration with 451 is not required for 450b. May be convened with 550a-550b. Bassett/Conklin

451. Environmental Hydrology Laboratory (1) I Laboratory procedures related to chemistry of surface and subsurface water. P or CR, 450a or equivalent. Fee. May be convened with 551. Bassett

457. Low Temperature Geochemistry (3) II 1995-96 (Identical with GEOS 457) May be convened with 557.

460. Watershed Hydrology (4) I (Identical with WS M 460) May be convened with 560.

461. Population and Resources (4) I (Identical with GEOG 461)

476. Environmental Law and Economics (3) I (Identical with AREC 476)

478. Global Change (3) II (Identical with GEOS 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 I 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) II Origin, distribution, and characteristics of oceanic water, advective and convective processes; estuarine and shoreline processes; effect on coastal aquifers; classification and hydrologic regime of lakes. P, MATH 125b. May be convened with 583. Bales


500. Ecosystemology for Urban Planning (3) I 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 I I Dynamics of immiscible fluids in porous and fractured media; anisotropy and scale; advective solute transport; consolidation and land subsidence; flow velocities in multilayered systems; free surface flow and salt water intrusion at sea fronts. P, CR, MATH 322 or 422a or 422b, P, 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, earth structures. P, MATH 422a or consult department before enrollment. (Identical with C E 504) Neuman


506. Water Quality Dynamics (3) I I I Chemical and physical methods are used to study the quality of ground and surface waters with emphasis on organic contaminants, colloids, and surface processes including sorption phenomenon. Equilibrium and dynamic models of water chemistry. P, 517R/L.

508. Vadose Zone Monitoring (2) II 1995-96 For a description of course topics, see 408. Graduate-level requirements include in-depth laboratory reports. P, 407 or 503 or 518. May be convened with 408.


514. Field Hydrology (Surface Water) (1) I For a description of course topics, see 414. Graduate-level requirements include an in-depth report on one aspect of the field work or participation and assistance in the preparation and conduct of a field project. Daily field work. Fee. P, 519. May be convened with 414. Ince

515. Introduction to Water Resources Policy (3) II For a description of course topics, see 415. Graduate-level requirements include an in-depth term paper. P, MATH 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 the subsurface environment. P, 503 or 535, SIE 270. Yeh

517R. Fundamentals of Water Quality (3) I I 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 prerequisite to 517L. P, CHEM 103b, PHYS 241, 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 ME 331a or C E 321; MATH 294; P, GEOS 101. Maddock/Zreda


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 rulemaking. Bradley/Waterstone

521. Introduction to Water Resources Systems Analysis (3) I I 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

522. Well Logging Interpretation (3) I (Identical with G EN 522)

523. Hydrology (3) I (Identical with C E 523) May be convened with 423.

524. Hydroclimatology (3) I Precipitation formation processes, the surface and atmospheric branch of the hydrologic cycle, land surface-atmosphere interaction, surface energy balance, evapotranspiration, heat and moisture fluxes into the soil and atmospheric boundary layer, P, non-majors should consult department before enrollment. Shuttleworth

525. Water Quality Modeling (3) I (Identical with C E 525)

526. Water Quality Management (3) I I I Optimization and systems analysis techniques useful 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.

531R. Hydrogeology (3) I I I For a description of course topics, see 431R. Graduate-level requirements include a research paper on a topic related to hydrogeology but not covered in lectures. P, GEOS 101, MATH 125a (Identical with GEOS 531R) May be convened with 431R. Zreda
534. Advanced Subsurface Hydrology (3) II Advanced aquifer and well hydraulics; heterogeneity, unsaturated flow; natural and artificial recharge; ground-water and surface-water interaction; mass and heat transport. P, MATH 223 or 322 or 422a or 422b. (Identical with GEOS 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 GEOS 536) Zreda

540. Advanced Surface Water Hydrology (3-4) II For a description of course topics, see 440. Graduate-level requirements include an in-depth research 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, microeconomics, 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 simulation project. P, knowledge of computer language, SIE 230 or STAT 160 or 361. May be convened with 445. D. Davis

550a-550b. Environmental Hydrology (3) I II For a description of course topics, see 450a-450b. Graduate-level requirements include an in-depth research paper. P, CHEM 103a-103b, MATH 125b. May be convened with 450a-450b. Bassett/Conklin

551. Environmental Hydrology Laboratory (1) II For a description of course topics, see 4551. Fee. P, CR, 455a or equivalent. May be convened with 451. Bassett

557. Low Temperature Geochemistry (3) II 1995-96 Application of the theoretical basis of linear/nonlinear systems, advantages and limitations of various approaches, e.g., linear vs. nonlinear, lumped vs. distributed, used in hydrologic modeling; interrelation between function development and model calibration requirements. P, MATH 254. Soroshian

562. Watershed Hydrology (3) I (Identical with WS M 560) May be convened with 460.

563. Isotope Hydrology (3) (Identical with GEOS 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; 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 517R/L. Bassett

572. Global Biogeochemical Cycles (3) I (Identical with GC 572)

576. Advanced Natural Resource Economics (3) I (Identical with AREC 576)

579. Advanced Topics in the Economics of Environmental Regulation (3) II (Identical with AREC 579)

580. Global Change (3) I II May be convened with 478.

581. Environmental Policy (3) II (Identical with POL 581) May be convened with 481.

582. Applied Groundwater Modeling (3) III 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. Bales

584. Advanced Applied Groundwater Modeling (3) II Advanced applied groundwater flow and transport modeling for saturated and unsaturated media using variety of current software packages. 2R, 1L. P, 482 or 582 or equivalent course.

586. Field Research for the Study of Planet Earth (3) II 1995-96 (Identical with REM 590) May be convened with 490.

593. Colloquium b. Global Climate Change (2) [Rpt./1] I 1996-97 (Identical with ATM 595b)

c. General Circulation Observations and Modeling (3) II (Identical with ATM 595c)

596. Seminar c. Advanced Topics in Hydrochemistry (1-3) [Rpt./1] I II Bales

597. Workshop a. Computational Tools EOS Hydrology (1-2) [Rpt./1] I II P, some previous knowledge of UNIX desirable. Bales

603. Advanced Topics in Subsurface Hydrology (3) II 1996-97 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. Neuman

605. Soil Water Dynamics (3) II 1995-96 Application of theoretical basis of linear/nonlinear systems, advantages and limitations of various approaches, e.g., linear vs. nonlinear, lumped vs. distributed, used in hydrologic modeling; interrelation between function development and model calibration requirements. P, MATH 254. Soroshian

612. Analysis of Hydrologic Systems (3) I Presentation and evaluation of a variety of mathematical modeling techniques; presentation of theoretical basis of linear/nonlinear systems, advantages and limitations of various approaches, e.g., linear vs. nonlinear, lumped vs. distributed, used in hydrologic modeling; interrelation between function development and model calibration requirements. P, MATH 254. Soroshian

642. Analysis of Hydrologic Systems (3) I Improvement of software packages. 2R, 1L. P, 482 or 582. Laboratory instruction only; consult department


655. Stochastic Hydrology (3) I 1995-96 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

699. Colloquium a. Hydrology and Water Resources (1-3) [Rpt./1] I II For HWR majors, research presentation only; consult department before enrolling.

700. Seminar a. Advanced Topics in Groundwater Hydrology (1-3) [Rpt./1] I II

b. Advanced Topics in Vadose Zone Hydrology (1-3) I II

c. Advanced Topics in Subsurface Modeling (1-3) II

e. Pollutants in the Hydrologic Environment (1-3) I II

f. Advanced Hydrologic Modeling (1-3) II

g. Conflict Resolution (3) [Rpt./1] I II (Identical with SIE 569g) P, consent of instructor.

Industrial Engineering
(See Systems and Industrial Engineering)

Irish-Gaelic
(See Critical Languages Program)

Insect Science (INSC)
Forbes Building, Room 410
(520) 621-1152
idpis@ag.arizona.edu

Graduate Interdisciplinary Program in Insect Science

Committee:
Professors Elizabeth A. Bernays (Entomology), William S. Bowers (Entomology), Danny L. Brower (Molecular and Cellular Biology), Reginald F. Chapman (Arizona Research Laboratories, Division of Neurobiology), Rene R. Feyereisen (Entomology), Henry H. Hagedorn (Entomology), John G. Hildebrand (Arizona Research Laboratories, Division of Neurobiology), Margaret G. Kidwell (Ecology and Evolutionary Biology), John H. Law (Biochemistry), Richard B. Levine (Arizona Research Laboratories, Division of Neurobiology),
Insect Science—Journalism 245

Jose M.C. Ribeiro (Entomology), Nicholas J. Strausfeld (Arizona Research Laboratories, Division of Neurobiology), Marc E. Tischler (Biochemistry), Michael A. Well (Biochemistry)
Associate Professors Diana E. Wheeler, Chairperson (Entomology), Edmund A. Arbas (Arizona Research Laboratories, Division of Neurobiology), Nancy A. Moran (Ecology and Evolutionary Biology), Robert L. Smith (Entomology), Leslie P. Tolbert (Arizona Research Laboratories, Division of Neurobiology)
Assistant Professors Leticia Aviles (Ecology and Evolutionary Biology), Judith L. Bronstein (Ecology and Evolutionary Biology), David R. Maddison (Entomology), Wayne P. Maddison (Ecology and Evolutionary Biology), Lynn J. Manseau (Molecular and Cellular Biology), David B. Morton (Arizona Research Laboratories, Division of Neurobiology), Daniel R. Papaj (Ecology and Evolutionary Biology), Linda L. Restifo (Arizona Research Laboratories, Division of Neurobiology), Martin F. Taylor (Entomology)
Associate Research Scientist David N. Byrne (Entomology)
The Interdisciplinary Program in Insect Science offers a graduate program leading to the Ph.D. degree that trains students broadly in insect biology, with individually designed programs suited to each student's interests and needs. Programs of study combine a broad knowledge of insects as organisms with training in one or more specialized disciplines, such as ecology, evolution, vector biology, neurobiology, biochemistry and molecular biology. The faculty members, made up of insect scientists based in five departments, can serve as major advisors for students majoring in the Insect Science Program. Information about their research interests can be obtained from the program office. Two semesters each of biology, chemistry, physics and mathematics are required for admission. A baccalaureate degree must be completed in one of the following areas: biology, chemistry, physics or mathematics. Applicants must have completed courses equivalent to Arizona's general education requirements, which include study in the humanities, arts and sciences. The supporting minor: Students are strongly advised to minor in a second major in economics, English writing or literature, history, political science, a modern language, anthropology, psychology, sociology or the natural sciences.

The major in journalism: 26 units in addition to the general education requirements for the Bachelor of Arts degree described in the College of Arts and Sciences section of this catalog. All majors must take 205, 206, 208, 301, 302, 320, 411 or 413, 450 or 451 and 439 or 462. Students must complete one advanced course from among JOUR 411, 415, 417, 419, and 441. 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 major in journalism assumes general knowledge of mathematics; students must complete MATH 122.
The supporting minor: Students are strongly advised to minor in a second major in economics, English writing or literature, history, political science, a modern language, anthropology, psychology, sociology or the natural sciences.
The teaching major: 30 units, including 205, 206, 208, 301, 302, 411 or 413; 421 or 422; 439 or 462; and 450 or 451.
The teaching minor: 20 units, including 205, 206, 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.

The major in journalism: 26 units in addition to the general education requirements for the Bachelor of Arts degree described in the College of Arts and Sciences section of this catalog. All majors must take 205, 206, 208, 301, 302, 320, 411 or 413, 450 or 451 and 439 or 462. Students must complete one advanced course from among JOUR 411, 415, 417, 419, and 441. 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 major in journalism assumes general knowledge of mathematics; students must complete MATH 122.
The supporting minor: Students are strongly advised to minor in a second major in economics, English writing or literature, history, political science, a modern language, anthropology, psychology, sociology or the natural sciences.
The teaching major: 30 units, including 205, 206, 208, 301, 302, 411 or 413; 421 or 422; 439 or 462; and 450 or 451.
The teaching minor: 20 units, including 205, 206, 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.

The Department of Journalism is accredited by the Accrediting Council on Education for Journalism and Mass Communications.

151. News in Mass Communications (3) I Designed to acquaint the nonjournalist with communications techniques used by newspapers, wire services, information agencies, news magazines and broadcast news; analysis of social and historical influence on the news media.
195. Colloquium
   a. Good and Bad News (1) II

205. Reporting the News (3) I II Gathering, evaluating, and writing news. P, CR 208, First-year Composition, knowledge of typing. Department permission required to enroll. (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. Department permission required to enroll.

208. Law of the Press (3) I II Introduction to Freedom of Expression. Responsibility of the media; libel; and laws pertaining to broadcast and print journalism. (Identical with M AR 208)

301. Photojournalism/Visual Communications (2) I II Reporting the news through images and graphics using color and black and white photography, digital cameras, electronic darkrooms and image transfers.


320. Editing (2) I II Theory and techniques of copy editing and headline writing; training on video display terminals. 1R, 3L, P, 208, 206 or CR. Department permission required to enroll.

362. Writing for Media (3) I (Identical with M AR 362)

381. Reporting for Broadcast News (3) I (Identical with M AR 381)

396H. Honors Proseminar (3) II

403. Advanced Photojournalism (3) I II Reporting and interpreting the news through photos, photo documentaries, and photo analysis. Open to majors only. P, 301, 302. May be convened with 503.

405. The Study of News (3) I II Critical study and problem analysis of the media. Field work may include publication of conclusions. May be convened with 505.

406. Magazine Color Photography (3) S Techniques for taking and editing color photographs to illustrate magazine articles. Preparation of resumes and photo portfolios. Graduate-level requirements include additional readings and two additional photo assignments. Field trips. May be convened with 506.

411. News Features (3) I II Writing the basic news feature article; specialized reporting andrewriting techniques. P, 206. May be convened with 513. Writing-Emphasis Course. P, CR 208, 206, 208. May be convened with 517. Writing-Emphasis Course; P, CR, 411 or 413. May be convened with 514. Department permission required to enroll.

413. Reporting Public Affairs (3) I II Study and practice of newsgathering on executive, legislative, and judicial levels in city, county, state and federal governments, with emphasis on news sources and interpretive writing. P, 206. May be convened with 513. 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). Department permission required to enroll.

414. The News Agency: Arizona News Service (3) [Rpt.] I II Role and operations of the news agency, wire service or syndicate. Class members will form staff of Arizona News Service to supply client newspapers from bureaus in Tucson and Phoenix. Field trips. P or CR, 411 or 413. May be convened with 514. Department permission required to enroll.

417. Sports News Writing (3) I Students will cover sports events and write sports features. Interview and rewriting techniques. P, 206. May be convened with 517. 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).


422. Publications Layout and Design (3) I Theory and practice of layout, typography, and design for magazines. P, consult department before enrolling. May be convened with 522. Department permission required to enroll.

439. Ethics and the News Media (3) I Analysis of ethical theory and how it relates to journalists' roles and responsibilities in a democratic society. Case studies involve questions of bias, accuracy, privacy and national security. (Identical with 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, 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, 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; changing requirements for socially responsible and professional journalism in a democracy. (Identical with M AR 470) May be convened with 570.

471. International Communications (3) I II Study of world news systems, including newsgathering agencies, role of the foreign correspondent, the foreign press, the factors influencing international news flow. May be convened with 571.

496. Seminar m. Directions in News Technology (3) [Rpt./1] S May be convened with 596m.

502. Freedom of Expression (3) I II Analysis of access and barriers to information and communication at local, state, national and international levels; intensive study of the legal relationship between mass media and society. Open to majors only.

503. Advanced Photojournalism (3) I II For a description of course topics, see 403. Graduate-level requirements include an intensive photo essay illustrating a social problem unique to the Southwest. Open to majors only. P, 301, 302. May be convened with 403.

505. The Study of News (3) I II [Rpt] For a description of course topics, see 405. Graduate-level requirements include a major research paper on an aspect of the subject matter. May be convened with 405.

506. Magazine Color Photography (3) S For a description of course topics, see 406. Graduate-level requirements include additional readings and two additional photo assignments. Field trips. May be convened with 406.

511. News Features (3) I For a description of course topics, see 411. Graduate-level requirements include an in-depth profile of an Arizona newsmaker. P, 206. May be convened with 411. Department permission required to enroll.

513. Reporting Public Affairs (3) I II For a description of course topics, see 413. Graduate-level requirements include identification, through study and interviews, of a major Tucson issue and completion of a series of articles that suggest resolution of the issue. P, 206, 502. May be convened with 413. Department permission required to enroll.

514. The News Agency: Arizona News Service (1) [Rpt.] I III For a description of course topics, see 414. Graduate-level requirements include a research paper. Field trips. P or CR, 411 or 413. May be convened with 414. Department permission required to enroll.

517. Sports News Writing (3) I For a description of course topics, see 417. Graduate-level requirements include a research paper concentrating on issues raised in class. P, 206. May be convened with 417. Department permission required to enroll.

521. Advanced Editing (3) I II For a description of course topics, see 421. Graduate-level requirements include assuming leadership positions such as news editor or copydesk chief during lab simulations. P, 320. May be convened with 421. Department permission required to enroll.

522. Publications Layout and Design (3) I For a description of course topics, see 422. Graduate-level requirements include critically analyzing a major publication and redesigning it according to newest principles. P, consult department before enrolling. May be convened with 422. Department permission required to enroll.

539. Ethics and the News Media (3) I For a description of course topics, see 439. Graduate-level requirements include a research paper examining a major ethical issue and providing a critique regarding how the media resolved the issue. (Identical with LA S 539) May be convened with 439.

550. Community Journalism: The Tombstone Epitaph (3) [Rpt.] I II For a description of course topics, see 450. Graduate-level requirements include assuming leadership roles, such as city editor or news editor, on the newspaper. P, 206, 208, discussion of preparation with instructor. May be convened with 450.
551. Community Journalism: El Independente (3) [Rpt.] I II For a description of course topics, see 451. Graduate-level requirements include assuming leadership roles, such as city editor or news editor, on the publication. P. 206, 208, discussion of preparation with instructor. May be convened with 451.

570. The Press and Society (3) I II For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper addressing a modern media problem and proposing a solution to it. May be convened with 470.

571. International Communications (3) I II For a description of course topics, see 470. Graduate students will be required to complete one extra research paper. May be convened with 471.

596. Seminar
a. History of the Press (3) I II
b. Latin-American Press (3) I II (Identical with LAS 596h)
i. News Analysis (3) I II
m. Directions in News Technology (3) [Rpt./1] S May be convened with 496m.

Judaic Studies (JUS)
Franklin Building, Room 308
(520) 621-9114
Committee on Judaic Studies
Acting Director, Leonard Dinnerstein (History)
Assistant Professor J. Edward Wright (Near Eastern Studies)
Lecturer Shoshana Green
Adjunct Professor Lou H. Silberman
Adjunct Lecturer Imra Benami

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 focuses on 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. The committee participates in the honors program. The major in Judaic studies assumes general knowledge in mathematics. Students must complete MATH 122.

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)

203a-203b. 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)

273. Introduction to Judaism (3) I Exploration of Judaism in its diversity to its history and to proponents of its present forms, from Sephardi to Ashkenazi, and from Orthodoxy 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) I II (Identical with HIST 370a-370b)

372a-372b. History and Religion of Israel in Ancient Times (3-3) Survey of the history and religion of ancient Israel. 372a: Biblical period through the Babylonian Exile; introduction to the Hebrew Bible. 372b: Ezra-Nehemiah to the Roman Empire, with emphasis on the formation of rabbinic Judaism. (Identical with HIST 372a-372b, NES 372a-372b and RELI 372a-372b)

374. The Holocaust (3) I II (Identical with HIST 374)

377a-377b. Modern Israel (3-3) Evolution of the State of Israel from the rise of Zionism in 19th Century Europe to the present. 377a: Survey of the origins of the State of Israel from the rise of Zionism in 19th Century Europe to the Declaration of the State of Israel in 1948. 377b: Evolution of the State of Israel from 1949 to the present. Emphasis on interactive generative processes and understanding of the interplay between past processes and present socio-political realities. (Identical with HIST 377a-377b, NES 377a-377b and POL 377a-377b)

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)

409a-409b. Biblical Hebrew (3-3) I II (Identical with NES 409a-409b) May be convened with 409a-409b.

435. Jewish Mysticism (3) I II 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.

454. Spanish Inquisition (3) I (Identical with HIST 454)

455. Introduction to Rabbinic Literature (3) II 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./4] (Identical with NES 495f)

496. Seminar
w. Feminist Approaches in the Bible (3) II (Identical with NES 496w, RELI 496w, and W S 496w) May be convened with 496w.

*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).

509a-509b. Biblical Hebrew (3-3) I II (Identical with NES 509a-509b) May be convened with 409a-409b.

530. Prophecy in Ancient Israel (3) II For a description of course topics, see 430. Graduate-level requirements include a substantial research paper. (Identical with RELI 530) May be convened with 430.

535. Jewish Mysticism (3) II For description of course topics, see 435. Graduate-level requirements include a substantial research paper. (Identical with NES 535) May be convened with 435.

555. Advanced Hebrew (3) [Rpt.] Advanced instruction in Biblical and/or Rabbinic Hebrew language and literature. P. 409b or 509b or consent of instructor.

595. Colloquium
f. Ancient Near East (3) [Rpt./4] (Identical with NES 595f)

596. Seminar
w. Feminist Approaches in the Bible (3) II (Identical with NES 596w and RELI 596w) May be convened with 496w.

Kazakh
(See Critical Languages Program)

Korean
(See Critical Languages Program)

Landscape Architecture
(See Renewable Natural Resources)

Latin
(See Classics)
553. Language Acquisition and Development (3) I Study of the development of language in young children; focus on oral language and its relationship to emergent literacy; instructional strategies that build on language development.

554. Applied Linguistics in Education (3) I The application to curriculum, teaching and learning of concepts from linguistics, psycholinguistics and sociolinguistics. P. 551 or CR.

557. Application of Misuse Analysis (3) 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) II Investigation of procedures for conducting literacy research; examples of literacy research paradigms; critical analysis of evidence supporting literacy practices. P. 507 or 551.

580. Children's Literature in the Classroom (3) III S For a description of course topics, see 480. Graduate-level requirements include an in-depth research paper or other project. May be convened with 480.

581. Multilingual Literature and Literacy (3) I Analyzes the use of multilingual literature that fosters self-concept, acceptance, and a sense of identity to develop literacy. Includes readings from the major categories of multilingual literature about Black, Native, Hispanic, and Asian Americans.

583. Literature Discussions (3) I Issues related to dialogue about children's literature within a community of readers. Research, theory and practice related to literature discussion 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) c. Issues in Educating Bilingual/Multicultural Children (1-3) II S [Rpt./9 units] d. Applications of Language and Literacy (3) [Rpt./9 units] II S

597. Workshop a. Southern Arizona Writing Project (3-9) [Rpt./12 units] I II S (Identical with ENGL 597a) b. Misuse Analysis in Teacher Education (2-3) II o. Teaching of English (3) II S [Rpt./3] (Identical with ENGL 5970, which is home)

612. Grammatical Analysis (3) I (Identical with ENGL 612)

613. Methods of Teaching English to Speakers of Other Languages (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; organizational models; program implementation. P. 504, 505, 507 or 551 or CR.

638. Reading Diagnostic Laboratory (3-6) [Rpt./6 units] I II Supervised practice in reading assessment; identification of factors influencing reading achievement, evaluation, construction and administration of assessment procedures; development of interview techniques. P. 507, 537.

639. Reading Instructional Laboratory (3-6) [Rpt./6 units] I II Supervised practice in teaching reading and writing; preparing, analyzing and critiquing special instructional programs for students. Open to majors only. P. 507, 537.

653. Written Language Development (3) I II Study of recent 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./21 P 15 graduate units including 510 and 514.

696. Seminar a. Language, Reading and Culture (1-3) [Rpt./6 units] II 15 graduate units including 504, 505. b. Research in Bilingual Education (1-6) I II c. Research in Language and Literacy (1-6) [Rpt./9 units] I II

795. Colloquium a. Theory and Research in Language, Reading and Culture (1-3) [Rpt./15 units] I II

796. Seminar a. Research and Evaluation in Language, Reading and Culture (1-3) [Rpt./15 units] I II

**Latin American Studies (LAS)**

1522 E. Drachman St.
(520) 622-4002; FAX: (520) 622-0177

**Latin American Area Center**

Interim Director Oscar J. Martinez
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), Linan A. Gyurko (Spanish and Portuguese), Boris S. Kozolchik (Law), Oscar J. Martinez (History), Michael C. Meyer (History), Andrew Nichols (Family and Community Medicine), Leland Pederson (Geography and Regional Development), José Promis (Spanish and Portuguese), Ellana 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 John Crow (Political Science, Emeritus), Kevin Gosner (Biography), Keith McElroy (Art), Alfonso Moises (Media Arts), Richard Obregón (Music), Richard Ruiz (Language, Reading and Culture), Kathleen Schwartzman (Sociology), Barbara Timmerman (Pharmaceutical Sciences)

Assistant Professors Ana Alonso (Anthropology), Maria Jose Barbosa (Spanish and Portuguese), Bert J. Barickman (History), Daniel Nugent (Anthropology), Ana Virginia Perches (Spanish and Portuguese), Raul P. Saba (Latin American Studies), Stacie Widdifield (Art), Amy Williamsen (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 Anthropologists Timothy J. Finan (Director, BARA), James Greenberg (BARA)

Assistant Research Anthropologist Helen Henderson (BARA)

Associate Curator, Arizona State Museum Thomas Sheridan

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 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. Since a variety of internship courses may be counted toward their upper-division requirements, students planning to major in the area of concentration or toward one of their related studies should consult with an advisor early in their undergraduate programs.

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 "Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog.

### 319. Mexican American Culture (3) II (Identical with ANTH 319)

### 322. Introduction to Prehispanic, Hispanic and Chicano Art (3) II (Identical with ARH 322)

### 325. Intermediate Grammar, Conversation and Writing Skills (3) II (Identical with PORT 325)

### 330. Intermediate Conversation (3) II P, 325 (Identical with SPAN 330)

### 331. Anthropology and Development (3) II (Identical with ANTH 331)

### 337. Survey of Mexican Folk Music (3) II S (Identical with MUS 337)

### 350. Readings in the Literary Genres (3) II (Identical with SPAN 350)

### 351. Race and Class in Latin America (3) II (Identical with HIST 351)

### 352. Slavery in Latin America (3) I (Identical with HIST 352)

### 361. The U.S.-Mexico Border Region (3) I (Identical with HIST 361)

### 368. Colonial Mexico (3) I (Identical with HIST 368)

### 369. Mexico Since Independence (3) II (Identical with HIST 369)

### 371a-371b. Commercial and Technical Spanish (3-3) (Identical with SPAN 371a-371b)

### 384. Sociology of Latin American Societies (3) II (Identical with SOC 384)

### 388. Immigration and Refugee Policy (3) I (Identical with POL 388)

### 401. Survey of Spanish-American Literature (3) (Identical with SPAN 401)

### 402. Survey of Mexican Literature (3) S (Identical with SPAN 402)

### 403. Mexican-American Literature (3) II (Identical with SPAN 403)

### 404. Architecture and Planning in Mexico (3) I (Identical with ARCH 404)

### 406. Lusophone Literature Since 1900 (3) I (Identical with PORT 406) May be convened with 506.

### 409. Economic Anthropology (3) II (Identical with ANTH 409) May be convened with 509.

### 411. Middle America (3) II (Identical with GEOG 411) May be convened with 511.

### 412. South America (3) I (Identical with GEOG 412) May be convened with 512.

### 415. Creative Writing in Spanish (3) II (Identical with SPAN 415)

### 417. Cultures of Ancient Mexico (3) S (Identical with ANTH 417) May be convened with 517.

### 422a-422c. Pre-Hispanic Art (3-3) (Identical with ARH 422a-422c) May be convened with 522a-522c.

### 423. Anthropology of Rural Mexico (3) II (Identical with ANTH 423) May be convened with 523.

### 425. Advanced Grammar and Composition (3) II (Identical with SPAN 425)

### 430. Brazilian Civilization (3) (Identical with PORT 430)

### 431. Civilization in the Portuguese-Speaking World (3) (Identical with PORT 431) May be convened with 531.

### 433. Mexican and Mexican-American Civilization Through Literature (3) (Identical with SPAN 433)

### 437. Democracies, Emerging and Evolving (3) I (Identical with POL 437) May be convened with 537.

### 439. Ethics and the News Media (3) I (Identical with JOUR 439) May be convened with 539.

### 441. Children's Literature in Spanish (3) I (Identical with SPAN 441)

### 444. Mexican and Mexican-American Prose Fiction (3) II (Identical with SPAN 444)

### 445. Novel of the Mexican Revolution (3) I (Identical with SPAN 445)

### 446. Mexican-American Theatre (3) I II (Identical with SPAN 446)

### 447. Latin-American Political Development (3) II (Identical with POL 447) May be convened with 547.

### 448. Government and Politics of Mexico (3) I (Identical with POL 448) May be convened with 548.

### 449. Brazilian Literature in Film (3) (Identical with PORT 449) May be convened with 549.

### 450. Religion and Politics (3) II (Identical with POL 450) May be convened with 550.

### 453a-453b. Mesoamerican Archaeology (3-3) I II (Identical with ANTH 453a-453b) May be convened with 553a-553b.

### 454. Andean Archaeology (3) II (Identical with ANTH 454) May be convened with 554.

### 457. Inter-American Politics (3) I (Identical with POL 457) May be convened with 557.

### 461. Population and Resources (3) II (Identical with GEOG 461)

### 463. Topics in Luso-Brazilian Literature (3) (Identical with PORT 463) May be convened with 563.

### 464. History of Argentina (3) I (Identical with HIST 464) May be convened with 564.

### 465. Women in International Development (3) II (Identical with ANTH 465) May be convened with 565.

### 466. History of Brazil (3) II (Identical with HIST 466) May be convened with 566.

### 467. Contemporary Latin America (3) I (Identical with HIST 467) May be convened with 567.

### 469. History of Women in Latin America (3) II (Identical with HIST 469) May be convened with 569.

### 495. Colloquium

#### a. Latin American Studies (3) [Rpt.] I II P, Spanish or Portuguese proficiency. (Identical with POL 495a) May be convened with 595a. 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).

### 504. Architecture and Planning in Mexico (3) I (Identical with ARCH 504) May be convened with 404.

### 506. Lusophone Literature Since 1900 (3) I (Identical with PORT 506) May be convened with 406.

### 509. Economic Anthropology (3) II (Identical with ANTH 509) May be convened with 409.

### 511. Middle America (3) II (Identical with GEOG 511) May be convened with 411.

### 512. South America (3) I (Identical with GEOG 512) May be convened with 412.

### 517. Cultures of Ancient Mexico (3) S (Identical with ANTH 517) May be convened with 417.

### 522a-522c. Pre-Hispanic Art (3-3) (Identical with ARH 522a-522c) May be convened with 422a-422c.

### 523. Anthropology of Rural Mexico (3) (Identical with ANTH 523) May be convened with 423.

### 530. Development of Spanish-American Literature from the Pre-Columbian Period to Independence (3) (Identical with SPAN 530)

### 531. Civilization in the Portuguese-Speaking World (3) I II (Identical with PORT 531) May be convened with 431.
Law (LAW)

Law Building, Room 110
(520) 621-1373; FAX: (520) 621-9140

Professors E. Thomas Sullivan, Dean,
Arthur W. Andrews, Charles E. Ares
(Emeritus), Mark L. Ascher, Barbara A.
Atwood, Lynn A. Baker, William E.
Boyd, Ronald L. Cherry, Robert Emmet
Clark (Emeritus), Dan B. Dobbs,
August C. Eckhardt (Emeritus), Robert J.
Glenon, Kenney F. Hegland, Roger C.
Henderson, Reka P. Hoff, Junius Hoffman
(Emeritus), Jane B. Korn, Boris
Kozolchyk, Toni M. Massaro, Thomas A.
Mauet, Jack J. Rappeport (Emeritus),
James R. Ratner, Theodore J. Schneyer,
Thomas L. Schuessler, Andrew Silverman,
Charles Marshall Smith (Emeritus),
Roy G. Spece, Jr., John W. Strong,
Thomas J. Tormey (Emeritus), Willard N.
Van Slyck, Jr. (Emeritus), Elliott J.
Weiss, David B. Wexler, Robert A.
Williams, Jr., Winton D. Woods, Jr.
Associate Professor David Golove
Assistant Professors Ronald J. Rinaldi,
Josh Sarnoff

The College of Law offers course work
leading to the Juris Doctor degree and
the Master of Laws in International Trade, and it participates in several joint
degree programs. Courses leading to the
Juris Doctor degree are numbered at the
600 level. For a description of College of
Law courses and degree requirements, see the College of Law Catalog. The
LL.M in International Trade may be
earned by a limited number of students.
For degree requirements, write David A.
Gantz, Director of Graduate Studies,
College of Law, University of Arizona,
1201 E. Speedway Blvd., Tucson, AZ
85721. The 500-level courses below identify
law-related courses offered by other
departments that are cross-listed with
law. They may be taken to support spe-
cial student interests or as part of a pro-
gram for students seeking joint degrees.
For information on joint degree pro-
grams, consult the College of Law and
the departments offering the joint de-
grees with the College of Law.

537. Democraies, Emerging and Evolving
(3) I (Identical with POL 537) May be con-
vened with 437.

539. Ethics and the News Media (3) I (Iden-
tical with JOUR 539) May be convened with
439.

540. Development of Spanish American
Nineteenth and Twentieth-Century Litera-
ture (3) (Identical with SPAN 540)

544. In the Wake of the Green Revolution (3)
[Rpt.] II 1995-96 (Identical with ANTH 544)

547. Latin American Political Development
(3) II (Identical with POL 547) May be con-
vened with 447.

548. Government and Politics of Mexico (3)
I (Identical with POL 548) May be convened
with 448.

549. Brazilian Literature in Film (3) (Identical
with PORT 549) May be convened with
449.

550. Religion and Politics (3) II (Identical
with POL 550) May be convened with 450.

553a-553b. Mesoamerican Archaeology (3-3)
I II (Identical with ANTH 553a-553b) May be con-
vened with 453a-453b.

554. Andean Archaeology (3) II (Identical
with ANTH 554) May be convened with 454.

557. Inter-American Politics (3) I (Identical
with POL 557) May be convened with 457.

563. Topics in Luso-Brazilian Literature (3)
(Identical with PORT 563) May be convened
with 563.

564. History of Argentina (3) I (Identical
with HIST 564) May be convened with 464.

565. Women in International Development
(3) II (Identical with ANTH 565) May be con-
vened with 465.

566. History of Brazil (3) II (Identical with
HIST 566) May be convened with 466.

567. Contemporary Latin America (3) I
(Identical with HIST 567) May be convened
with 467.

569. History of Women in Latin America (3)
II (Identical with HIST 569) May be convened
with 469.

595. Colloquium
a. Latin American Studies (3) [Rpt.] I II P,
Spanish or Portuguese proficiency. May
be convened with 495a.

b. Latin American Studies Special Topics
(3) [Rpt.] /1

596. Seminar
a. Latin American Studies (3) [Rpt.] I P,
Spanish or Portuguese proficiency.

b. Latin-American Press (3) I II (Identical
with JOUR 596h)

596. Seminar
j. Latin America: Modern Period (3) [Rpt.]
I II (Identical with HIST 596j)

600. Contracts (5)

601a-601b. Introduction to Legal Process
and Civil Procedure (2-3)

602. Criminal Procedure (4)

603a-603b. Research and Writing (1-1) 603a
is First-year Legal Research and 603b is First-
year Legal Writing

604a-604b. Torts (2-3)

605. Property (5)

606. Constitutional Law I (3)

607. Appellate Practice and Moot Court (1)

608. Evidence (4)

609. The Legal Profession (2)

610. Health Law (3)

611. Employment Law (3)

612. Family Law (3)

613. Law and Medicine (3)

615. Constitutional Law II (4)

616. Corporations I (3)

617. Corporate Finance (2 P, 616.

618. Antitrust Law (3)

619. Estates and Trusts (4)

620. Immigration Law (3)

621. Administrative Law (3)

622. Law Review (1-3)

623. Conflict of Laws (3)

624. Labor Law (3)

625. American Legal History (2)

626. Jurisprudence (2-3)

627. Mexican Law (2)

630. Scientific Evidence (3)

631. Federal Indian Law (3) (Identical with
AIMS 631)

632. Federal and State Taxation of Multina-
tional Transactions (3) P, 646.

633a-633b. Commercial Transactions (3-3)
633a is not prerequisite to 633b.


635. Basic Insurance (3)


638. Real Estate (3)

639. Community Property (2)

640. Mining and Public Land Law (2)

641. Water Law (3)

642. Federal Jurisdiction (3)

644. Remedies (3)

645a-645b. Trial Advocacy (2-3) 645a is Basic
Trial Advocacy; P, 608, 609. 645b is Advanced
Trial Advocacy; P, 608, 609, 645a.

646. Federal Income Taxation (5)

647. Corporate Taxation (3) P, 646.


649. Torts II (3)

650. Criminal Law (3)

652. Income Taxation of Estates and Trusts
(2) P, 619, 646.
Library Science

1515 East First Street
(520) 621-3565; FAX: (520) 621-3279

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)

Associate Professors Helen M. Gothberg (Emerita), Charles A. Seavey, Ronald A. Van DeVoorde (Emeritus)

Assistant Professor H. Martin Frické

The School of Library Science offers courses focusing on the study of information and its use as a social phenomenon. The school offers an undergraduate minor, the Master of Arts degree with a major in library science and the Doctor of Philosophy degree with a major in library science. For admission and degree requirements, please see the Graduate Catalog.

116. 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, wordprocessing, spreadsheet creation and database management.

401. Introduction to the Organization of Information (3) Introduction to the theories and practices used in the organization of information. Overview of national and international 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 backgrounds, 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 technique. May be convened with 505.

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.

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)

443. Knowledge and Society (3) I II (Identical with PHIL 443)

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 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 conved 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 conved with 407.

509. Information Sources for Agricultural Scientists (1) (Identical with PLS 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 conved 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 conved with 411.

512. Automation in Libraries (3) Introduc-
tion 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 conved 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 conved with 440.

543. Knowledge and Society (3) I II (Identical with PHIL 543)

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 conved with 450.

Majors are urged to continue their foreign language study beyond the minimum 16 units required by the college. Although the linguistics major does not depend heavily on numerical and quantitative skills, mathematics training is a significant benefit for understanding many areas in the discipline, as well as for graduate study in linguistics and many other fields. Therefore, the linguistics department recommends that prospective majors complete MATH 117 or 121 (or an equivalent). However, completion of MATH 122 may be substituted for this requirement, with the consent of the undergraduate advisor.

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) I Fundamentals of linguistics; phonetics, phonology, morphology, syntax, semantics and language acquisition; provides basis for further study in the field.

203a-203b. Elementary Navajo Language (3-3) Speaking, reading, writing, understanding and transcribing. (Identical with AINS 203a-203b)

210. Native Languages of North America (3) I 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)

222. 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 1996-97 (Identical with ANTH 303)

307a-307b. Elementary O'odham (Papago) Language (3-3) Speaking, reading, writing, and oral comprehension in the Tohono O'odham (Papago) language. (Identical with AINS 307a-307b)

310. Morphology and Morpho-syntactic Properties of the World's Languages (3) 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 Considers the sound structure of a wide variety of human languages, with the aim of finding principles that describe in an insightful way the properties of their sounds and sound patterns. In addition the course will introduce the student to the higher level organizational principles governing the combinations of sounds into meaningful units, words, and phrases. P, 101 or 201.

320. Language and Social Issues (3) I II S Focuses on the theme that individuals identify with groups (in part) on the basis of the language or dialect they use. Examines the role of the individual as a language-using being with the problems of self-identity and of social difference, not only in our multilingual-multipolar culture, but in the world as well.

341. Language Development (3) I (Identical with PSYC 341)

376. Introduction to the Philosophy of Language (3) (Identical with PHIL 376)

388. Symbolic Processing (3) II 1996-97 Fundamentals of processing of natural language text, especially parsing and grammar development; includes programming in Prolog or other symbolic programming languages. P, C SC 115 or equivalent programming background; LING 101 or 201.

402. Gender and Language in Japan (3) II (Identical with JPN 402) May be convened with 502

403. Foundations of Syntactic Theory I (3) I Introduction to fundamental issues in the theory of syntax. Familiarizes the student with the essentials of (1) government binding theory and its precursors, and (2) standard categorical grammar and its relatives. P, 300. May be convened with 503.

410. Foundations of Phonological Theory I (3) I Investigation of the principles that underlie current phonological theory, concentrating on the representation of sounds and the regular patterns of sound in natural language. Topics include distinctive feature theory, syllable theory, the core skeleton, rule formulation and rule interactions. P, 315. May be convened with 510.

411. Introduction to Japanese Linguistics (3) (Identical with JPN 411) May be convened with 511.

412. Advanced Japanese Linguistics (3) (Identical with JPN 412) May, be convened with 512.


419. Linguistic Structure of Modern Chinese (3) (Identical with CHN 419) May be convened with 519.

420. Linguistic Structure of Modern Chinese (3) (Identical with CHN 420) May be convened with 520.

422. Linguistic Semantics and Lexicology (3) II 1995-96 Study of word and sentence meaning, relationship between the lexicon and the grammar, idioms, metaphor, etymology, and change of meaning. P, one course in linguistics. (Identical with PHIL 422) May be convened with 522.

425. Language Variation (3) II 1996-97 Study of geographical and social dialects, stylistic differences, and idiolectal variation and the implications of variation for writing grammars and for understanding language change. P, one course in linguistics, preferably LING 101, 201 or ANTH 276. (Identical with ANTH 425) May be convened with 525.

426. Introduction to Arabic Linguistics (3) II (Identical with ARB 426) May be convened with 526.

432. 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 432 and PSYC 432) May be convened with 532.

436. Japanese Sociolinguistics (3) (Rpt./1) (Identical with JPN 436) May be convened with 536.

438. Computational Linguistics (3) I 1995-96 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 438 and PSYC 438) May be convened with 538.

441. Language Acquisition (3) II (Identical with SP H 441) May be convened with 541.

443. Lexical and Syntactic Development (3) I II (Identical with PSYC 443) May be convened with 543.

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 or 201. (Identical with AINS 445a-445b) May be convened with 545a-545b.
Management and Policy (MAP)
McClelland Hall, Room 405
(520) 621-1035; FAX: (520) 621-4171

Professors Barbara A. Gutek, Head, Lee R. Beach, Terence Connolly, Edwin B. Flippo (Emeritus), Michael R. Gottfredson, Travis W. Hirschi (Sociology), James P. Logan (Emeritus), H. Brinton Milward, June M. Morrison (Emerita), Raymond A. Mulligan (Emeritus), Thomas R. Navin (Emeritus), Gregory B. Northcraft, Amnon Rapoport, George W. Summers (Emeritus) Associate Professors Marvin Fortman, David A. Tansik, Robert E. Tindall Assistant Professors Terri L. Griffith, Kenneth W. Koput, Lisa D. Orôdoñez

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 department participates in the Master of Business Administration, 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) 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 201b.

320. 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) 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. Not available to students who have completed or are enrolled in AREC/ECON 339 (Identical with ECON 376 and MKTG 376).

420. Advanced Business Law (3) 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 II Wills, inheritances, estates, and trusts; the administration of estates, including the duties and liabilities of executors and trustees; basic estate and gift taxes 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) II S Analysis of management opportunities and challenges; evaluation and formulation of 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 with emphasis on perspectives from organizational behavior, social psychology and sociology. P, 305. (Identical with SOC 444)

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 its administration including health promotion, health education, environmental health, and the nature and functions of public health departments and planning agencies.

471. Management Policy (3) II Analysis plus case studies of management in business enterprises. Open only to B.P.A. majors. An honors section of this course will be available for entrepreneurship program students. P, 305, FIN 311, 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).

475. Topics in Management (3) II Rpt./1 Critical examination of various research activities taking place in the field of management and organizational behavior. P, 305.

480. Men, Women and Work (3) 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, ECON 330, 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, ECON 330, FIN 311, MKTG 361. (Identical with FIN 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./2] I II

*Open only to students who meet the requirements for Advanced Standing as specified in the College of Business and Public Administration section of this catalog.

500. Management Case Analysis and Presentation (3) II Written analysis of cases and other reports; development of skills in analysis, decision making, and written and oral presentation, with emphasis on the total situation of each case considered.

502. Organization Theory and Behavioral Relations (3) 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. (Identical with PA 502 and PHL 502)

503. Human Resource Management (3) I Principles, methods, research relevant to management of an organization's human resources, with emphasis on employment psychology, training, development, compensation. P, 305 or 502.

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 strategic 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.
Management and Policy—Management Information Systems

537. Finance for New Ventures (3) (Identical with FIN 537)

538. Marketing, Negotiation and Decision Tactics (3) Development of bargaining and decision-making skills through simulated negotiations and role playing. Open only to students in the entrepreneurship program. P, ECON 500a-500b, FIN 511, MKTG 500. (Identical with MKTG 538)

539. Planning of New Ventures (3) II New venture development, financial projections, resource assessment, and long-range planning. Open only to students in the entrepreneurship program. P, ECON 500a-500b, FIN 511, MKTG 500. (Identical with FIN 539)


545. Interactive Behavior in Small Groups (3) II Critical survey of the essential ideas of n-person game theory (n>2) and the findings of experimental research on social dilemmas bargaining and coalition formation.

546. Marketing, Negotiation and Decision Making (3) I Theory and research on the strategies and abilities of human judges and decision makers. Focus is upon behavioral, as contrasted with normative, investigation, and upon methods of improving judgment and decision performance. P, statistics.

550a-500b. 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 prerequisite to 580b.


595. Colloquium

600. Behavioral Science Theory and Method in Management (3) [Rpt./1] 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
b. Program Planning and Development (1-3) I

696h. Seminar

a. Development Administration (1-3) I
b. Program Planning and Development (1-3) I

Management Information Systems (MIS)

McClelland Hall, Room 430
(520) 621-2748; FAX: (520) 621-2433

Professors David E. Pingry, Head, Andrew D. Bailey Jr., Moshe Dror, Seymour Goodman, James F. LaSalle, Jay F. Nunamaker

Associate Professor Nicholas Aquilano, Sudha Ram, Olivia R. Liu Sheng, Douglas R. Vogel

Assistant Professors Ai-Mei Chang, Hischun Chen, Anindya Datta, Byungtae Lee, Janny Leung, David Meader, Sarma Nidumolu, Suzanne Weisband

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) II S Basic concepts of 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) II S COBOL and PASCAL programming language; file organization, maintenance, and structured programming techniques. P, 111.

301.* Data Structures and Algorithms (3) 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) II S Computer architecture, operating systems principles, systems software, data communications, networks, protocols and distributed processing. P, 121.

331.* Database Management Systems (3) II S Introduction to database management systems; relational, CODASYL, and hierarchical models; security concurrency, integrity and recovery issues; query interfaces. P, 301.

341.* Information Systems Analysis and Design (3) 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. P, 121.

342.* Data Structures and Algorithms (3) II S (Identical with C SC 342)

372.* Comparative Programming Languages (3) III S (Identical with C SC 372)

373.* Basic Operations Management (3) 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 Seminar (3) II

411.* Social Issues of Computing (3) II S Broad 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 variate generation, statistical analysis of output data and SIMAN simulation language. P, fundamental knowledge of probability and statistics. (Identical with CS 421)

422. Linear Programming and Applications (3) I Recognition, formulation and solution of linear programming models for decision making. Modelling issues illustrated using examples from systems design, manufacturing, logistics, finance, etc. P, MATH 119. May be convened with 522.

441. Information System Design and Implementation (3) I II S Design of computer-based solutions to operational problems; involves an analysis of subsystems user interfaces, hardware/software selection and evaluation, and system implementation; explores interface between systems and individuals and systems and organizations. P, 341.

450. International Dimensions of Information Technologies (3) I National and regional information technology development strategies and policies; IT and national sovereignty; development and control of global "information highways"; impact of public and business policies on information systems design and use; international institutions and IT: convergence or divergence 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 file organization, search, 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; teaches and uses the C programming language and the Unix operating system. P, 301. 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) Productive systems, including service type industries; activities entailed in selecting, designing, operating, controlling, and updating systems. 473a: Forecasting, aggregate planning, MRP, inventory models under uncertainty, scheduling. P, 373. 473b: Topics include project management, quality control, reliability, facility layout and decision theory. Case studies, group projects and industry speakers give students an understanding of the human problems and quantitative methods. P, 373. May be convened with 573a-573b.

474. Current Topics in Operations Management (3) I 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. Managing for Quality Improvement (3) I Operational aspect of quality improvement. Topics include statistical process control, total quality 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 and/or term project. P, 373. May be convened with 576.

477. Materials and Logistics Management (3) I Organization, management and control of material flow processes; logistical strategies and relationships of procurement, handling, warehousing, transportation, and inventory control. P, 373, 473a. May be convened with 577.

478. Project Management (3) I II Definitions of programs and projects, organizational forms, developing the work breakdown structure, scheduling techniques (PERT and CPM), control mechanisms such as milestones, cost reporting and progress reports. Lectures and case analyses. P, 373. May be convened with 578.

479. Computer Models for Operations Management (3) I II Use of available software packages to analyze complex operations management problems. P, 373. May be convened with 579.

480. Introduction to Expert Systems (3) I II An in-depth technical background on the commercial expert systems. P, 473b or CR. May be convened with 580.


507a-507b. Information Systems Architecture and Data Communications (3-3) 507a: 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. P, 507b: Comprehensive view of data and computer communications. Explores key issues in the field, in the general categories of principles (including computer and technology used in the field); design approaches and applications in business; standards such as the IEEE, OSI, TCP/IP and others. P, 507a.

511. 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.

521. Modeling and Simulation (3-3) 521a: Topics include concepts of simulation, simulation software, model validation, selecting input probability distributions, random variate generation, statistical analysis of output data. SIMAN simulation language is covered. Previous programming experience is helpful, but not required. P, fundamental knowledge of probability and statistics. 521b: Modeling and analyzing complex business systems using advanced simulation and statistical techniques. A semester project is required. P, 521a or equivalent course. (Identical with CS 521a-521b and SIE 521a-521b)

522. Linear 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: Introduces database processing in comparison with file processing. Review of file organization and relevant data structures. Detailed study of various tools needed for logical and physical design, including data flow diagrams and the entity-relationship model. Examines the Relational and Codasyl database models. Several commercially available database management systems are reviewed. Course covers implementation. Students learn to develop database applications using Sybase or Sun/Unix machines. P, 531a.

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 CS 541a-541b)

546. Algorithms for Graphs and Network (3) I 1996-97 Model formulation and solution of problems on graphs and networks. Topics include heuristics and optimization algorithms for shortest paths, min-cost flow, matching and traveling salesman problems. Credit is allowed for this course or SIE 546. P, 552 or SIE 544 or consent of instructor.

580. International Dimensions of Information Technologies (3) I For a description of course topics, see 450. Graduate-level requirements include an additional term paper or program and a class presentation. May be convened with 450.
551.* Advanced Business Programming (3) I
For a description of course topics, see 451. Graduate-level requirements include an additional in-depth term paper and 30 percent more reading. P, 531a. May be convened with 451.

553. Software Systems (3) I II For a description of course topics, see 453. Graduate-level requirements include the production of several medium-sized programs, with emphasis on the program life-cycle, maintainability, and life-cost. P, 531a. May be convened with 453.


567. Design and Control of Production Systems (3) II Introduction to the basic concepts in operations management. Topics covered include project planning, aggregate planning, forecasting, classical 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 are 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 programs. P, ECON 500 or consent of instructor.

572. Operations Management (3) I Manufacturing operations from a tactical standpoint. Major topics include materials requirements planning, capability management, scheduling and JIT planning and control. P, 567 or consent of instructor.

573a-573b. Production and Operations Management (3-3) For a description of course topics, see 473a-473b. Graduate-level requirements include an additional term paper or program. May be convened with 473a-473b.

574. Current Topics in Operations Management (3-3) 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. Managing for Quality 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) II Markovian chains, novel arrival processes, continuous-time Markov chains, queuing theory, models of computer and manufacturing systems. P, MATH 123.

584. Combinatorial Optimization and Integer Programming (3) II 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.


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.

597. Workshop
a. Collaboration Computing (3) I II May be convened with 497a.

611a-611b. Topics in Research Methodologies in MIS (3-3) 611a: Introduces beginning doctoral degree students and advanced master's degree students to important research and survey articles in the field of management information systems. 611b: Provides a knowledge of research methodologies used in the MIS discipline, including experimental design, surveys, case studies, field work, and software engineering.

646. Combinatorial Optimization and Integer Programming (3) II 1995-96 Formulation, solution and implementation of integer problems, for decision making where choices are discrete. Methods include branch-and-bound, cutting-plane methods and Lagrangean relaxation. Credit is allowed for this course or SIE 646. P, 522 or SIE 544 or consent of instructor.

671. International Issues (3) I Analysis of industry successes and failures in global markets, focusing on the national characteristics, company strategies and national policies behind them. Case studies of more than 20 countries around the world (most of which will be student generated). Regional developments and problems. Sectoral emphases on international technological developments and issues related to the globalization of the information technology. P, graduate standing and at least one 500-level MIS or equivalent course.

680. Advanced Topics in Artificial Intelligence (3) I In-depth discussion of advanced AI topics such as natural language processing, cognitive modeling techniques, machine learning techniques, and neural network computing. Hands-on projects are required. P, 531a. Open to all graduate students.

696. Seminar
a. Readings in MIS (3)

Marketing (MKTG)
McClelland Hall, Room 320
(520) 621-7479; FAX: (520) 621-7483

Professors Ambar G. Rao, Head, Dipankar Chakravarti, Joseph W. Newman (Emeritus), Melanie Wallendorf Associate Professors Merrie L. Brucks, Susan E. Heckler, Christopher P. Puto, Richard A. Scott
Assistant Professors Pallassana Kannan, Praveen Kopalle

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 participates in the Master of Business Administration and Doctor of Philosophy degrees with a major in business administration. A Master of Business Administration degree with an emphasis on marketing research also is available.

The department participates in the honors program.

361.* Introduction to Marketing (3) II Role of marketing in the economy and in business and nonprofit organizations; environmental factors affecting marketing; nature of marketing management decisions. P, ECON 200.

370.* Marketing for Nonprofit Organizations (3) 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.
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. In exceptional cases, concurrent registration with MKTG 376 may be allowed with permission of the department.

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 strategies for programs, budgets, media selection, evaluation of effectiveness. 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.

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.


471. * Marketing Policies and Operations (3) I II An integrative, capstone course focusing on comprehensive marketing problems; development, control, and auditing of marketing organizations and operations. P, 440, 450; 3 additional units of marketing at the 400 level; FIN 311, MAP 305. 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).

480. * New Venture Market and Industry Analysis (4) I Assessment of market opportunity; competitive strategy development, marketing structure services, 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 MAB 483
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 many aspects 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.

110. Solid State Chemistry (4) I II Fundamental principles of the chemistry of condensed states of matter including metals, polymers, molecular solids and ceramics. 3ES. P, CHEM 103a.

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 microstructure 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 MXE 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.

249. Technology and the Growth of Civilization (3) II (Identical with ANTH 249)

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)
461. Biological and Synthetic Materials (3) II 1995-96 Discussion of structure and properties of biological materials and composites, such as bone, teeth and elastin. Synthetic materials as substitutes for biological materials. Biocompatibility. 1.5ES, 1.5ED. P, CHEM 103a, May be convened with 561.

462. Structure and Properties of Polymers (3) I 1996-97 Topics of intensive current development in polymer science. In each case, the relation between molecular structure, morphology and properties will be explored. Shows how polymers can be designed and tuned to have the properties needed to fulfill specialized functions. Topics include high modulus fibers, nonlinear optical properties, conducting polymers and resins for composite materials. 1.5ED, 1.5ES. P, 460. May be convened with 562.

465. Microelectronic Packaging Materials (3) I Design of microelectronic packaging systems based on the electrical, thermal and mechanical properties of materials. Chip chip package, circuit board and system designs are considered. 3ED. (Identical with ECE 465) May be convened with 565.

470. Technology of Polymers and Ceramics (3) I Processing and properties of polymers and ceramics in a wide range of technological applications. Discussion of patent literature. 3ED. P, 260 or 331R. May be convened with 570.

471. The Formation and Structure of Glass (3) I The glass transition, Kauzmann's paradox, kinetic theory of glass formation, physics and chemistry of glass making, glass structure, thermal properties. 3ES. P, 260. May be convened with 571.

479. Culture and Materials Technology (3) I (Identical with ANTH 479) May be convened with 579.

480. Experimental Methods for Microstructural Analysis (3) I An introduction, through a combination of lectures and laboratory experiences, to both established and new techniques for microstructural characterization of materials. 3ES. May be convened with 580.

485. Technological Forecasting (3) I Introduction to basic forecasting techniques which include causal models, trend extrapolation, growth curves, relevance trees and other models. 2ES, 1ED, P, MATH 125b or knowledge of calculus. (Identical with ENGR 485) May be convened with 585.

486. Technology and Society (3) I The evolution of our technological civilization will be discussed with emphasis on possible future models of technological organization and on the changing roles of the scientist and engineer. 1ES, 2ED. (Identical with ENGR 486) May be convened with 586.


501. Planning for Discovery: Problem Selection and Proposal Preparation (3) II Generation and organization of ideas into an effective research program. Program 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, electronics and biomedical materials processing, 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 field trip. P, 380. May be convened with 405.

509. Transport Phenomena (3) I For a description of course topics, see 409. Graduate-level requirements include either a term paper or computer model. P, 240, MATH 254. May be convened with 409.


511. Mineral Processing (3) I (Identical with MN E 511) May be convened with 411.

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) I 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.

532. Solid-Fluid Reactions (3) I (Identical with CHEE 532)


534. Advanced Topics in Electronic Materials (3) I [Rpt.2] 1996-97 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) I 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 CHEE 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.

554. Design Competition (3) I 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. Atomistic Computational Techniques in Materials Science (3) II Monte Carlo and molecular dynamics techniques; classical and quantum dynamical models; application to calculation of materials properties (structural, thermodynamic, transport, electronic properties).

552. Nondestructive Evaluation of Materials (3) I 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 1995-96 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 1996-97 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) I For a description of course topics, see
Materials Science and Engineering—Mathematics 263

Mathematics (MATH)

Mathematics Building, Room 108
(520) 621-6892; FAX: (520) 621-8322


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. McCalum, John N. Palmer, Douglas M. Pickrell, Zhen-Su She, Frederik W. Stevenson, Richard B. Thompson, Maciej P. Wojtkowski, Bruce Wood, A. Larry Wright (Statistics)

Assistant Professors Bruce J. Bayly, Moses Brio, Kwok Chow, Marta Civil, Samuel Evens, Paul Fan, Leonid Friedlander, Jiang-Hua Lu, Robert S. Maier, Marek Rychlik, Douglas Ulmer, Jan Wehr, Xue 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 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 C SC 115, MATH 124 or 125a, 125b, 215, 223, 323, and 355. Advanced students need not take lower numbered courses.

Students considering post-graduate studies in mathematics are urged to take additional 400-level mathematics courses chosen in consultation with their advisor.

Students majoring in mathematics whose performance on the upper-division writing-proficiency examination is unsatisfactory must take ENGL 397a.

The comprehensive mathematics option: The core above and 413, 415, 424, and 425.

The industrial and applied mathematics option: The core and one of the sequences 454-456, 464-466a, or 475a-475b; either 424 or 425; one of 410, 413, or 415.

The computer science option: The core and either of the sequences 415-416 or 475a-475b; two of 413, 443, 447 and 479.

A minor in computer science is required for this option.

The probability and statistics option: The core and 425, 464, 466a and either 413 or 468.

The economics and finance option: The core and 425, 464, either 410 or 413, one of 426, 466a or 479. The minor must be in either economics or 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, selected from courses other than 301.

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 390 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.
Introduction to College Algebra (3) I II Lecture. Not applicable to the mathematics major or minor. Basic concepts of algebra, linear equations and inequalities, relations and functions, quadratic equations, system of equations. P, two entrance units in algebra or an acceptable score on the math readiness test.

Introduction to College Algebra (3) I II Self-Study. Identical 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.

College Algebra (3) I II Lecture. Not applicable to the mathematics major or minor. Brief review and continuation of MATH 117R. College Algebra (3) I II Lecture. Not applicable to the mathematics major or minor. P, two entrance units in algebra or an acceptable score on the math readiness test.

College Algebra (3) I II Self-Study. Identical to MATH 117R except taught in a self-study tutorial format. Not applicable to mathematics majors or minors. Students with credit in 120 will obtain only two units of graduation credit for 117R. P, 116R or 116S or an acceptable score on the math readiness test.

Plane Trigonometry (2) I II Not applicable to the mathematics major or minor. Students with credit in 120 will obtain one unit of graduation credit for 118. P, one entrance unit in geometry, and either 1 1/2 entrance units in algebra, or 116R/S.

Finite Mathematics (3) I II Elements of set theory and counting techniques, probability theory, linear systems of equations, matrix algebra, linear programming with simplex method, Markov chains. P, 117R/S or an acceptable score on the math readiness test.

Calculus Prep (4) I II Reviews algebra and trigonometry; covers the study of functions including polynomials, rational, exponential, logarithmic and trigonometric. 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 two units of graduation credit for 117R/S. P, two entrance units in algebra or an acceptable score on the math readiness test. Graphing calculators are required in this course.

Mathematics in Modern Society (3) The course will examine topics such as voting schemes, apportionment problems, network problems, critical paths. Fibonacci numbers, population models, symmetry, fractals, data analysis, probability and statistics. P, two years of high school algebra and a satisfactory score on the Mathematics Readiness Assessment test.

Elements of Calculus (3) I II Introductory topics in differential and integral calculus. P, 117R/S or an acceptable score on the math readiness test.

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, including the derivative to understand the behavior of functions; applications to optimization problems in physics, biology and economics. Graphing calculator will be required for this course. Credit allowed for 124 or 125a, but not both. P, 120 or 117R/S and 118, or an acceptable score on the math readiness test.

Calculus (3) An accelerated version of 124. 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, including the derivative to understand the behavior of functions; applications to optimization problems in physics, biology and economics. Graphing calculator will be required in this course. P, an acceptable score on math readiness test. Credit allowed for 124 or 125a, but not both.

Continuation of 124 or 125a. 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. Graphing calculator will be required in this course. P, 124 or 125a.

Calculus with a Computer (2) Designed to supplement regular calculus courses. The use of computers to solve calculus problems emphasizing numerical and geometrical understanding of calculus. P for CR, 125b.

Introduction to Symbolic Logic (3) (Identical with PHIL 202).

Introduction to Linear Algebra (3) I II Vector spaces, linear transformations and matrices. P, 125b.

Vector Calculus (4) I II Vectors, differential and integral calculus of several variables. P, 125b.

Discrete Mathematics in Computer Science (3) I II Set theory, logic, algebraic structures; induction and recursion; graphs and networks. P, 125b.


Practicum a Problem-Solving Laboratory (1) [Rpt./4] I II P, 125b.

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. May not be applied to any mathematics major or minor, other than in elementary education. Open to elementary education majors only. P, 117R/S, or 121, or an acceptable score on the math readiness test.

Introduction to Number Theory and Modern Algebra (3) I II Elementary number theory, complex numbers, field axioms, polynomial rings; techniques for solving polynomial equations with integer and real coefficients. P, 323.

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.

Introduction to Mathematical Analysis (3) I II Elementary real analysis as an introduction to abstract mathematics and the use of mathematical language. Elementary logic and quantifiers; manipulations with sets, relations and function, including images and pre-images; properties of the real numbers; supremum and infimum; other topics selected from cardinality, the topology of the real line, sequences and limits of sequences and functions; the emphasis throughout is 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).

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.

Foundations of Computing (3) I II (Identical with C SC 344)

Analysis of Ordinary Differential Equations (3) I II Linear and nonlinear equations; basic solution techniques; qualitative and numerical methods; systems of equations; computer studies; applications drawn from physical, biological and social sciences. P, 215.

Introduction to Probability Theory (3) I II Sample spaces, random variables and their properties, with considerable emphasis on applications. P, 123 or 125b.

Workshop a Mathematics Education (1) I II Open only to teaching majors in MATH P, 315 or 330.

Mathematical Logic (3) I 1995-96 Sentential calculus, predicate calculus; consistency, independence, completeness, and the decision problem. Designed to be of interest to majors in mathematics or philosophy. P, 124 or 125a. (Identical with C SC 402) May be convened with 502.

Foundations of Mathematics (3) I II 1996-97 Topics in set theory such as functions, relations, direct products, transfinite induction and recursion, cardinal and ordinal arithmetic; related topics such as axiomatic systems, the development of the real number system, recursive functions. P, 215. (Identical with PHIL 403) May be convened with 503.

History of Mathematics (3) I The development of mathematics from ancient times through the 17th century, with emphasis on problem solving. The study of selected topics from each field is extended to the 20th century. P, 125b. May be convened with 504.
405. Mathematics in the Secondary School (3) II Not applicable to B.A. or B.S. degrees for math majors. (Identical with TTE 405)
415. Introduction to Abstract Algebra (3) I Introduction to groups, rings, and fields. P, 323. May be convened with 515.
421. Fourier Series and Orthogonal Functions (3) I II Linear spaces, orthogonal functions, Fourier series, Legendre polynomials and Bessel functions. P, 254 or 355. May be convened with 521.
422a-422b. Advanced Analysis for Engineers (3-3) Laplace transforms, Fourier series, partial differential equations, vector analysis, integral theorems, complex variables. Credit allowed for 422a or 422b, but not for both. P, 254 or 355. 422a is not prerequisite to 422b. Both 422a and 422b are offered each semester. May be convened with 522a-522b.
424. Elements of Complex Variables (3) I II Complex numbers and functions, conformal mapping, calculus of residues. P, 223. May be convened with 524.
426. Real Analysis of Several Variables (3) Continuity and differentiation in higher dimensions, curves and surfaces; change of coordinates; theorems of Green, Gauss and Stokes; exact differentials. P, 425. May be convened with 526.
430. Second Course in Geometry (3) I II 1996-97 Topics may include low-dimensional topology; map coloring in the plane, networks (graphs) polyhedra, two-dimensional surfaces and their classification, mapping coloring on surfaces (Heawood's estimate, Ringel-Youngs theorem), knots and links or projective geometry. P, 215. May be convened with 530.
431. Calculus of Variations (3) I 1995-96 Euler equations and basic necessary conditions for extrema, sufficiency conditions, introduction to optimal control, direct methods. P, 254 or 355.
434. Introduction to Topology (3) II Properties of metric and topological spaces and their maps; topics selected from geometric and algebraic topology, including the fundamental group. P, 323.
443. Theory of Graphs and Networks (3) I Undirected and directed graphs, connectivity, circuits, trees, partitions, planarity, coloring problems, matrix methods, applications in diverse disciplines. P, 215 or 223 or 243. (Identical with C SC 443) May be convened with 543.
447. Combinatorial Mathematics (3) I II 1996-97 Enumeration and construction of arrangements and designs; generating functions; principle of inclusion-exclusion; recurrence relations; a variety of applications. P, 215 or 243. May be convened with 547.
466. Theory of Statistics (3) I I (Identical with STAT 466a) May be convened with 566a.
473. Automata, Grammars and Language (3) I (Identical with C SC 473)
475a-475b. Mathematical Principles of Numerical Analysis (3-3) 475a: Analysis of errors in numerical computations, solution of linear algebraic systems of equations, matrix inversion, eigenvalues, roots of nonlinear equations, interpolation and approximation. P, 215; 254 or 355; and a knowledge of a scientific computer programming language. 475b: Numerical integration, solution of systems of ordinary differential equations, initial value and boundary value problems. (Identical with C SC 475a-475b)
479. Game Theory and Mathematical Programming (3) I II 1995-96 Linear inequalities, games of strategy, minimax theorem, optimal strategies, duality theorem, simplex method. P, 410 or 413 or 415. (Identical with C SC 479) May be convened with 579.
484. Operational Mathematics (3) I Basic concepts of systems analysis, Fourier and Laplace transforms, difference equations, stability criteria. P, 421 and 424 or 422b. May be convened with 584.
485. Mathematical Modelling (3) II Development, analysis, and evaluation of mathematical models for physical, biological, social, and technical problems; both analytical and numerical solution techniques are required. P, 421, CR 475b. May be convened with 585. Writing Emphasis Course. P, satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Guidelines of this catalog).
518. Topics in Algebra (3) [Rpt./36 units] I II Advanced topics in groups, rings, fields, algebras; content varies.

519. Topics in Number Theory and Combinatorics (3) [Rpt./36 units] I II Advanced topics in algebraic number theory, analytic number theory, class fields, combinatorics; content varies.


521. Fourier Series and Orthogonal Functions (3) II For a description of course topics, see 421. Graduate-level requirements include more extensive problem sets or advanced projects. P, 254 or 355. May be convened with 421.

522a-522b. Advanced Analysis for Engineers (3-3) For a description of course topics, see 422a-422b. Graduate-level requirements include more extensive problem sets or advanced projects. Not applicable to M.A., M.S., or Ph.D degrees for math majors. P, 254 or 355. May be convened with 422a-422b.


524. Elements of Complex Variables (3) 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.

525. 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.

526. 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.

527a-527b. 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.


529. Topics in Modern Analysis (3) [Rpt./36 units] I II Advanced topics in measure and integration, complex analysis in one and several complex variables, probability, functional analysis, operator theory; content varies.

530. Second Course in Geometry (3) II 1996-97 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.

531. Algebraic Topology (I) 1995-96 Poincare duality, fixed point theorems, characteristics classes, classification of principal bundles, homology of fiber bundles, higher homotopy groups, low dimensional manifolds. P, 534a-534b.

534a-534b. Topology-Geometry (3-3) Point set topology, the fundamental group, calculus on manifolds. Homology, de Rham cohomology, other topics. Examples will be emphasized. P, 415 and 425.


537a-537b. Global Differential Geometry (3-3) 1995-96 Surfaces in n, structure equations, curvature. Gauss-Bonnet theorem, parallel transport, geodesics, calculus of variations, Jacobi fields and 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.

538. Topics in Geometry and Topology (3) II Advanced topics in point set and algebraic topology, algebraic geometry, differential geometry; content varies.

539. Algebraic Coding Theory (3) II 1995-96 Construction and properties of error correcting codes; encoding and decoding procedures and information rate for various codes. P, 415. (Identical with ECE 539)

545. Theory of Numbers (3) I (Identical with C SC 543) May be convened with 443.

546. Theory of Numbers (3) II 1996-97 Correspondence between Lie groups and Lie algebras, structure and representation theory, applications to topology and geometry of homogeneous spaces, applications to harmonic analysis. P, 511a, 523a, 534a-534b, or consent of the instructor.


564. Theory of Probability (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.


566. 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) 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./36 units] 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 578)

579. Game Theory and Mathematical Programming (3) II 1995-96 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) II For a description of course topics, see 485. Graduate-level requirements include more advanced projects. P, 421, CR 475b. May be convened with 485.

596. Seminar a. Topics in Mathematics (1-3) [Rpt./12 S] b. Mathematical Software (3) [Rpt./1] I P, 254 or 355, knowledge of “C” programming. May be convened with 496b. c. Research on Learning (1) [Rpt./3] S P, must be accepted into NSF-funded grant program, PRIME. d. Initiation Reform in the Schools (1) [Rpt./3] S P, must be accepted into NSF-funded grant program.

597. Workshop a. Numbers, Algebra and Functions (2) [Rpt./3] S P, must be accepted into NSF-funded grant program, PRIME.

636. Information Theory (3) II 1996-97 (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 697b)

5 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.

6 Students 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.

9 Credit will be allowed for only one of 424 or 422b.

422b-422c will not be considered a two-semester course at the 400 level in the Master of Arts degree program.

10 Credit will be allowed for only one from each of the following groups: 123, 124 or 125a; 254 or 355; 410 or 413.

Media Arts (MAR)
Modern Languages Building, Room 265
(520) 621-7352; FAX: (520) 621-9662
Professors J. Michael Gillette, Interim Head; Caren J. Deming, Peter Lehman
Associate Professors Harry Atwood (Emeritus), Mary Beth Haralovich, Wesley B. Marshall, Eileen R. Meehan, Alfonso Moises, Robert J. Sabal
Assistant Professors Donald Kirihara, Beverly A. Seckinger
Lecturer F.D. Nott

The department provides instructional programs designed to prepare students to assume leadership roles in the media arts as independent artists or as members of industries such as 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 with a major in media arts and Bachelor of Fine Arts degree with a major in media arts. Advanced students have opportunities to obtain professional experience through the department’s internship program, and through work on various departmental projects.

The department strongly recommends that students develop basic typing and computer word processing skills prior to taking courses in media arts.

The department participates in the honors program.

The department participates in career specializations through the interdisciplinary studies major, which is described elsewhere in this catalog. Information on these areas of study is available from the Media Arts Office, Modern Languages Building, room 265.

The Bachelor of Arts with a major in media arts is designed for students planning careers in media management or for those students seeking a well-balanced liberal arts education in critical studies of the media as 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 with a major in media arts, as described in the Fine Arts (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: a minimum of 35 units of media arts courses, including media arts core (200, 201a, 201b, 210, 212), and 18 units of media arts upper-division course. Of the 18 units of required upper-division courses, 6 units must be from the approved media arts “Critical Studies” list and 6 units from the approved media arts “Industry and Management” list. A listing of approved “Critical Studies” and “Industry and Management” courses is available in the Media Arts Undergraduate Advising Office, Modern Languages Building, room 294. An approved upper-division media arts writing proficiency course also is required. A listing of approved writing emphasis courses also is available in the Modern Languages Building, room 294.

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 Bachelor of Fine Arts prepares students for creative leadership roles in media production, primarily in video, film and computer visualization. This program also provides an appropriate basis for advanced study at the M.F.A. level.
The B.F.A with a major in media arts is limited to an enrollment of 25 students per year, with students entering the course rotation only in the fall. Admission to this program will be selective and competitive due to limited faculty and laboratory resources. All students who have met criteria for advanced standing in media arts may apply but only the most qualified applicants will be admitted. Specific instructions regarding B.F.A admission criteria (portfolio review, statement of purpose, GPA) and application procedures are available from the departmental office.

Requirements: The general education requirements for the Bachelor of Fine Arts are identical with those of the B.A. with a major in media arts, as described above. Requirements in the major: a minimum of 60 units of media arts courses, including the media arts core (200, 201a, 201b, 202, 210), plus 297a, as well as the following required courses in the B.F.A.: 362, 304, 305, 306, 311, 314, 315, 371, 400, 401 or 402 or 499, 410. The remaining 10 units are electives selected from available media arts courses.

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.

General Education Mathematics Requirement: Both the B.A. and B.F.A. majors are required to take MATH 117 or higher. Majors whose courses of study might require mathematics courses beyond the minimum requirement (e.g. business minors; anyone needing statistics; production students with a focus on computer imaging; etc.) should select the "M" (moderate knowledge) mathematics strand. Students in the "M" strand should take MATH 117 or higher (but not MATH 122) to satisfy the general education math requirement. Students who are certain that their course of study will not require mathematics beyond the minimum requirement should select the "G" strand (general knowledge) and take MATH 122.

The minor in media arts: The following 26 units of courses comprise a minor in media arts: 200, 201a, 201b, 202 and 210, plus 9 units of media arts upper-division (300-400 level) classes. No more than 6 units of production classes (beyond 210) may be counted toward the minor. To take media arts upper-division courses students must have advanced standing in media arts.

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.

Advanced Standing Requirements: Eligibility requirements for advanced standing are as follows:

1. credit for a minimum of 56 units
2. completion of the media arts core (200, 201a, 201b, 202, 210)
3. completion of ENGL 101 or 103H, ENGL 102 or 104H, MATH 117 or higher, 4 units of foreign language and the following Booklink-approved general education courses for the B.A. degree: 3 units of Traditions and Cultures, 4 units of Science with lab, 3 units of Individuals/Societies/Institutions
4. a grade-point average of not less than 2.50 overall at The University of Arizona.

It is strongly recommended that students complete all general education requirements by the end of their sophomore year.

Students who have not been enrolled at the University for more than two consecutive semesters must meet all provisions of the Advanced Standing Policy in effect at the time of their return.

Ineligible students either erroneously or inadvertently enrolled in restricted courses will have their enrollments cancelled.

Transfer students who otherwise would qualify for advanced standing in media arts 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 Media Arts Undergraduate Advising Office, Modern Languages Building, room 294, for additional information.

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.

201a-201b. Survey of Media History (4-4) I II History of film, television and radio from 1895 through the early 1950s; silent and sound film; radio news and drama, international genres and styles, the emergence of U.S. television. 201a: 1895 to the early 1950s. 201b: 1950s to the present.

205. Reporting the News (3) I II (Identical with JOUR 205)

208. Law of the Press (3) I (Identical with JOUR 208)

210. Beginning Media Production (3) I II Introduction to basic vocabulary of studio television, narrative structure and audio production. Production experience in all three units.

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.

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 II Survey of the history, organization, and practice of electronic journalism.

297. Workshop

a. BFA Portfolio Workshop (1) I P, 200, 210

302. Recording Studio Production (3) I II (Identical with MUS 302)

303. Professional Practices (1) I II Requires students to meet the professional expectations of media work. Job search strategies (resume writing and interviewing) and professional concepts are studied. P. 200, 304, or 305, and one Writing-Emphasis Course.

304. Beginning Video Production (3) I II Introduction to the technical elements of video production, including equipment, professional practices, and production techniques. Laboratory experience with video equipment and production of technical exercises. 2R, 3L. P, 200 and M AR advanced standing.

305. Introduction to Film Production (3) I II Basic principles of 16mm film production; camera, editing, sound, production techniques and practices; laboratory experience with film production equipment and production of technical exercise films. 2R, 3L. P, 200 M AR advanced standing.

308. Survey of Media Law and Regulation (3) I II Introduction to the legal and regulatory framework of the electronic media and film: licensing, cross-ownership, public interest, self-regulation, consumer influence, and related topics.


311. Lighting for Media Production (2) I Function and qualities of light; typical application in photography, television, motion pictures, architecture, and interior design. P. 200.

312. Video Art in America (3) I II 1995-96 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 video programs, including techniques and production procedures. Students will produce a short video work. 2R, 3L. Open to media arts majors and minors only. P, 304, M AR advanced standing.

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.

318. Personal Diary Film and Video (3) Exploration of the history of image making in the home and family context and the integration of film and video making into daily life. Students produce short video assignments.

320. Media Arts Criticism (3) II Analysis of arguments in journalistic and academic criticism and application of critical approaches in written assignments. Writing-Emphasis Course. P, 200 and satisfaction of the upper-division writing-proficiency requirement (see “Writing-Emphasis Courses” in the Academic Guidelines section of this catalog).

321. 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.

349. Intermediate Artists' Video (3) I (Identical with JPN 336)

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.


371. Film/Video Production Financing (3) I II Strategies for production financing for independent film/video projects and ways to position a project in the marketplace. Students will develop a prospectus for their own project. P, 304 or 305.

372. Exhibition Management (3) 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 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 II Advanced work in the writing of news and public affairs programs for radio, television, cable, and other electronic media with emphasis on news program and documentary formats. P, 205, 304, M AR advanced standing. 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) S Advanced procedures and techniques utilized in news gathering, writing and production of newscasts with emphasis on events coverage, newsroom organization. Practice performance is emphasized in laboratory exercises. 2R, 3L. P, 304, 380, M AR advanced standing. (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).


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 WS 5423) 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) I II Includes psychoanalysis, semiotics, materialism, and class analysis, and feminist media production. P, 200, M AR advanced standing. May be convened with 527.

431. Commercial Intertextuality (3) I II Analysis of the development and distribution of media texts with emphasis on intertextual references. P, media arts advanced standing.


437. Ethnographic Film and Video (3) I II Survey of ethnographic film and video from 1895 to present. Examines representative films and tapes in terms of media and anthropological theories. P, media arts majors, advanced standing. (Identical with ANTH 437)

449. Advanced Artists' Video (3) I (Rpt./1 unit) I II (Identical with ART 449)

450. Conducting Media Campaigns (3) I II Analysis of the development and distribution of information through the media. Press releases, fact sheets, public service announcements, interviews, press conferences, and public hearings are studied. P, 350 or 376.

462. Advanced Writing for Media (3) I Advanced dramatic/narrative screenplay writing. Practice experience in the creative process leading to a complete screenplay. P, 362.

470. The Press and Society (3) I II (Identical with JOUR 470)

471. Broadcast and Cable Management (3) I II Investigation of principles, techniques, and current issues in programming for radio and television stations (commercial and public) and cable systems. 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 unit] P, 381. c. News Production (3) [Rpt./1 unit] I II S P, 214. d. Editing (1-6) [Rpt./20 units] S

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) I II For a description of course topics, see 423. Graduate-level requirements include 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 readings and an in-depth research paper on issues in film theory. May be convened with 426.

527. Feminist Media Theory (3) I 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 approaches to media arts through history of telecommunications, broadcasting, film, recorded music and cable television.

535. Hollywood Film and Television (3) I For a description of course topics, see 435. Graduate-level requirements include additional papers. May be convened with 435.

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 history; 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/MEDI/ NEUR/OBG/OPH/PATH/PED/ PSYI/RONC/RADI/SURG)
Arizona Health Sciences Center Room 2208
(520) 626-6518; FAX: (520) 626-4884
Please note: Some College of Medicine courses follow a schedule different from the standard academic calendar.

Interdepartmental (MED)

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.

596. Seminar Many interdepartmental seminars are numbered at both the 500 or 600 and the 800 levels. See 896 below for a complete listing.

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 (2) II P, PATH 801 or permission of instructor.
   b. Physical and Biological Basis of Nuclear Medicine (2) II

Medical Technology
(See Health-Related Professions)

Family and Community Medicine (FCM)


Professors of Clinical Family & Community Medicine Frank A. Hale, Lawrence M. Moher, Augusto Ortiz

Research Professors Carter L. Marshall, Ronald R. Watson

Clinical Professors Pedro Luis Escobar Adjunct Professor Paul B. Pearson

Associate Professors Evan W. Kligman, Head, Louise Canfield, Larry C. Clark, Jennie Joe, Daniel O. Levinson, Kamb Nasser, Richard L. Papenfuss, Cheryl K. Ritenbaugh, Arthur B. Sanders (Surgery), Catherine M. Shisslak, Douglas L. Taren

Associate Professors of Clinical Family & Community Medicine Claire L. McCleure, Bernhardt D. Stein

Research Associate Professors Mikael Aickin, Joel S. Meister

Assistant Professors Tamsen Bassford, Dorian H. Codres, Antonio L. Estrada, Paul R. Gordon, Scott J. Leischow, Mark A. Richter, Denise J. Roe

Assistant Professors of Clinical Family & Community Medicine James R. Allender, Enrique S. Corvalan, Pam Reid Duffy, Sharon J. Isikoff, Lane P. Johnson, James P. Kerwin, Patricia Levensohn-Chialvo, Steven A. Menhennett, Myra M. Muramoto, Robert G. Rhode, Michael S. Shafer

Research Assistant Professors George H. Adams, Brenda Cartmel, Julia C. Emerson, Scott S. Emerson, Howard J. Eng, Julie R. Erickson, Ilene T. Gordon, Barbara R. Hartmann, Janet H. Senf, Lee Sennott-Miller, Nicolette I. Teufel

Clinical Assistant Professors James R. Allender, J. Kevin Carmichael, Jacqueline A. Chadwick, Clifton D. Crutchfield, Murray M. DeArmond, Nancy J. DeArmond, Karen M. Ehrenfeld, Nancy Alexander Koff, Michael E. Scott, James W. Tysinger, Mark D. Van Ert, Barbara H. Warren

Instructor Sheila H. Parker

Instructors of Clinical Family & Community Medicine Victoria E. Murrain, Tejal M. Parikh

Clinical Instructor Richard H. Gerhauser

Research Lecturers Barton R. Burkhalter, Ronald J. Gordon

Senior Clinical Lecturers John T. Condon, Jerry L. Dodson, Melvin H. Goodwin, Wadie W. Kamel, George W. Nash

Clinical Lecturers Joanne Baron, William L. Bartholomew, Marvin M. Bell
### 487. Poverty and Health (3) II (Identical with NURS 487) May be convened with 587.

500. Research (2-16) [Rpt./2]. P. basic science courses. (Identical with PHL 500)

501. Cognitive-Behavioral Medicine (2) [Rpt.] I II For a description of course topics, see 401. Graduate-level requirements include a research project or paper. May be convened with 401.

531. Art Therapy Techniques (3) [Rpt.] Focuses on art expression as non-verbal communication and as a healing agent for children and persons with disabilities. P. previous course work in art and/or special education.

#### 552. Survey of Art Therapy (3) [Rpt./3 units] I Surveys the development of art therapy in the United States through examination of the literature, theories, and current trends in the field.

570. Issues and Trends in Public Health (3) I II S Public health methods, organizations and services such as environmental/occupational health; disease control; health education and promotion; policy and legislation; and medical care. (Identical with PHL 570)

571. International Comparison of Health Care Systems (3) I II S Comparison of health care systems in developing and industrialized countries in relation to other social systems; public/private component analyses; health care methods and finance. (Identical with PHL 571)

572. Population Dynamics and Family Planning (3) I II S Social/economic determinants and consequences of population growth; behavioral and health aspects of human reproduction; organization/evaluation of selected family planning programs. (Identical with PHL 572)

573. Health Issues of Women and Children (3) I II S Knowledge base, social strategies, health policies and programs relating to health and well-being of women, especially of child-bearing years, and children from infancy to adolescence. (Identical PHL 573)

574. Health Administration and Policy (3) I II S Management processes/roles of public health professionals; health service organization; policy issues and resources utilization/control; human resources management; public health trends. (Identical PHL 574)

575. Environmental and Occupational Health (3) I II S Examination of living/working environments impacting human health; chemical and physical stressors affecting health; techniques for assessing and controlling risks in air, soil and water. (Identical with PHL 575)

576. Biostatistics in Public Health (3) I II S Analysis and interpretation of measures of wellness and disease association, disease outbreaks, population surveillance, and health promotion program evaluation. (Identical with PHL 576)

577. Social and Behavioral Basis of Public Health (3) I II S Social learning theory, diffusion of innovations, relationship of cultural values to behavioral change, social marketing, high risk behavior intervention strategies, and communication issues. (Identical with PHL 577)

578. Public Health Nutrition (3) II Community and individual nutritional assessment; risk profiles; planning, implementing and evaluating programs; international; national and local resources/programs; Healthy People 2000 goals. (Identical with PHL 578)

587. Poverty and Health (3) II (Identical with NURS 587) May be convened with 587.

588. Healing Systems in the Southwest (3) I II (Identical with NURS 588)

### 593. Internship

- a. Public Health (1-12) [Rpt./12 units] (Identical with PHL 593a)

#### 596. Seminar

- g. Occupational Disease (1-2) [Rpt./4 units] II Open to medical or industrial hygiene students only. Consult department before enrolling. (Identical with PHL 596g)

#### 800. Research (2-16) [Rpt./2] (Identical with PHL 800)

803. Clinical Clerkship (6)

811. Subinternship

- a. Family Medicine (4-6) I II S

815. Subspecialty

- b. The Dying Patient (3) [Rpt./1] (Identical with PHL 581b)

- d. Problems in Community Oriented Primary Care (3)

- f. Geriatrics (4-6) [Rpt./6 units] P, third year rotation in FCM and MEDI (Identical with MEDI 815f, which is home)

- h. Cancer Epidemiology and Prevention (3) P, none; statistics preferred. (Identical with RONC 815h)

- i. Prevention and Control of Disease (1-2) [Rpt./4 units] I Consult department before enrolling. (Identical with PHL 596i)

#### 819. Preceptorship

- a. Arizona Senior Clinical Preceptorship in Family and Community Medicine (AHED) (6-12)


- c. Epidemiology at CDC (3) I II P, open to majors in medicine, public health, and nursing. Consult department before enrolling.

- d. Verde Valley Rural Care (4-12)
Research Professors Marilyn J. Halonen (Pharmacology), Thomas E. Moon (Family and Community Medicine), Seymour Reichlin
Research Associate Professors Robert T. Dorr (Pharmacology), Irwin Flink, Yei-Mei Peng, Duane L. Sherrill
Clinical Assistant Professors Thomas M. Bejo, Jerry Bangert (Pathology), Donald Brooks, Laura Casali, Neil Clements Jr., Michael Darragh, Pamela Davis, Mindy J. Fain, Susan Fisk-Sander, James Galloway, Guillermo Gonzalez-Osete, Jennifer Hallum, Philip Jaffe, Michelle Jeanette, William Johnson, Peter C. Kelly, Fabia Kwieciinski, Nathan Lauffer, Farrell Lloyd, Richard M. Mandel, Margaret M. Miller, Thomas Morales, Scott Nowlin, Patrick S. Pasulka, Stephen Ruffenach, Philip Serlin, Nancy Silvis, Marvin Siepian, Linda Snyder, Paul E. Stander, Alison Stopec, Sally B.L. Thompson, Gayle A. Traver (Nursing), Christopher Verdi, Bridget Walsh, Barbara H. Warren (Family and Community Medicine), Carol A. Wolfe
Research Assistant Professors Joseph J. Bahl, Danetta A. Bronnimann, Marianne B. Broome-Powell, Frank Cardelto, Brenda V. Dawson, Russell Dodge, Paul Enright, Mohamed Gaballa, Steven B. Knoper
Clinical Instructors Anne Tsen
Senior Clinical Lecturers Bruce F. Bachus, Bruce A. Bethancourt, Michael Boxer, John A. Bruner, Frank Cardelto, Venu Gopal, John R. Harlan, Philip Levy, Richard A. Manch, Frank L. Meyskens, Jr., Ulrich F. Michael, James L. Parsons, Stephen J. Ruffenach, Averly A. Sandberg, Michael M. Schreiber, David Wayne Smith (Emeritus), Martin Snyder (Surgery), Harold C. Trebar
Research Lecturer Susan E. Wilson-Sanders

555. Cancer Biology (3) II 1996-97 (Identical with CIBIO 555)

596. Seminar
a. International Health in the Developing World (3) S Open to health majors only. (Identical with PHL 896a)

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. Caduceus Project: Healing Arts (3) P, completion of 2nd year of medical school.

i. CUP (Commitment to Underserved People) (3) P. Students must participate in orientation and training; and community service during first and second year.

j. Family Medicine Special Studies (4-6) P, completion of basic sciences

k. Mayo Group Practice (6) P, 4th year medical students

896. Seminar

a. *International Health in the Developing World (3) S Open to health majors only. (Identical with PHL 896a)

e. Principles and Practice of Home Health (2) I I Consult department before enrolling. (Identical with PHL 896d)

j. *Health Policy: Leadership and Current Issues (2)

n. *International Nutrition (3-6) P, completion of third year medical school

p. *Managed Health Care (3) [Rpt.] II (Identical with PHL 896p)

t. *Tropical Disease Problems (2) (Identical with PHL 896t)

*Available as both 596 and 896.

Medicine (MEDI)


Assistant Professors Mary E. Gilles, Howard Lien, John D. Palmer (Pharmacology), Thomas E. Raya, David S. Shimm (Radiation Oncology), Charles W. Taylor

Clinical Professors Robert O. Brandenburg, Pedro Luis Escobar, Richard McCarthy, David Ulmer
Assistant Research Scientist Pelagee Beeson
(Speech and Hearing Sciences)

605. Human Neuroscience (6) I II (Identical with CBA 605)

695. Colloquium
a. Motor Control (2) [Rpt./8 units] 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)

805. Human Neuroscience (6) I II (Identical with CBA 605)

810. Clerkship
a. Neurology Consult Service (4)
b. Neurology (3-6) P, 803

815. Subspecialty
b. Cerebrovascular Disease (4-6) P, 803.
c. Epilepsy Elective (4-6)
d. Neurological and Neuromuscular Disorders (3-6) Yr. P, 803; consult department before enrolling.
v. Clinical Evaluation and Treatment of Sleep Disorders (3-6) (Identical with MEDI 815v)

891. Preceptorship
a. Obstetrics and Gynecology (3-6)

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, Reid Schindler

800. Research (6-18) III

815. Subspecialty
a. Ophthalmology (3-6)

891. Preceptorship

Pathology (PATH)
Associate Professors James M. Byers III, H. Eugene Hoyne (Pediatrics), Ronald B. Schifman, Catherine M. Spier
Research Assistant Professor Thomas A. Bellamy, Theresa K. Kramer, Naomi E. Rance
Research Professor Claire M. Payne
Research Assistant Professors Margaret M. Brieht, Mark A. Nelson
Clinical Associate Professor Karen K. Steinbrenn
Clinical Assistant Professors Maria L. Aguirre, Jerry L. Bangert, Achyut K. Bhattacharyya, Diane K. Eklund, John D. Howard, William F. Kern, III, S. Anne Leavitt, Bruce O. Parks, M. Andrew Sibley

n. Physical Medicine and Rehabilitation (3-6) [Rpt./1] CDT P, 3rd or 4th year medical school.
o. Care of HIV-Infected Patients (4) (Identical with FCM 815c)
p. Critical Care Medicine (3-6) (Identical with ANES 815p)
q. Cardiology Consultation (4)
r. Clinical Neurology (4-6) 1993-94
s. Rheumatology (4-6) P, MEDI 803.
u. Clinical Endocrinology, Metabolism and Hypertension (3-6) I II P, completion of required third year Internal Medicine clerkship.
v. Clinical Evaluation and Treatment of Sleep Disorders (3-6) (Identical with NEUR 815v and PSYI 815v)
y. Consultation in Internal Medicine (3) P, 803.
z. Pulmonary Function Lab (3) P, medical student.

891. Preceptorship
a. General Medicine and/or Subspecialities (3-12) [Rpt./2]
b. Ambulatory Internal Medicine: Clinical Problems (4-6) P, Open to fourth year medical students.
e. Hematology/Oncology (3-8) P, 803.
f. Medical Toxicology/Clinical Pharmacology (4) P, completion of required clerkships.
g. AIDS Clinic (4) P, Open to 4th year medical students.

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 J. Copple (Pediatrics), Mary I. Johnson (Pediatrics), Alfred Kasznia (Psychology), Gary E. Schwartz (Psychology), William A. Sibley
Associate Professors Colin R. Barnford, William M. Feinberg, Erwin B. Montgomery, Jr., Gary Wnek (Psychology)
Assistant Professors Geoffrey L. Ahern, David M. Labiner, Nathaniel T. McMullen (Anatomy), Naomi E. Rance (Pathology), Steven Z. Rapsak, Linda Restifo (A.R.L.)
Clinical Professors Harvey W. Buchsbaum, Jose Laguna, Oscar Reimnuth
Clinical Associate Professors Barbara S. Glessner, Enrique L. Labadie, Johan Van Dalen (Ophthalmology)
Clinical Assistant Professors Ronnie Bergen, Robert H. Hamilton, Ann Herring (Psychiatry)
Senior Clinical Lecturers Harold H. Harrison, Bruce D. Ragsdale
Clinical Lecturers Paul D. Bozzo, Peter F. Salomon, Ronald P. Spark, Isabell E. Speer, David A. Wheeler
Assistant Clinical Lecturers John F. Duval, H. Neal Smith, Jr., Kent G. Zimmerman

501. General and Systemic Pathology (10) I II P, formal admission to the M.D./Ph.D. program and permission from the course director.
510. Preceptorship
520. Clerkship
530. General and Systemic Pathology (10) I
540. Molecular and Medical Genetics (3) I
550. Research (1-12) (See College of Medicine Electives Manual)

801. General and Systemic Pathology (10) I II P, formal admission to the M.D./Ph.D. program and permission from the course director.
810. Preceptorship
820. Clerkship
830. General and Systemic Pathology (10) I
840. Molecular and Medical Genetics (3) I
850. Research (1-12) (See College of Medicine Electives Manual)

891. Preceptorship
892. Clerkship
893. General and Systemic Pathology (10) I
894. Molecular and Medical Genetics (3) I
895. Research (1-12) (See College of Medicine Electives Manual)

274 Medicine

891. Subinternship
a. Ambulatory Pediatrics (1-18)
892. Subspecialty
a. Advanced Neonatology (4-6)
b. Pediatric Infectious Diseases (3-6)
d. Cardiac Ultrasound Echocardiography and Doppler (4-6)
e. Pediatric Cardiology (4-6)
f. Pediatric Neurology (4-6)
g. Pediatric Hematology/Oncology (4-6)
h. Pediatric Orthopaedics (3-6) P, completion of basic sciences.
i. Developmental and Behavioral Pediatrics (4-6) P, pediatric clerkship
j. Pediatric Pulmonary (4-6) I II P, 803.
m. Pediatric Gastroenterology (4) P, equivalent
n. Pediatric Gastroenterology (4) P, 803 or equivalent.
p. Pediatric Endocrinology (4-6) P, 803.
q. Pediatric Nephrology (4) s.
r. Pediatric Critical Care (3-6) Limited to fourth-year medical students

815. Subspecialty
a. Consultation Psychiatry (4-6) P, 803.
b. Outpatient Psychiatry (4-6) P, 803.
c. Forensic Psychiatry (3-6) I II S P, 803.
d. Geriatric Psychiatry (4-6) P, 803; consult department before enrolling.
e. Clinical Evaluation and Treatment of Sleep Disorders (3-6) (Identical with MEDI 815v)

891. Preceptorship

Public Health
See Public Health elsewhere in this catalog.

Radiation Oncology (RONC)
Professors J. Robert Cassady, M.D., Head, Timothy Bowden, Ph.D. (Molecular & Cellular Biology, Pharmacology & Toxicology; Coordinator, Research Training, Arizona Cancer Center), Thomas C. Cetas, Ph.D., (Electrical & Computer Engineering; Aerospace & Mechanical Engineering), Eugene W. Gerner, Ph.D. (Biochemistry), Hugo Villar, M.D., (Surgery) Associate Professors Anne E. Cress, Ph.D., David S. Shimm, M.D. (Assistant Professor, Internal Medicine), Baldassarre D. Stea, M.D., Helen L. Gensler, Ph.D. Assistant Professor Jesse Martinez, Ph.D., Eugene Gross, Ph.D., Kathy McGovern, Ph.D.
Clinical Associate Professor Wendell Lutz, Ph.D. (Asst. Prof. AME)
Clinical Assistant Professors Bruce Lulu, Ph.D., Chee Wei Cheng, Ph.D., Marian Croghan, M.D., Helen Fosmire, M.D., Alan Hamilton (Surgery) Research Assistant Professor William Richards, M.D., Ph. D.
Assistant Scientific Investigator Alexander H. Borchers Research Associates Sabine F. Rosenberg, Padma Sundaresan (Pathology), Natalia A. Ignatenko, David E. Gannett, M.D.
Clinical Lecturers John D. Doerr (Surgery), Michael R. Manning
Assistant Clinical Lecturer William Becket, M.D.

505. Eukaryotic DNA Replication (3) [Rpt./1] 1993-94 (Identical with CBIO 505)
515. Subspecialty
h. Cancer Epidemiology and Prevention (3) I P; none; statistics helpful. (Identical with EP 515H)
Molecular Mechanisms of Carcinogenesis (3) I 1996-97 (Identical with CBIO 551)
554. Cancer Biology (3) II 1996-97 (Identical with CBIO 555)
595. Colloquium
d. Special Topics in Cell Biology (2) [Rpt./6 units] II (Identical with CBIO 595d)
596. Seminar
h. Cancer Biology Series (1) I (Identical with CBIO 596h)
l. Comprehensive Cancer Care (1) [Rpt./1] I 1995-96 (Identical with MED 596l)
597. Workshop
a. Mechanisms of Cancer Prevention (3) II 1995-96 P, graduate status in biological sciences (Identical with CBIO 597A)
800. Research
815. Subspecialty
a. Introduction to Radiation Oncology (1-16)
h. Cancer Epidemiology and Prevention (3) I P none: statistics helpful. (Identical with EPI 815b)
i. Cancer Prevention and Control (3-15) II (Identical with EPI 815)
851. Molecular Mechanisms of Carcinogenesis (3) II 1995-96 (Identical with CBIO 851)
855. Cancer Biology (3) II 1996-97 (Identical with CBIO 855)
896. Seminar
h. Cancer Biology Series (1) I (Identical with CBIO 896h)
l. Comprehensive Cancer Care (1) [Rpt./1] I 1995-96 (Identical with MED 896l)

Radiology (RADI)

Professors Theron W. Ovitt, Head, Harrison H. Barrett (Regent’s Professor, Optical Sciences), M. Paul Capp, Raymond F. Carmody, William Dallas (Optical Sciences), Tim B. Hunter, Dennis D. Patton (Chief, Nuclear Medicine, Optical Sciences), Gerald D. Pond (Chief, Diagnostic Radiology), Joachim F. Seeger, William L. Wolfe, Jr. (Optical Sciences), James M. Woolfenden
Associate Professors Robert J. Gillies (Biochemistry), Arthur F. Gmitro (Optical Sciences), Evan C. Unger, Walter H. Williams
Assistant Professor Pamela J. Lund

800. Research (1-6) [Rpt./1]
815. Subspecialty
a. Diagnostic Radiology (4)
b. Nuclear Medicine (1-6)
891. Preceptorship
b. Diagnostic Radiology (4) P, completion of basic sciences.

Surgery (SURG)

Professors Bruce E. Jarrell, Head, Charles W. Putnam, Associate Head (Pharmacology), L. Milos Chvapil (Emeritus), Jack G. Copeland (Associate Director, University Heart Center), George W. Drach, John B. Fortune, Theodore J. Glattke (Speech and Hearing Sciences), Kenneth V. Iserson, Douglas Lindsey (Emeritus), Noel D. Matkin (Speech and Hearing Sciences; Supervisor, Douglas Lindsey), Paul M. McDonagh (Physiology), Harvey W. Meislin (Director, Emergency Services), Leonard F. Feltier (Emeritus), Arthur B. Sanders (Associate Professor, Family and Community Medicine; Clinical Lecturer, Internal Medicine), Gulshan K. Sethi, Donald P. Speer (Anatomy), Robert F. Spetzler, Thomas H. Stanisic, Charles M. Tipton (Head, Exercise and Sport Sciences; Director, Health Related Professions), Hugo V. Villar (Radiation Oncology), Robert G. Volz (Emeritus), Stuart K. Williams (Physiology), Charles L. Witte, Marilyn H. Witte, Charles F. Zukoski, III

Associate Professors Robert M. Anderson (Emeritus), James B. Benjamin, Ronald Heimark, Glenn C. Hunter, Douglas F. Larson (Director, Instructional Research/Development; Assistant Professor, Pharmacology), Joseph L.R. Mills, Paul Nakazato, William D. Rappaport, Daniel W. Spaite, John B. Sullivan, Jr. (Adjunct Assistant Professor, Pharmacology and Toxicology; President and CEO, University Physicians, Inc.), Terence D. Valenzuela (Clinical Associate Professor, Internal Medicine), David B. Van Wyck (Internal Medicine)

Assistant Professors Francisco Arabia, W. Bradford Carter, Bruce L. Dalkin, Michael J. Esser, Allan J. Hamilton (Clinical Assistant Professor, Radiation Oncology), Jon K. Nisbet, Luis J. Rosado, William Smith, Francisco G. Valencia, James A. Warneke, Martin E. Weinand, Craig S. Williams


Clinical Associate Professors Theodore J. Bunt, C. Peter Crowe, Jr. (Senior Clinical Lecturer, Pediatrics), Farid S. Haddad, Timothy R. Harrington, George F. Hewson, Robert R. Karpman, Hal W. Pittman, Gerald L. Schmitz, Andrew G. Shetter, Earl A. Surwit (Obstetrics and Gynecology), Research Associate Professors Janis M. Burt (Associate Professor, Physiology), Donald W. DeYoung (Chief, Experimental Surgery/Clinical Services; Adjunct Associate Professor, Veterinary Sciences; Veterinary Specialist, University Animal Care, Arizona Health Sciences Center), Ronald L. Misiorowski (Research Associate, Anatomy), David Montgomery, John A. Szivek

Clinical Assistant Professors Aychat Bhatcharyya (Pathology), Riemeke M. Brakema, Richard H. Carmona (Physician Consultant, Student Health Service), Catherine Cosentino, Curtis A. Dickman, Mary Jo Ghory, Peter N. Herrington, Kenneth R. Johnson, Mazen Khayata, Samuel M. Keim, Jerry D. Morh, Neopito L. Robles, Jerry B. Rogers, Jolyon D. Schilling, H. Thomas Sethney, Del V. Steinbronn (Radiation Oncology), Jon Wang, William L. White, Joseph M. Zabramski

Professors of Clinical Surgery Eric G. Ramsey, Martin Schiff, Jr.

Associate Professors of Clinical Surgery Robert B. Dzioba, Frederick A. Greenwood, Samuel M. Keim, Frederick J. Menick, Frank Walter

Assistant Professors of Clinical Surgery Scott S. Berman, William J. Brooks, Heeten Desai, John A. Guisto, Irwin E. Harris, Sharon J. Isikoff (Clinical Family and Community Medicine), Rockwell Jackson, Christopher T. Johnson, Rebecca J. Kennedy, David Neal, John T. Ruth, Wendell B. Whitacre

Research Assistant Professors Carl A. Boswell, Lorraine M. Manciet, Judith B. Ulreich


The surgery Specialty Clerkship rein-
broads general exposure to surgery dur-
forces these basic skills by application to
sessions, rounds and weekly conferences.
developed by case-oriented small group
management. An awareness of the nature
ing room conduct and postoperative
tive evaluation in emergency, inpatient,
ical or research surgery.
ences includes hospital training in general
and specialty surgery with a strong em-
phasis upon the five-year graduate pro-
gram. It emphasizes training of the clini-
cal surgeon but encourages elective
surgical study for future community, ac-
demic or research surgery.
760. Principles of Perfusion Techniques I (3) I
(Ide ntical with PHCL 670)
671. Perfusion Technology Laboratory (1) I
(Ideal with PHCL 671)
672. Principles of Perfusion Techniques II
(2) I (Ideal with PHCL 672)
800. Research (1-12) P, 803. (See College of
Medicine Electives Manual)
d. Research Techniques in Orthopedic
Surgery (4-8) P, 803.
803. Clinical Clerkship (6-9)
807. Specialty Clerkship (3) P, basic science
courses.
110. Clerkship
a. General Surgery (3-8)
b. Burn Care (4-8) P, fourth year medical
students or completion of 803.
119. Subinternship
b. BNI Neurological Surgery (4-6) P, fourth
year medical students.
815. Subspecialty
a. Urinary Stone Disease (6)
b. Cardiothoracic Surgery (4-12)
c. Neurosurgery (3-6)
d. Surgical and Medical Problems in Fluid
and Electrolyte Balance (1-3) [Rpt./1]
e. Urology (4-6)
f. Orthopedics (3)
g. Cardiovascular Physiology and Re-
search (1-12)
h. Lymphvascular System in Health and
Disease (6 to 12)
j. Otohinolaryngology (3)
k. Sports Medicine (Section of Orthopedic
Surgery) (3-8) [Rpt./1]
l. Orthopedic Biomechanics/Biomaterials
(6) P. Nine weeks of surgery clerkship,
803 and/or 807.
m. Trauma (3-8)
n. Spinal Cord Injury (3) Open to majors
only; P, senior standing.
o. Surgical Critical Care (3-6) [Rpt./] P, 803.
p. Pediatric Orthopedic Surgery (3-6)
[Rpt./6 units] P, rotation in pediatrics and
orthopedic surgery.
q. Plastic Surgery (3-6) I II P, senior year in
medical school.
r. Clinical Experience in Rehabilitation
Medicine (1-4)
s. Vascular Clinical Management (4-8)
[Rpt./8 units] P, completion of junior
and senior rotations in surgery.
t. Emergency Medicine (3-12)
u. Head and Neck Surgery (4-6) P, comple-
tion of required clerkships.
v. Clinics in Medical Ignorance (3-4) II P,
junior standing.
w. Pediatric Urology (4) I II
x. Clinical Toxicology (4-6) P, 4th year
medical students.
y. Advanced Surgical Skills (3-6) P, general
surgery.
816. Subspecialty
a. Pediatric Surgery (4) (Identical with
PED 816a)
b. Hand Surgery (4)
891. Preceptorship
a. Surgery and Subspecialties (1-18)
[Rpt./3]
e. Spine and Orthopedic Reconstruction
(6-12) P, 803.
h. Vascular Surgery (4-8) P, fourth year
medical students or completion of 803.
i. Perfusion Science (3) [Rpt./9 units] I II S
(Identical with PHCL 8911, which is
home).
896. Seminar
a. Medical Ignorance (2) [Rpt./1] II

**Mexican American Studies (MAS)**

Douglass Building, Room 315
(520) 621-7551; FAX: (520) 621-7966

**Mexican American Studies and Research Center**

Professors Celestino Fernández (Sociology), Jose D. Garcia (Physics), Lanin A. Gyrko (Spanish and Portuguese), Miguel M. Méndez (Spanish and Portuguese and Mexican American Studies), Michael C. Meyer (History), Eliana S. Rivero (Spanish and Portuguese), Macario Saldate IV (Guadalajara Summer School), Charles M. Tatum (Humanities), Thomas Weaver (Anthropology)

Associate Professors John A. Garcia (Political Science), Juan R. Garcia (History), Roseann Gonzalez (English), Antonio Rios-Bustamante (Mexican American Studies), Kathleen C. Schwartaman (Sociology), William Velez (Mathematics)

Assistant Professors Antonio L. Estrada, Acting Director (Mexican American Studies and Family and Community Medicine), Hector Delgado (Sociology and Mexican American Studies), Susan Gonzalez-Baker (Public Administration and Policy and Mexican American Studies), Alfonso Morales (Sociology and Mexican American Studies), Ana Perches (Spanish and Portuguese), Joaquin Ruiz (Geosciences)
Lecturers Salomón Baldenegro, Adalberto Guerrero (Emeritus)
Adjunct Lecturer Raquel Rubio-Goldsmith

Under the auspices of the Mexican American Studies and Research Center, the Mexican American studies curriculum is an interdisciplinary exploration of the Mexican American experience. Its general goal is to provide a socially pertinent education with humanistic and practical content which will enrich the total university curriculum as well as prepare students to serve the total community.

The major: 36 units in MAS, including 6 required courses: 180a-180b, 233, 350, 485, and 496a; and 18 units chosen from the listing below. Majors must demonstrate proficiency in Spanish.

The major in Mexican American studies assumes general knowledge of mathematics. Students should choose MATH 122 or a more advanced mathematics course to complete their mathematics requirement.

A supportive minor in Mexican American studies to augment other academic areas or majors is encouraged.

The minor: The minor requires 21 units, including 180a, 233, 496a and 12 units chosen from the listing below.

160. Minority Relations and Urban Society (3) I (Identical with SOC 160)
161. The Chicano in American Society (3) II (Identical with SOC 161)
180a-180b. Introduction to Mexican American Studies (3-3) Introduction to Mexican American studies from various perspectives. 180a: The human sciences. 180b: Research issues and interpretation in the field; public policy and Mexican origin populations; and social sciences and the professions and impact on the Mexican American community.
233. History of the Mexican American (3) I (Identical with HIST 233)
239. Mexican American Culture (3) I (Identical with ANTH 239)
322. Politics of the Mexican American Community (3) I (Identical with POL 322)
350. The Chicano Movement (3) I Exploration and analysis of the origin, nature, dynamics (political, social, cultural), ideology, activities, and effects of the Chicano movement of the 1960s. P, at least two MAS courses.
361. The U.S.-Mexico Border Region (3) I (Identical with HIST 361)
368. Colonial Mexico (3) I (Identical with HIST 368)
369. Mexico Since Independence (3) II (Identical with HIST 369)
403. Mexican-American Literature (3) II (Identical with SPAN 403)
406. Foundations of Reading Instruction in Spanish (3) II Student must be registered in the College of Education. (Identical with LRC 406)

423. Anthropology of Rural Mexico (3) II (Identical with ANTH 423)
433. Mexican and Mexican-American Civilization Through Literature (3) (Identical with SPAN 433)
443a-453b. Mesoamerican Archaeology (3-3) II (Identical with ANTH 453a-453b)
459. Hispanic Linguistics (3) [Rpt./9 units] I (Identical with SPAN 459)
467. Race and Ethnic Relations (3) I (Identical with SOC 467)
473. Spanish for the Native Speaker of Spanish (3) I (Identical with SPAN 473) May be convened with 573.
485. Mexican-American Women's History (3) I (Identical with SPAN 585)
496. Seminar (3) I P; MAS courses required for the major and minor.

501. Medical Microbiology (6) I The biological characteristics of microorganisms of importance in human health and disease; the reaction of the host to infectious agents and the mechanisms of host defense; diagnosis and management of infectious disease. Lectures, discussions, and laboratory experiments. P, CHEM 241b.
503R. Biology of Animal Parasites (3) I (Identical with V SC 503R) May be convened with MIC 403R.
503L. Parasitology Laboratory (1) I (Identical with V SC 503L) May be convened with MIC 403L.
504. Molecular Parasitology (3) II GRD (Identical with V SC 504) May be convened with MIC 404.
505. Eukaryotic DNA Replication (3) [Rpt./11 units] I (Identical with CBIO 505)
511. Molecular Biology (3) I (Identical with MCB 511) May be convened with MIC 411.
517. Microbial Physiology and Gene Cloning (3) II (with Biochemistry and microbial physiology of microorganisms. P, MIC 317, CHEM 241b, 243b.
519. General Immunological Concepts (4) (Identical with MIC 519) May be convened with MIC 419.
520. Pathogenic Bacteriology (3) I I etiology and pathogenesis of bacterial diseases in hu-

Microbiology (MIC)

Undergraduate Program
Veterinary Science-Microbiology Building
Room 207
(520) 621-6903; FAX: (520) 62-2100

Professors Charles R. Sterling, Program Di rector (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), Donald V. Lightner (Veterinary Science), C. John Mare (Veterinary Science), Neil Mendelson (Molecular and Cellular Biology), David Mount (Molecular and Cellular Biology), Merritt R. Nelson (Plant Pathology), George B. Olson (Emeritus), Ian L. Pepper (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 Akporiaye (Microbiology and Immunology), Robert Arnold (Civil Engineering), Richard L. Friedman (Microbiology and Immunology), Martha Hawes (Plant Pathology), Martinez J. Hewlett (Molecular and Cellular Biology), Robert J. Janssen (Emeritus), Christina Kennedy (Plant Pathology), 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 Rainera M. Miller (Soil and Water Science), Marc Orbach (Plant Pathology), L.S. Pierson (Plant Pathology), Michael Riggs (Veterinary Science), Gary A. Thompson (Plant Sciences), Zhongguo Xiong (Plant Pathology)

Lecturer Lee M. Kelley (Emeritus) Adjunct Associate Professor Mary Olsen (Plant Pathology)

Research Associate Professor Janet M. Decker (Veterinary Science)

Research Assistant Professors Mortaza Abbassadeghan (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 students 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 office in Room 207, Veterinary Science-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 181R/L, 182, 317, 419, 421a, 421b and 428. CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b, and 323/323 or 325/326, PHYS 102a-102b, or 104a-104b, and 180a-180b, BIOC 460 or 462a-462b, MATH through calculus (123, 124, or 125a), and STAT 163 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 181R/L, 182, 317, 419, 421a, 421b and 428. CHEM 103a-103b, 104a-104b, 241a-241b, 243a-243b, and 323/323 or 325/326, PHYS 102a-102b, or 104a-104b, and 180a-180b, BIOC 460 or 462a-462b, MATH through calculus (123, 124, or 125a), and STAT 163 are also required.

**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.

**181R. Introductory Biology I (3)** (Identical with MCB 181R)

**181L. Introductory Biology Laboratory (3)** (Identical with MCB 181L)

**182. Introductory Biology II (4)** (Identical with ECOL 182)

**195. Colloquium**

a. **General Microbiology and Microbial Physiology (3)** (Identical with SW 325)

b. **Biology of Animal Parasites (3)** (Identical with SW 403R or MCB 403)

c. **Parasitology Laboratory (1)** (Identical with SW 403L or MCB 403L)

d. **Molecular Parasitology (3)** (Identical with SW 404 or MCB 404)

**401. Cell Biology (3)** (Identical with MCB 410)

**411. Molecular Biology (3)** (Identical with MCB 411)

**419. General Microbiology (3)** (Identical with MCB 419)

**421a-421b. Microbiological Techniques (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.

**423. Mechanisms of Disease (5)** (Identical with SW 423) May be convened with MBIM 523.

**425. Environmental Microbiology (3)** (Identical with SW 425) May be convened with MBIM 525.

**426. Environmental Microbiology Laboratory (2)** (Identical with SW 426) May be convened with MBIM 526.

**427. General Virology (3)** (Identical with PL P 427R)

**427L. General Virology Laboratory (2)** (Identical with PL P 427L)

**428. Microbial Genetics (3)** (Identical with PL P 428)

**429. General Virology (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.

**430. Introduction to Biobiology (2)** (Identical with PHYS 430) May be convened with MBIM 530.

**432. Pathogenic Virology (3)** (Identical with SW 432)

**438. Ecology of Infectious Disease (3)** (Identical with SW 438) May be convened with MBIM 538.

**440. Biodegradation of Pollutants in Soil and Groundwater (3)** (Identical with SW 440) May be convened with MBIM 540.

**443. Research Animal Methods (3)** (Identical with SW 443) May be convened with MBIM 543.


**454. Host-Microbial Interactions (3)** (Identical with SW 454) May be convened with MBIM 554.

**470. Food Microbiology and Sanitation (3)** (Identical with SW 470) May be convened with MBIM 570.

**471. Food Microbiology and Sanitation Laboratory (2)** (Identical with SW 471) May be convened with MBIM 571.

**473. Recombinant DNA Methods and Applications (4)** (Identical with MCB 473)

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**Middle Eastern Studies**

Franklin Building, Room 204

(520) 621-5450; FAX: (520) 621-9257

**Center for Middle Eastern Studies**

Professors Jerrold D. Green (Political Science), Director, Ludwig W. Adamec (Near Eastern Studies), Michael E. Boinine (Geography and Regional Development), Nathan Buras (Hydrology and Water Resources), Kenneth Clark (Architecture), William Dever (Near Eastern Studies), Leonard Dinnerstein (History), Richard M. Eaton (History), Kenneth E. Foster (Arizona), Adel S. Hamid (Near Eastern Studies), Seymour Goodman (Management Information Systems) Carol Kramer (Anthropology), Fred S. Matter (Architecture), John Olsen (Anthropology), Hamdi Qafisheh (Near Eastern Studies), John C. Racy (Psychiatry), Jacqueline E. Sharkey (Journalism), Charles Smith (Near Eastern Studies), David Soren (Classics), Sorosh Sorooshian (Hydrology and Water Resources), Anthony Vuturo (Family and Community Medicine), Donald A. Wells (Economics), Norman Yoffee (Anthropology)


Assistant Professors Linda T. Darling (History), Chris Demchak (Public Ad-
ministration and Policy), Tamra Pearson d'Estree (Psychology), David Gibbs (Political Science), Simin Karimi (Near Eastern Studies), Kathleen M. May (Nursing), Senzil Nawid (Near Eastern Studies), Beverly Seckinger (Media Arts), David Spigo (Political Science), J. Edward Wright (Judaic Studies)

Lecturers Rohn Elou, Jean F. Goetinck (French and Italian), Shoshana Green (Judaic Studies), Richard Wilkinson (Humanities)

Adjunct Professor Lou Silverman (Judaic Studies)

Adjunct Assistant Professors Anne H. Betteridge (Middle Eastern Studies), Amy W. Newhall (Middle Eastern Studies)

The Center for Middle Eastern Studies coordinates a concentration in Middle Eastern studies for students majoring in a variety of other disciplines, including anthropology, agriculture, architecture, economics, French, journalism, Judaic studies, medicine, Near Eastern studies, and political science. Areas of particular strength include Afghanistan, Iran, Iraq, the Fertile Crescent, and Egypt. Faculty members are available to counsel students on planning their programs.

For students interested in majoring in Middle Eastern languages, programs are available through the Department of Near Eastern Studies and the Committee on Judaic Studies.

The center participates in the honors program.

Military Science, Naval Science, and Military Aerospace Studies

The Center for Middle Eastern Studies

The Center for Middle Eastern Studies coordinates a concentration in Middle Eastern studies for students majoring in a variety of other disciplines, including anthropology, agriculture, architecture, economics, French, journalism, Judaic studies, medicine, Near Eastern studies, and political science. Areas of particular strength include Afghanistan, Iran, Iraq, the Fertile Crescent, and Egypt. Faculty members are available to counsel students on planning their programs.

For students interested in majoring in Middle Eastern languages, programs are available through the Department of Near Eastern Studies and the Committee on Judaic Studies.

The center participates in the honors program.

Military Science, Naval Science, and Military Aerospace Studies

Military science (Army), naval science (Navy and Marine Corps) and aerospace studies (Air Force) are open to male and female students seeking a commission. ROTC courses can be counted as elective credit toward graduation in most academic majors. Lower-division courses carry no service commitment. Veterans may receive credit for the first two years of the four-year ROTC program. Textbooks and uniforms are provided by the departments. For further information about the four-year ROTC programs, the special two-year ROTC programs, entry requirements for upper-division courses, and ROTC scholarships, see the catalog section on School of Military Science, Naval Science and Aerospace Studies under General Divisions of the University or contact the department.

Military Science (ML S)

South Hall, Room 101
(520) 621-1609; FAX: (520) 621-1846
Naval Science (NS)

South Hall, Room 109
(520) 621-1281; FAX: (520) 621-1846

Professor Stephen P. Duermeyer, Head
Associate Professor Vincent W. Converse
Instructors David W. Fischer, Timothy J. Minnehan, Tommy S. Southard, Jr., Catherine R. Wdowiak, James D. Zartman

100. Naval Laboratory (1) [Rpt./10 units] I II Various topics such as drill and ceremonies, physical fitness, cruise preparation, sail training, safety awareness, personal finances, and applied exercises in naval ship systems, navigation, naval operations, naval administration, and military justice. 3L.

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 courtesy and customs, military justice, shipboard damage control and safety.

102. Naval Ship Systems I: Engineering (3) II Ship characteristics and types including ship design, hydrodynamic forces, stability, compartmentation, propulsion, electrical and auxiliary systems, interior communications, ship control, and damage control; basic concepts of the theory and design of steam, gas turbine, and nuclear propulsion.

103. Naval Laboratory (2) [Rpt./9] Various topics such as drill and ceremonies, physical conditioning, cruise preparation, safety awareness, naval warfare and operations, administration and military justice. USMC history, traditions, missions, land navigation, troop leading skills and small unit tactics.

105. Marine Lab for Platoon Leaders (1) [Rpt./9] USMC history, traditions, missions, land navigation, troop leading skills and small unit tactics.


301. Leadership and Management I (3) I Theory, principles, and procedures of management. Students learn piloting navigation including the use of charts, visual and electronic aids, the theory and operation of magnetic and gyro compasses, and celestial navigation.

302. Leadership and Management II (3) II International and inland rules of the road, relative-motion vector-analysis, formation tactics, and ship employment. Introduction to naval operations and ship handling. P, N S 301

310. Evolution of Warfare (3) I 1996-97 The development of warfare to present, focusing on theorists, strategists, tacticians, and technological developments. Student acquires sense of strategy and impact of precedent on military actions.

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 1995-96 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 (ML A)  

South Hall, Room 104
(520) 621-3521; FAX: (520) 621-1846

Professor Terence N. Thompson
Assistant Professors Gregory S. Jones, David M. Lewis, 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 Navy. General purpose and aerospace support forces. 1R, 1L. 100a is 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 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 Strategy (3-3) Critical analysis of various aspects of the military in American society and its application and effects on the world political and economic environment. 3R, 1L. Consult department before enrolling.

**General Military Course **

**Professional Officer Course**

Mining and Geological Engineering (G EN/MNEC/MN E)

Mines Building, Room 229
(520) 621-6063; FAX: (520) 621-8330

Professors Jay C. Dotson (Emeritus), DeVerle P. Harris (Geosciences), Y.C. Kim, Richard Newcomb (Agricultural and Resource Economics), William C. Peters (Emeritus, Michael Rieber (Economics))

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 (G EN)

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 II (Identical with MN E 120)

219. Mineralogy and Petrology for Engineers (3) Introduction to crystal groups, mineral chemistry, mineral recognition, genesis, classification and identification of rocks and their recognition in hand specimens and in the field. 2R, 3L. P, CHEM 103a-103b, 104a-104b, GEO 101. 103. (Identical with MN E 219) LaBrecque

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, 1L. 3ES, 1.5ED. P, GEOS 321. (Identical with GEOS 407) May be convened with 507. Glass

415. Rock Excavation (3) I (Identical with MN E 415) May be convened with 515.

416. Field Studies in Geophysics (3) II S Seismic, magnetic, electrical, and gravity exploration techniques. Field trips. Special fee may be required. 3ED. P, 448 or 548. (Identical with GEOS 416) May be convened with 516. Sternberg


425. Geotechnical Investigations (3) II Senior design course emphasizing the investigation
and analysis of geologic factors in the design and construction of engineering projects. 1R, 6L. 3ED. May be convened with 525. Glass

426. Health and Safety in Mining (1) (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.


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, PHYS 141, 242, MATH 223. (Identical with GEOS 448) May be convened with 548. Sternberg/Johnson


470. Computer Methods in Geophysical Engineering (3) II Use of computers to solve problems in geophysical 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 For a description of course topics, see 416. Graduate-level requirements include additional project work requiring a more in-depth analysis. Field trips. Special fee may be required. P, 448 or 548. (Identical with GEOS 516) May be convened with 416. Sternberg

522. Well Logging Interpretation (3) II Basic well logging theory. Fundamentals of quantitative formation evaluation. Detailed investigation of aspects of well logging applicable to student's research interests. P, consult department before enrolling. (Identical with GEOS 522 and HWR 522) LeBracque

524. Fundamentals of Geotechnics (3) II For a description of course topics, see 424. Graduate-level requirements include an in-depth research paper on an assigned topic. P, C E 340. May be convened with 424. Kulati|k

525. Geotechnical Investigations (3) II For a description of course topics, see 425. Graduate-level requirements include a research project. May be convened with 425. Glass

526. Health and Safety in Mining (1) I (Identical with MN E 526) May be convened with 426.

527. Geomechanics (3-4) I (Identical with MN E 527) May be convened with 427.

529. Rock Slope Analyses and Design (3) I (Identical with MN E 529)

537. Developments in Rock Mechanics (2) I (Identical with MN E 537)

545. Fundamentals of Geostatistics (3) [Rpt. /6 units] II (Identical with MN E 545) May be convened with 445.

548. Geophysical Exploration and Engineering (3) I For a description of course topics, see 448. Graduate-level requirements include a special research project collecting and interpreting geophysical field data. P, PHYS 140, 116, MATH 223. (Identical with GEOS 548) May be convened with 448. Sternberg/Johnson

549. Mineral Exploration (3) I For a description of course topics, see 449. Graduate-level requirements include a research report. P, GEOS 209. (Identical with GEOS 549 and MN E 549) May be convened with 449. Poulton

550. Earthquake Engineering (3) I Applied course in earthquake causes and effects, integrating the fields of seismology, engineering, and seismic geology. P, MATH 254. Glass

557. Fundamentals of Geomechanics (4) II (Identical with MN E 557)

560. Electrical Exploration Methods (3) I Electrical properties of minerals and rocks; resistivity and resistivity exploration, induced polarization and complex resistivity, magneto-telluric methods, and electromagnetic prospecting methods. P, 421, 448. Consult department before enrollment. (Identical with GEOS 560) Sternberg

570. Computer Methods in Geological Engineering (3) II For a description of course topics, see 470. Graduate-level requirements include an additional advanced research project. P, introductory courses in computer programming, math, and earth science. May be convened with 470. Poulton/Sternberg

580. The Mechanics of Fracture in Rock and Other Brittle Materials (3) II (Identical with MN E 580)

587. Applied Neural Network Computing (3) II Theoretical development and applications of artificial neural networks for classification, parameter estimation, prediction, filtering, and association. Emphasis is placed on applications in science and engineering. P, knowledge of a programming language. Poulton


649. Probabilistic Methods in Geotechnical Engineering (3) II (Identical with CE 649)

696. Seminar

a. Research (1-3) [Rpt. /] II (Identical with MN E 696a and MNEC 696a)

**Mining Engineering (MN E)**

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) III 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) Kemery/Poulton

219. Mineralogy and Petrology for Engineers (3) (Identical with G EN 219)

220. Mining Methods (3) II Introduction to the techniques, unit operations, and systems involved in underground and surface mining of minerals and coal. Field trips. 2ES, 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) II 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 351A. May be convened with 506. Harpalani

410. Mine Surveying (1) II Mine surveying problems and practices; closed traverse of underground mine; shaft plumbing, slope and raise surveying. 1ES, P, 120, C E 251. Lever

411. Mineral Processing (3) I Physical and chemical unit operations needed 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 MSE 411) May be convened with 511.

415. Rock Excavation (3) II Methods of excavation of rock in surface and underground mines and construction, ranging from the empiricism of conventional blasting practice to the application of the fundamental mechanics of rock fracture. 2R, 3L, 1.5ES, 1.5ED. 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

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 management responsibilities to control accidents, a review of federal regulations and standards affecting the industrial workplace, and instruction regarding the interaction of industrial hygiene, safety, fire protection and workers' compensation to control losses resulting from industrial accidents. 1ES. (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; rock testing; geomechanical classifications; engineering applications: slopes, pillars, tunnels, dam foundations; reinforcement design. 3R, 3L, 1.5ES, 1.5ED, P, C E 217, GEOE 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) Coal geology, properties, and use. Ground and underground methods and equipment: strip mining; gob mining; continuous, conventional, longwall mining; underground control; ventilation; haulage; electrical power; drainage. Preparation and reclamation. 2ED, 1ES, P, 220, 406, ECE 207. May be convened with 533.

435. Mine Design (3) II Computer-aided design of a modern mine; feasibility study, pit limit design, mining sequence development and short-term mine planning. 2R, 3L, 3ED, P or CR, 430, 440. May be convened with 535. Kim

436. Subsurface Environmental Engineering (3) II Analysis of sources of heat, humidity, gases and dust in mines and other subsurface facilities. Design of engineering systems to control these pollutants. 1.5ES, 1.5ED, P. May be convened with 536. Harpalani

440. Materials Handling (3) I Surface and underground 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


490. Practicum a. Unit Operations (1-3) I II 5 P, 220. May be convened with 594. Lever

501. Analysis of Mine Operations (3) II For a description of course topics, see 401. 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 G EN 515) May be convened with 415.

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 G EN 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, GEOE 321. (Identical with G EN 527) May be convened with 427. Kemeny

529. Rock Slope Analyses and Design (3) I 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 529) Kulatilake

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, 220, 402. May be convened with 430. Kim

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 or CR, 430, 440. 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 consultation department before enrolling. May be convened with 436. Harpalani

537. Developments in Rock Mechanics (2) I Discussion of new developments in rock mechanics and of areas of interest for future research. Field trips. P, 427 or 527. (Identical with G EN 537)

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 G EN 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) I (Identical with G EN 549) May be convened with 449.


580. The Mechanics of Fracture in Rock and Other Brittle Materials (3) II Fracture me-
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 (G EN 427) (Identical with G EN 580) Kemeny


594. Workshop
a. Unit Operations (1-3) I II S P, 220. May be convened with 494.

696. Seminar
a. Research (1-3) [Rpt.] I II (Identical with G EN 696a)

Molecular and Cellular Biology (MCB)

Life Sciences South Building, Room 444

(520) 621-7560; FAX: (520) 621-3709

Professors Samuel Ward, Head, H. Vasken Aposhian, Hans Bohnert (Biochemistry), Don Bourque (Biochemistry), George T. Bowden (Radiation Oncology), Danny Brower, Robert P. Erickson (Pediatrics), Wayne R. Ferris (Emeritus), William J. Grimes (Biochemistry), Richard B. Hallick (Biochemistry), John Hildebrand (Arizona Research Laboratory), Henry Koffler (Biochemistry, Microbiology and Immunology), Brian Larksins (Plant Sciences), John Little (Biochemistry), Neil H. Mendelson, David W. Mount, Gene Myers (Computer Science), Paul Sypherd, Hans Van Etten (Plant Pathology)

Associate Professors Gail Burd, Carol Dieckmann (Biochemistry), Jennifer D. Hall, Martha Hawes (Plant Pathology), Martinez J. Hewlett, Thomas J. Lindell, Roger L. Miesfeld (Biochemistry), Elizabeth Vierling (Biochemistry)

Assistant Professors Alison Adams, Herman Gordon (Anatomy), Lynn Manseau, Roy Parker, Bruce Patterson, Mani Ramaswami, Mary Rykowski (Anatomy), Scott Selleck (Arizona Research Laboratories), Ted Weinert

The University Department of Molecular and Cellular Biology offers the Bachelor of Science, Master of Science, and Doctor of Philosophy degrees with a major in molecular and cellular biology. The department will only admit graduate students whose stated objective is the Doctor of Philosophy degree.

The major: 30 units in addition to the general education requirements for the Bachelor of Science degree described in the Arts and Sciences section of this catalog. Required courses are 181R, 181L, 182, 320, 410, 411, 462a, and at least two units of an upper-division laboratory course (such as 321, 473, 494 or 499). Writing-Emphasis course requirements can be met by taking 404, 455, 470, 473 or 498H. With the assistance of a major advisor, the student must select a minimum of 30 units, including at least 6 units of upper-division molecular and cellular biology elective courses.

Molecular and cellular biology majors complete a structured minor with the following required courses: CHEM 103a, 104b-a, 241a-b, 243a-b; PHYS 131, 132; MATH 125a or 125, and 125b.

_**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 minor:**_ A minor in molecular and cellular biology requires 21 units minimum, and must include 181R, 181L and 182. At least 9 units must be upper-division course work.

The department participates in the honors program. Core courses all have additional honors credit.

105A. The Universe and Humanity: Origin and Destiny (3) II (Identical with PTYS 105a)

120. Human Physiology: The Facts of Life (4) (II) (Identical with EXSS 120)

181L. Introductory Biology Laboratory (1) I Laboratory exercises presenting techniques and fundamental principles of modern biology. Designed to complement the information concurrently presented in 181R. P, 181R or CR, 181R. (Identical with BIOC 181L, ECOL 181L, MDC 181L)

181R. Introductory Biology I (3) 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 required. (Identical with BIOC 181R, ECOL 181R, MIC 181R)

182. Introductory Biology II (4) II (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)

320. Genetics (4) (Identical with ECOL 320)

360. Principles of Plant Physiology (4) [Rpt.] I (Identical with PL S 360)

404. Contemporary Biology in Human Affairs (3) II Advances in biomedical research will be reviewed and their ethical, social and legal implications discussed. P, one course in BIOC or biology; botany not acceptable.


415. Molecular Genetics (3) I II (Identical with PLP 428)

429. General Virology (3) I II (Identical with MIC 429)

437. Vertebrate Physiology (4) I (Identical with ECOL 437)

455. Developmental Mechanisms (3) I Molecular and cellular mechanisms of development, with emphasis on model systems. P, 181R, 181L, and an advanced course in genetics, molecular or cell biology. (Identical with BIOC 455)

456. Developmental Biology (3) I (Identical with AN S 456) May be convened with 556.

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

462a-462b. Biochemistry (3) I II (Identical with BIOC 462a-462b) Honors section available for (4) honors credits.

466. Physiology Laboratory (3) I II (Identical with ECOL 466) May be convened with 566.

467R. Endocrinology (3) 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. P, 2R, 6L. BIOC 462a, CR 411. (Identical with BIOC 473, GENE 473, MIC 473, and PL S 473)

476a-476b. Analysis of Biological Diversification (3-4) I (Identical with ECOL 476a-476b) May be convened with 576a-576b.

496. Seminar
a. Developmental Biology (1) [Rpt.] I II Consult instructor before enrolling. May be convened with 596a.
b. Cell Biology (1) [Rpt. /6] I II Consult instructor before enrolling. May be convened with 596b.
d. Molecular Genetics (1) [Rpt. /6] I II Consult instructor before enrolling. May be convened with 596d.
e. Molecular Biology (1) [Rpt. /6] I II Consult instructor before enrolling. May be convened with 596e.

497. Workshop
a. Special Tutoring Workshop (1-3) [Rpt.] I Open to senior MCB and Biochemistry majors only. Consult department before enrolling. (Identical with BIOC 497a).

505. Eukaryotic DNA Replication (3) [Rpt. /1] (Identical with CBIO 505)

510. Plant Molecular Biology (3) II 1996-97 (Identical with PLS 510)

511. Molecular Biology (3) II For a description of course topics, see 411. Graduate-level requirements include attending an additional lecture hour per week to discuss independent research. MCB majors should not take this course for graduate credit. P, 462a and consult department before enrolling. (Identical with BIOC 511 and MBIM 511) May be convened with 411.

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).

529. General Virology (3) II (Identical with MBIM 529)

545. Concepts in Genetic Analysis (3) I Methods of genetic analysis including mutant 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 and INSC 545)

550. Topics in Pigment Cell Biology (2) I (Identical with CBA 550)

555. Molecular Mechanisms of Development (3) II Detailed examination of molecular, genetic and cellular approaches to selected problems in developmental biology. P, 545, 568 or consult department before enrolling. (Identical with BIOC 555, GENE 555)

556. Developmental Biology (3) I (Identical with AN S 556) May be convened with 456.

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

558. Advanced Subjects in Endocrinology (2) [Rpt.] I (Identical with CBA 558)

560. Current Advances in Plant Physiology (3) I (Identical with PLS 560)

566. Physiology Laboratory (3) II (Identical with ECOL 566) May be convened with 466.

567R. Endocrinology (3) II (Identical with CBA 567R) May be convened with 467R.

568. Nucleic Acids (4) I (Identical with BIOC 568)

569. Topics in Gene Regulations (2) II 1995-96 (Identical with BIOC 569)

571. Human Embryology (4) II (Identical with CBA 571) May be convened with 471.

572. Biological Regulation (4) I (Identical with BIOC 572).

574. Advances in Mammalian Genetics (2) [Rpt. /1] 1995-96 (Identical with BIOC 574)

575. Special Topics in Biological Imaging (2) I 1995-96 (Identical with CBA 575)

576A-576B. Analysis of Biological Diversification (3) I (Identical with ECOL 576A-576B) May be convened with 476A-476B.

577. Principles of Cell Biology (4) II (Identical with CBA 577)

582. Topics in Neural Development (2) I 1995-96 (Identical with NRS 582)

583. Topics in Neural Plasticity (2) II 1996-97 Reading and discussion of primary literature on molecular, cellular, biochemical, physiological, and structural changes that occur on the adult nervous system. P, a course in neurobiology, consult department before enrolling. (Identical with CBA 583 and NRS 583)

584. Cellular Neurobiology (2) II 1996-97 (Identical with CBA 584) Tolbert-St John

585. Intracellular Messengers (2) I 1996-97 (Identical with NRS 585)

587. Biology of Neurological Disease (3) II 1995-96 (Identical with NRS 587)

588. Principles of Cellular and Molecular Neurobiology (4) I (Identical with NRS 588)

589. Cancer Genetics and Cytogenetics (3) I 1995-96 (Identical with CBIO 589)

595. Colloquium
a. Topics in Molecular Biology (1) [Rpt. /6] I II Open to majors only.
d. Special Topics in Cell Biology (2) [Rpt. /3] II (Identical with CBIO 595d)

596 Seminar
a. Developmental Biology (1) [Rpt. /6] I II Consult instructor before enrolling. May be convened with 496a.

597. Workshop
a. Recombinant DNA Techniques (2) S (Identical with BIOC 597a)

612. Molecular, Plant, Microbe Interactions (3) I 1995-96 (Identical with PL P 621)

623A-623B. Biology Update 1-2 (2-2) S (Identical with BIOC 623A-623B)

695. Colloquium
a. Plant Biology (1) I (Identical with PL P 695a)
b. Plant Pathology (1) II (Identical with PL P 695b)
c. Science, Society and Ethics (1) II (Identical with GEN 695e and NRS 695e)

696. Seminar
a. Developmental Biology (1) [Rpt. /6] I II To be taken only when 596a repeated course limit has been met.
b. Cell Biology (1) [Rpt. /6] I II P, 596b. To be taken only when 596b repeated course limit has been met.
c. Molecular Genetics (1) [Rpt. /6] I II P, 596d. To be taken only when 596d repeated course limit has been met.
d. Molecular Biology (1) [Rpt. /6] I II P, 596e. To be taken only when 596e repeated course limit has been met.

697. Workshop
a. Scientific Infrastructure (2) I II Open to majors only.

761. Laboratory Rotation I (2) [Rpt. /1] I II Research project with graduate faculty for 8 weeks, 15 hours per week. Open to majors only.

762. Laboratory Rotation II (2) [Rpt. /1] I II Research project with graduate faculty for 8 weeks, 15 hours per week. Open to majors only.

763. Laboratory Rotation III (2) I II Research project with graduate faculty for 8 weeks, 15 hours per week. Open to majors only.

Music (MUS/MUST)

Music Building, Room 109
(520) 621-1655; FAX: (520) 621-8118

Professors Gary D. Cook, Interim Director, James R. Anthony (Emeritus), John Bloom (Emeritus), John Boe (Emeritus), Andrew Buchhauser (Emeritus), Edna Church (Emeritus), Robert Cutietta, Larry J. Day, Gordon Epperson (Emeritus), Billie R. Erlings, Thomas Ervin, Richard Faith (Emeritus), Paula Fan, John R. Ferrer (Emeritus), Gregg I. Hanson, O. M. Hartsell (Emeritus), Jeffrey Haskell, Steven Hedden, Robert Hull (Emeritus), Henry Johnson (Emeritus), Roy A. Johnson, Jean-Louis Kashy, Timothy Kolosick, Jack Lee (Emeritus), Robert McBride (Emeritus), Carrol McLaughlin, Theodora M. McMillan (Emeritus), Elizabeth Mosher, Robert Muszynski (Emeritus), Edward W. Murphy, James P. O'Brien, Marguerite Ough (Emerita), Leonard A. Pearlman (Emeritus), Richard E. Peters (Emeritus), Jocelyn Reiter, Charles Roe, Azita Sammarco (Emerita), Anna Mae Sharp (Emeritus), Maurice Skones (Emerita) Maurice Skones (Emerita) Maurice Skones (Emerita) R. Warren Sutherland, Nicholas L. Zumbro

Associate Professors Daniel I. Asia, William Dietz, Elizabeth Thompson Ervin, Nancy Ferguson, Noehema Fer-
The School of Music, a division of Fine Arts, offers courses leading to the following degrees: Bachelor of Music with majors in jazz studies, music education, performance, and composition; Bachelor of Arts in Music; Master of Music; Doctor of Musical Arts; and Doctor of Philosophy. The school of Music participates with the Committee on Dance in providing course work for the drama-musical theatre major offered by the Department of Theatre Arts 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 181 level requires minimum performance skill equivalent to at least two years of recent private study and/or four years of recent membership in school or community organizations. Admission to the 185 level requires a minimum of five years of private study or ensemble/solo experience resulting in sufficient advancement that the student shows promise of being at a professional level after completion of four years of undergraduate study. MUS 180 serves as a remedial course of study for the student who does not qualify for MUS 181, but who possesses good basic playing skills and music comprehension. Enrollment is contingent upon audit and availability. 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 an appropriate large 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 advisor or performance instructor, be required to register for MUS 201/401 or 202/402 and to appear in and attend performances as arranged by their instructor. Lessons missed by the student will not be rescheduled unless the instructor has been notified by the student 24 hours before the regular time of the lesson. Lessons missed by the instructor will be rescheduled within the semester. Lessons falling on a legal holiday will not be rescheduled.

Degree Programs: The curricula for all music programs include a common core of studies which is intended to coordinate all aspects of musical training in a program of comprehensive musicianship.

The music 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 MUS 110a-110b, 120a-120b, 130a-130b, 388m, 370, 371, 2 units of conducted ensemble, 4 units of MUS 181 or above.

Bachelor of Music

Basic Requirements: Admission to any Bachelor of Music degree program requires audition/application. All candidates for the B.M. must complete the following basic requirements: (1) general education requirements, as outlined under the Bachelor of Music degree in the "Faculty of Fine Arts" section of this catalog. (2) MUS 110a-110b, 120a-120b, 130a-130b, 210a-210b (except for guitar performance majors), MUS 220a-220b, 320, 330a-330b. Keyboard majors are exempt from 110a-110b and 210a-210b. (3) One of the majors outlined below. All B.M. students are required to take at least one 3-unit course focusing specifically on gender, race, ethnicity or non-Western civilization. This course can be part of the major, general education, or elective course work and must be approved by a departmental advisor.

First Year Curriculum: Music majors should enroll, in consultation with an academic advisor, in the following courses during the freshman year: MUS 110a-110b (except keyboard majors), 120a-120b, 130a-130b, one unit of MUS 200 each semester, two to four units per semester in the major instrument or voice, ENGL 101-102, and six units of general education requirements as outlined under the Bachelor of Music in the "Faculty of Fine Arts" section of the catalog.

The MAJOR IN PERFORMANCE includes the following five areas of specialization:

Keyboard instrument—major instrument, 31 units (minimum entrance level: MUSI 185. Graduation requirement: 7 units of MUSI 485); ensemble*: one semester of conducted, four semesters of accompanying, two semesters of coached, one semester of elective; MUS 370, 410a-410b, 420a-420b, 421, 426a-426b, and a senior recital (MUS 425).

Minimum total units: 134.

String instrument/harp—major instrument, 31 units (minimum entrance level: MUSI 185. Graduation requirement: seven units of MUSI 485); ensemble*: eight semesters of conducted, six semesters of coached; MUS 370, 410a, 421; three units of music electives; a senior recital (MUS 425). At least four units of the general studies courses or music electives must be at the upper-division level. Minimum total units: 130.

Guitar—major instrument, 31 units (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 guitar ensemble, MUS 370, 410a-410b, 420a-420b, 424. Minimum total units: 132.

Voice—voice, 31 units (minimum entrance level: MUSI 185. Graduation requirement: seven units of MUSI 485); ensemble*: eight semesters of conducted; MUS 211a-211b, 205/405 (2 units), 370, four units of music electives; a senior recital (MUS 425); 16 units of foreign language. At least nine units of the general studies courses or music electives must be at the upper-division level. Minimum total units: 134.

Wind Instrument or Percussion—major instrument, 32 units (minimum entrance level: MUSI 185. Graduation requirement: eight units of MUSI 485); ensemble*: eight semesters of conducted (minimum: three orchestra, three band, two
jazz—if appropriate instrument), six semesters of conducted: MUS 370, 410a, 421, four units of music electives; a senior recital (MUS 425). At least four units of the general studies courses of music electives must be at the upper-division level. Minimum total units: 132.

The MAJOR IN JAZZ STUDIES: Major instrument, 16 units of two units/semester (minimum entrance level: MUSI 181. Graduation requirement: four units of MUSI 185); minor instrument or voice, six units of one unit/semester; ensemble*: six semesters of MUS 200/400r, four semesters of MUS 200/400r, two semesters of 201/401, two semesters of coached ensemble electives; MUS 302, 321a-321b, 331, 422, 6 units of music electives. At least six units of the general studies course or music electives must be at the upper-division level. Minimum total units: 128.

The MAJOR IN MUSIC EDUCATION (Voice): seven semesters of two units per semester (minimum entrance level: MUSI 181. Graduation requirement: two units of MUSI 285 and a half recital); keyboard: MUSI 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, 450, 451; EDUC 350; ED P 310; LRC 435, 493b; TTE 300, 338m, 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: two units of MUS 285 and a half recital); ensemble*: seven semesters of conducted (including one unit of MUS 200, if appropriate instrument), one semester of coached; MUSI 111, 153, 250, 350a-350b, 351a-351b, 370, 371, 421, 439, 450; EDUC 350; ED P 310; LRC 435, 493b; TTE 300, 338m, 493b. Minimum total units: 133.

All Music Education Majors: After completion of MUS 250, all music education majors should have a 2.8 grade-point average in all music courses other than ensembles and a 2.5 grade-point average overall in the most recently completed 56 units before being admitted to the junior level Teacher Education Program. The Music Education Advisory Review (MEAR) and professional music education courses—methods, conducting, and techniques—must be completed before student teaching. One half recital must be given concurrently with enrollment in MUS 285 or above.

The MAJOR IN COMPOSITION: Major instrument or voice, seven semesters of 2 units/semester (minimum entrance level: 181. Graduation requirement: 6 units of 185); ensemble*: six semesters of conducted, two semesters of coached; MUS 240 (6 units), 340 (6 units), 370, 420a-420b, 421, 425, 440 (6 units), 441, 442; additional general academic electives. Minimum total units: 134.

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 Arts and Sciences section of this catalog, the following course work is required: 110a-110b, 120a-120b, 130a-130b, 210a-210b, 220a-220b, 320, 330a-330b, 420a-420b; three units of music electives. The student also must complete six semesters of work in a major instrument or voice (minimum entrance level: MUSI 181. Graduation requirement: two units of MUSI 185) and four semesters of ensemble* (including two semesters of College Musicum). A 20-unit minor is also required. To meet the general education requirements in a foreign language, German or French is recommended. Minimum total units: 128.

*In all music degrees the term “semester” in the ensemble requirement indicates that the student is required to register for the number of successive semesters of ensemble listed.

100. Basic Musicianship (3) I II CDT Study of the rudiments of musical notation, harmony, rhythm, and melody.


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 sight-reading, accompanying, tone production and other classical techniques. 102a and 102b are offered both semesters.

103. Class Voice for General College Students (2) [Rpt.] Practical training in singing, with emphasis on basic skills of breathing, tone and diction; repertory to include folk, current, and classic songs in English.

105L. 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. Understanding Music Through Listening (3) I II Development of listening skills through introductory study of Western art music, world music, and jazz. 1R, 1D, 25.

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 I (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) II Class instruction in all percussion instruments, including materials and procedures for teaching these instruments in the schools. For music education majors only.

210a-210b. Piano Class II (1-1) Continuation of 110b, with additional sight-reading, score-reading, and accompanying. Open to music 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.

240. Introduction to Composition (3) I II [Rpt. /1] Introduction to the basics of music composition, stressing fundamental forms, techniques and procedures. P, 120b or consent of instructor.

250. Introduction to Music Education (3) I II Observation of and practical field experience in public schools; video-taped class presentations. Field trips. Open to music majors only. P, CR, 130a-130b.

302. Recording Studio Production (3) I II Recording studio procedures including the recording chain and pre-post and actual recording production techniques. P, with permission of the School of Music. (Identical with M 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 Schönberg 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. 201. 321b: Continuation and refinement of the techniques studied in 321a.

330a-330b. History of Western Music (3-3) CDT Detailed study of the history of music in Western civilization from its origins to modern times; its relationship to general cultural development. P. 220b. 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).

331. Jazz History (3) I II CDT Development of jazz in the United States.

337. Survey of Mexican Folk Music (3) I S Examination of the traditional folk music of Mexico. Covers the history and evolution of the mariachi as well as the vast potpourri of Mexican music tradition. A working knowledge of Spanish is helpful but not required. (Identical with LAS 337, MAS 337)

338m. The Teaching of Secondary School Music (3) III Open only to students admitted to teacher education. (Identical with TTE 338m)

350a-350b. Woodwind Techniques and Materials (1-1) CDT Class instruction of flute, clarinet, oboe, saxophone, and bassoon, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

351a-351b. Brass Techniques and Materials (1-1) CDT Class instruction on trumpet, trombone, horn and other brass, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

352. String Instrument Techniques and Materials (1-3) CDT Class instruction on violin, viola, cello and bass, including materials and procedures for teaching these instruments in the public schools. Open to majors only.

360. Music Fundamentals through Experience (3) I II CDT CDT Skills, concepts and information learned through playing, singing and focused listening. Emphasis on beginning experiences with autophone, guitar, recorder and voice. No prior musical training is assumed.


370. Introduction to Conducting (2) CDT 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 and Choral Conducting (2) II CDT Conducting techniques for instrumental ensembles of varying sizes; instrumental rehearsal techniques, score reading, and score study. P. 370.

396H. Honors Proseminar (3) I 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 convened 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 convened with 520a-520b.

421. Orchestration (3) III 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) II CDT Class instruction and practice in arranging for small jazz combos, rock groups, stage bands, and pop-vocal combinations; detailed study of jazz instrumental practices and problems. Open to majors only or consult department prior to enrolling. P. 200r, 201b, 220b.

424. History and Literature of Guitar (3) II 1996-97 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) 1996-97 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) I S CDT Overview of nonwestern musics in selected world cultures.

439. Jazz Pedagogy (3) I II CDT Teaching and rehearsal technique, literature and materials for jazz ensembles and combos. P. 220b, 250.

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. Majors only.

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. Majors only.

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 II 410a-410b. Pedagogy (2-2) Study of methods and pedagogical techniques useful for voice teaching and choral conducting. Open to music majors in their major performance area only. May be convened with 510a-510b.

452a-452b. Counterpoint (3-3) Practical study of the counterpoint of the 16th (in 452a) and 18th (in 452b) centuries. P. 220b. May be convened with 552a-552b.

475. Workshop (3) I II S CDT Conducting experience learned through playing, singing and focused listening. Emphasis on beginning experiences with autophone, guitar, recorder and voice. No prior musical training is assumed.

497. Workshop (3) I II S CDT Conducting experience learned through playing, singing and focused listening. Emphasis on beginning experiences with autophone, guitar, recorder and voice. No prior musical training is assumed.

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.

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) I II CDT Detailed study of the survey of analytical systems as applied to a number of stylistic periods. Both cognitive and aural procedures will be investigated. This course may not be used to fulfill doctoral requirements in music. Open to majors only.

522a-522b. Art Song Repertory (2-2) 1996-97 CDT Detailed study of representative selections from the standard repertory of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.

523a-523b. History of the Opera (3-3) 1996-97 Detailed study of the course of opera from its inception by the Florentine Cameraata through Berg, Menotti, Stravinsky, Ginastera, Penderecki, Britten and others. Open to majors only.

524. History and Literature of Guitar (3) I II 1996-97 CDT Detailed study of representative selections from the standard repertory of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.

525. History and Literature of the Wind Band (3) I II 1996-97 CDT Detailed study of representative selections from the standard repertory of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.

526a-526b. Piano Literature (3-3) 1996-97 CDT Detailed study of representative selections from the standard repertory of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.

530. Music in the Renaissance (3) I II 1996-97 CDT Detailed study of representative selections from the standard repertory of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.

531. Music in the Baroque (3) I II 1995-96 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 II 1995-96 The Viennese classical tradition from its origins to Beethoven. Open to majors only.

533. Music of the Twentieth Century (3) I II 1995-96 CDT Detailed study of representative selections from the standard repertory of German, Italian, French, Russian and English language art songs; problems of accompaniment, interpretation, style and ensemble. Registration restricted to singers and pianists. Open to majors only.


537. Survey of Early Music (3) II 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. Consent of instructor required. Majors only.

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. Consent of instructor required.

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.

555. Music and German Literature (3) I 1996-97 (Identical with GER 555) May be convened with 455.

560. Aesthetics of Music (3) I 1996-97 Exploration of the problems of musical meanings, including a panoramic examination of what philosophers, philosophic musicians and artists, and others of critical intelligence have contributed to comprehensive theory.

570. Advanced Conducting (3) [Rpt.] II Styles of choral, band, and orchestral literature, as they pertain to the problems of the conductor; references to the styles of all periods, with emphasis on the contemporary and modern.

597. Workshop o. Level I Orff Schulwerk (2) May be convened with 497o.

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)

602A-602B. History of Speculative Theory (3-3) I II 1995-96 Survey of speculative theory in music, classical Greeks to present.

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) Study of the philosophies, procedures, techniques, and materials used in teaching theory at the college level.


630. The Music of Bach (3)

631. The Music of Mozart (3)

635. Choral Literature and Techniques (3) [Rpt.-/5] II A research-oriented study of choral literature from all stylistic periods and genre from the Renaissance to the present, together with appropriate conducting techniques. 2R, 3L. Open to majors only. P; graduate standing in choral conducting or choral music education. No more than 12 units of this course may be applied to a graduate degree program.

650. Foundations and Principles of Music Education (3) 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) Principles and techniques of curriculum construction applied to the field of music.

652. Management Techniques in Music (3) The management of music at all levels of education, industry, and performance.

654. Psychology of Music (3) I S 1996-97 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) I Contemporary practices in planning, organizing, and evaluating learning experiences in music for college and university students. Open to music majors only.


e. Keyboard Seminar (2) [Rpt. /8 units]

Ensembles All courses listed below may be repeated during each semester of registration. Prerequisite for entrance to all ensembles is by audition.

Large Conducted Ensembles (200, 400, 500) (1)

a. Marching Band
b. Campus Band
d. Symphonic Band
h. Wind Symphony
i. Summer Chorus
j. Symphonic Choir
k. University Singers
l. University-Community Chorus
m. Chamber Choir
n. Choraliers
o. Symphony Orchestra
q. Collegium Musicum
r. Jazz Ensemble
s. Honor Choir (not at 500 level)

Coached Ensembles (201, 401, 501) (1) Offering chamber music experience; designed to develop musical independence.

a. Accompanying
b. Brass Ensemble
c. Percussion Ensemble
d. Guitar Ensemble
e. Jazz Combo
f. Saxophone Choir
g. String Ensemble
h. Woodwind Ensemble
i. Steel Band
j. Mariachi Arizona
k. Electronic Music Ensemble
l. Harp Ensemble (1) [Rpt. /9 units total at all levels] I II

Small Conducted Ensembles (202, 402, 502) (1)
a. Chamber Winds
b. Contemporary Ensemble
c. Clarinet Choir
e. Pep Band
f. Flute Choir
g. Recital Choir
j. Trombone Choir

Opera Theatre (205L, 405L, 605L) (1-4) Training in all aspects of operatic production, including major and 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 consent of instructor.

Composition Studies: Individual and Group Instruction

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 consent of instructor.

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 180, 181 and 185.

*See schedule of fees below.

Piano

180-P, 181-P, 182-P (1-2)
580-P (1-2); 585-P (1-4)
685-P, 785-P (1-4)

Piano Accompanying

685-W (1-4)

Voice

180-V, 181-V, 182-V (1-2)
185-V, 285-V, 385-V, 485-V (1-4)
580-V (1-2); 585-V (1-4)
685-V, 785-V (1-4)

Vocal Coaching

685-J (1)

Organ

181-O, 182-O (1-2)
185-O, 285-O, 385-O, 485-O (1-4)
580-O (1-2); 585-O (1-4)
685-O, 785-O (1-4)

Conducting

585-Q (1-4); 685-Q, 785-Q (1-4)
String Instruments

String Bass
180-N, 181-N, 182-N (1-2)
580-N (1-2); 585-N (1-4)
685-N, 785-N (1-4)

Violin
180-K, 181-K, 182-K (1-2)
580-K (1-2); 585-K (1-4)
685-K, 785-K (1-4)

Cello
180-M, 181-M, 182-M (1-2)
580-M (1-2); 585-M (1-4)
685-M, 785-M (1-4)

Harp
181-H, 182-H (1-2)
580-H (1-2); 585-H (1-4)
685-H, 785-H (1-4)

Guitar
181-G, 182-G (1-2)
580-G (1-2); 585-G (1-4)
685-G, 785-G (1-4)

Viola
180-L, 181-L, 182-L (1-2)
580-L (1-2); 585-L (1-4)
685-L, 785-L (1-4)

Harpischord
181-1, 182-1 (1-2)
185-1, 285-1, 385-1, 485-1 (1-4)
580-1 (1-2); 585-1 (1-4)
685-1 (1-4)

Wind Instruments

Enthusiach
180-E, 181-E, 182-E (1-2)
185-E, 285-E, 385-E, 485-E (1-4)
580-E (1-2); 585-E (1-4)
685-E (1-4)

Bassoon
180-B, 181-B, 182-B (1-2)
185-B, 285-B, 385-B, 485-B (1-4)
580-B (1-2); 585-B (1-4)
685-B, 785-B (1-4)

Clarinet
180-C, 181-C, 182-C (1-2)
185-C, 285-C, 385-C, 485-C (1-4)
580-C (1-2); 585-C (1-4)
685-C, 785-C (1-4)

Flute
180-F, 181-F, 182-F (1-2)
185-F, 285-F, 385-F, 485-F (1-4)
580-F (1-2); 585-F (1-4)
685-F, 785-F (1-4)

Horn
180-D, 181-D, 182-D (1-2)
185-D, 285-D, 385-D, 485-D (1-4)
580-D (1-2); 585-D (1-4)
685-D, 785-D (1-4)

Oboe
180-A, 181-A, 182-A (1-2)
580-A (1-2); 585-A (1-4)
685-A, 785-A (1-4)

Saxophone
180-S, 181-S, 182-S (1-2)
185-S, 285-S, 385-S, 485-S (1-4)
580-S (1-2); 585-S (1-4)
685-S, 785-S (1-4)

Trombone
180-R, 181-R, 182-R (1-2)
580-R (1-2); 585-R (1-4)
685-R, 785-R (1-4)

Trumpet
180-T, 181-T, 182-T (1-2)
185-T, 285-T, 385-T, 485-T (1-4)
580-T (1-2); 585-T (1-4)
685-T, 785-T (1-4)

Tuba
180-Y, 181-Y, 182-Y (1-2)
580-Y (1-2); 585-Y (1-4)
685-Y (1-4)

Percussion
180-Z, 181-Z, 182-Z (1-2)
580-Z (1-2); 585-Z (1-4)
685-Z, 785-Z (1-4)

Music Fees

All students registering for private instruction are charged special fees per semester according to the following schedule.

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 private lessons. $5 for one hour practice per day. $10 for two hours practice per day. $15 for three hours practice per day.

Organs, Harpsichords, and Synthesizers: $10 for one hour practice per day. $15 for two hours practice per day. $20 for three hours practice per day.

Harp: $20 for one hour practice per day. $25 for two hours practice per day. $30 for three hours practice per day.

Band and Orchestra Instruments: Rented only to those enrolled in ensembles or techniques and literature classes. $10 per semester.

Refund Schedule: Refunds will be made 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.

Refunds will be made 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.

Near Eastern Studies (NES/ARB/PRS)

Franklin Building, Room 403
(520) 621-8013; FAX: (520) 621-2333

Professors Charles D. Smith, Head, Ludwig A. Adamec, Michael E. Bonine, William G. Dever, Adel S. Gamal, Hamdi A. Qafisheh
Associate Professors Julia Clancy-Smith, Esther Fuchs (Judaic Studies), William J. Wilson
Assistant Professors Simin Karimi, Senzil Nawid, J. Edward Wright
Lecturer Shoshona Green

The Department of Near Eastern Studies provides undergraduate and graduate programs in study of the history, culture, 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 including 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.

Students who intend to major in Near Eastern Studies should choose MATH 121 or MATH 117 (or equivalent) or a more advanced mathematics course to complete their mathematics requirement.

Arabic (ARB)

101. Elementary Arabic I (5) CDT Conversations and readings in modern standard Arabic.
102. Elementary Arabic II (5) CDT Conversations and readings in modern standard Arabic.
403. Advanced Arabic I (3) Continuation of 402, with emphasis on oral and written comprehension and expression.
404. Advanced Arabic II (3) Continuation of 403, with emphasis on oral and written comprehension and expression.
424a-424b. Conversational Levantine Arabic (3-3) 1994-95 Extensive oral drill, with emphasis on the acquisition of facility in normal conversation and comprehension. 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. May be convened with 525a-525b.
426. Introduction to Arabic Linguistics (3) II History and structure of the Arabic language in its various forms. May be convened with LING 426. (Identical with LING 426) May be convened with 526.
595. Colloquium
n. Modern Arabic Prose (3) [Rpt.] P, two years of Arabic. May be convened with 595n.
o. 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, morphological, or syntactic structure of any variety of Arabic. P, 102, LING 101. (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.] I 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) S P, three years of Arabic for non-native speakers of Arabic. May be convened with 495z.

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)

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171. Ancient Civilizations of the Near East (3) I Survey of pre-Islamic cultures of Persia, Mesopotamia, Syria-Palestine, Anatolia and Egypt, with emphasis on unifying themes and institutions. (Identical with ANTH 171 and HIST 171)

172. Islamic Civilization: Traditional and Modern Middle East (3) II Survey of the traditional and contemporary social, political, and economic institutions of Islamic civilizations in the Middle East. (Identical with ANTH 172 and HIST 172)

203a-203b. Intermediate Modern Hebrew (5-5) CDT (Identical with JU S 403a-403b)

303. Advanced Hebrew (3) [Rpt.] I II (Identical with JUS 303)

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)

377a-377b. Modern Israel (3-3) (Identical with JU S 377a-377b)

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 Prosseminar

401. Ancient Mesopotamia (3) 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, 171, ANTH 101, 110 or consult department before enrolling. (Identical with HIST 401) May be convened with 501.


434. Islamic Thought (3) II Traditional ideological systems of Islamic countries and their evolutionary transformations. (Identical with RELI 434) May be convened with 534.

435. Jewish Mysticism (3) II (Identical with JU S 435) May be convened with 535.

441. Arab-Israeli Conflict (3) I II S (Identical with POL 441)

442. Transformation of Agrarian Societies in the Middle East (3) II Dynamics, processes, and implications of rural change in the Middle East; focus on changes in peasant communities, nomadic pastoralists, rural-urban relations, and planned change. (Identical with POL 442) May be convened with 542.

547. Prehistoric Mesopotamia (3) I (Identical with ANTH 457) May be convened with 557.

546. Population and Development in the Middle East (3) I Review of theories and research in population, resources and socioeconomic development, with emphasis on determinants and consequence of population growth and migration in contemporary Middle East. (Identical with POL 467) May be convened with 567.

568a-568b. Asia and the West (3-3) (Identical with HIST 468a-468b) May be convened with 568a-568b.
469. Geography of the Middle East (3) I
(Identical with GEOG 469)

470. Religious History of India (3) (Identical with HIST 470) May be convened with 570.

472. History of Medieval India (3). I (Identical with HIST 472) May be convened with 572.

473. History of Modern India and Pakistan: 1750-Present (3) II (Identical with HIST 473) May be convened with 573.

474. Archaeometry: Scientific Methods in Art and Archaeology (3) II (Identical with ANTH 474) May be convened with 574.

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)
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. If 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 Ages 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.

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.

495. Colloquium
f. Special Topics in Near Eastern Studies (3) [Rpt./4] Consult department before enrolling (Identical with JU S 495f) May be convened with 595f.

496. Seminar
b. Special Topics in Near Eastern Studies (3) [Rpt./4] May be convened with 596b.

501. Ancient Mesopotamia (3) I For a description of course topics, see 401. Graduate-level requirements include additional readings and a research paper. (Identical with HIST 501) May be convened with 591f.

502b. Introduction to Comparative Literature and Literary Theory (3) II (Identical with CPLT 503b)

509a-509b. Biblical Hebrew (3 to 4—3 to 4) CDI For a description of course topics, see 409a-409b. Graduate-level requirements include extra extensive readings. (Identical with JU S 509a-509b) May be convened with 409a-409b.

534. Islamic Thought (3) II For a description of course topics, see 434. Graduate-level requirements include the submission of a research paper or book report on a subject or book approved by the instructor. May be convened with 434.

535. Jewish Mysticism (3) II (Identical with JU S 535) May be convened with 435.

542. Transformation of Agrarian Societies
In the Middle East (3) II For a description of course topics, see 442. Graduate-level requirements include the submission of an expanded research paper. (Identical with POL 542) May be convened with 442.

557. Prehistoric Mesopotamia (3) I (Identical with ANTH 557) May be convened with 457.

567. Population and Development in the Middle East (3) I For a description of course topics, see 467. Graduate-level requirements include submission of an expanded research paper. (Identical with POL 567) May be convened with 467.

568a-568b. Asia and the West (3-3) (Identical with HIST 568a-568b) May be convened with 468a-468b.

570. Religious History of India (3) (Identical with HIST 570) May be convened with 470.

572. History of Medieval India (3) I (Identical with HIST 572) May be convened with 472.

573. History of Modern India and Pakistan: 1750-Present (3) II (Identical with HIST 573) May be convened with 473.

574. Archaeometry: Scientific Methods in Art and Archaeology (3) II (Identical with ANTH 574) May be convened with 474.

577a-577b. History of the Middle East (3-3)
For a description of course topics, see 477a-477b. Graduate-level requirements include a research paper or book report on a subject or book approved by the instructor. 577a is not prerequisite to 577b. (Identical with HIST 577a-577b) May be convened with 477a-477b.

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. (Identical with JU S 496w) May be convened with 481a-481b.

585. Social Organization of India and Pakistan (3) I For a description of course topics, see 485. Graduate-level requirements include a research paper based on original source material. (Identical with ANTH 585) May be convened with 485.

586. Political Systems of India and Pakistan (3) II For a description of course topics, see 486. Graduate-level requirements include a research paper based on original source material. (Identical with POL 586) May be convened with 486.

590. Women in Middle Eastern Society (3) I (Identical with ANTH 590) May be convened with 490.

595. Colloquium
d. Middle East (3) [Rpt./II]

596. Seminar
b. Cultural Anthropology (1-3) I II (Identical with ANTH 596b)
i. International Water Resource Management (1-3) [Rpt./2] I (Identical with HWR 696i)

Neuroscience (NRSC)

Gould-Simpson Building, Room 611
(520) 621-8380; FAX: (520) 621-8282

Graduate Interdisciplinary Program in Neuroscience

Committee:

Professors John G. Hildebrand, Chairperson (Arizona Research Laboratories, Division of Neurobiology), Carol A. Barnes (Psychology), Bryan Benson (Anatomy), James R. Bloedel (Physiology), Richard Bootzin (Psychology), Thomas F. Davis (Pharmacology), Merrill F. Garrett (Psychology), Theodore Glattke (Speech and Hearing Sciences), Raphael F. Gruener (Physiology), Thomas J. Hixon (Speech and Hearing Sciences), Victor J. Hruby (Chemistry), Mary I. Johnson (Pediatrics), Alfred W. Kasznia (Psychology), Richard B. Levine (Arizona Research Laboratories, Division of Neurobiology, Physiology), Ronald J. Lukas (Pharmacology), Bruce L. McNaughton (Psychology), Lynn Nadel (Psychology), L. Claire Parsons (Nursing), Frank Porreca (Pharmacology), William R. Roese (Internal Medicine), Alan R. Rubens (Neurology), Joachim F. Seege (Radiology), Robert F. Spetzler (Surgery), Nicholas J. Strausfeld (Arizona Research Laboratories, Division of Neurobiology, Anatomy), Douglas G. Stuart (Physiology), Henry I. Yamamura (Pharmacology)

Associate Professors Edmund A. Arbas (Arizona Research Laboratories, Divi-
sion of Neurobiology, Physiology), Gail D. Burd (Anatomy, Molecular and Cellular Biology), William M. Feinberg (Neurology), Ralph E. Fregosi (Exercise and Sport Sciences), Edward D. French (Pharmacology), Erwin B. Montgomery, Jr. (Neurology), John A. St. John (Anatomy), Linda Swisher (Speech and Hearing Sciences), Leslie P. Tolbert (Arizona Research Laboratories, Division of Neurobiology), Gary L. Wenk (Psychology, Neurology)

Assistant Professors Geoffrey L. Ahern (Neurology, Psychology), John J. Allen (Psychology), Herman Gordon (Anatomy), Jeneette D. Hoit (Speech and Hearing Sciences), Josephine Lai (Pharmacology), Chad J. Marsolek (Psychology), Nathaniel T. McMullen (Anatomy, Neurology), David B. Morton (Arizona Research Laboratories, Division of Neurobiology), Mani Ramaswami (Molecular and Cellular Biology), Naomi E. Rance (Pathology), John W. Regan (Pharmacology and Toxicology), Linda L. Restifo (Arizona Research Laboratories, Division of Neurobiology, Neurology), Scott B. Selleck (Arizona Research Laboratories, Division of Neurobiology, Molecular and Cellular Biology), Andree You (Pharmacology, Physiology)

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 have already completed 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 neuroscience throughout the University. Research interests of the faculty range from molecular mechanisms of synaptic transmission to human neurological disorders. Particularly strong clusters of faculty focus upon cognitive neuroscience, developmental neurobiology, human speech and hearing, insect neurobiology, neuropeptides, neuropharmacology, and motor control. Information about the research interests of the faculty can be obtained from the program office.

Prospective students should consult the Graduate Catalog for further details.

195H. Honors Colloquium (1) II 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. 195A.

450a. Principles of Mammalian Systems Neurophysiology (2) I II (Identical with PSYC 430a) May be convened with 450a.

450b. Laboratory in Mammalian Systems Neurophysiology (3) I II (Identical with PSYC 430b) May be convened with 450b.

407. Neurobiology (4) I (Identical with MCB 407)

443. Insect Neurobiology (3) II (Identical with ENTO 443) May be convened with 543.

495. Colloquium

407. Developmental Neurobiology (1) [Rpt./6 units] I I I S

d. *Brain, Behavior and Computation (1) [Rpt./6 units] I I S

*May be convened with 500-level.

500a. Principles of Mammalian Systems Neurophysiology (2) I II (Identical with PSYC 503a) May be convened with 500a.

500b. Laboratory in Mammalian Systems Neurophysiology (3) I II (Identical with PSYC 503b) May be convened with 503b.

506. Neural Encoding, Memory and Computation in the Mammalian Brain (3) I II (Identical with PSYC 506)

524. Gerontology: A Multidisciplinary Perspective (3) I II (Identical with PSYC 524)

582. Topics in Neural Development (2) I 1995-96 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 CBA 582, MCB 582 and PSIO 582)

583. Topics in Neural Plasticity (2) II 1996-97 (Identical with MCB 583)

584. Cellular Neurobiology (2) II 1996-97 (Identical with MCB 584) Tolbert-St. John

585. Neural Mechanisms of Behavior (2) II 1995-96 Discussion of the neural mechanisms of behavior; the control of movement; and integrative mechanisms and plasticity. Examples from vertebrates and invertebrates. (Identical with PSY 585)

586. Intracellular Messengers (2) I 1995-96 Intracellular messenger systems in the nervous system, description of salient features of each mechanism, and discussion of a particular system which uses that messenger. P, 588, or permission of instructor. (Identical with BIO 586 and MCB 586)

587. Biology of Neurological Disease (3) II 1995-96 Emphasis on reading, discussing and presenting the primary literature pertaining to scientific investigation of neurological diseases, e.g., multiple sclerosis, stroke, epilepsy, for graduate and medical students. Contact program office before enrolling. (Identical with MCB 587)


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, 588, consult program office before enrolling. (Identical with ANAT 589, INSC 589 and PSIO 589)

695. Colloquium

695b. Developmental Neurobiology (1) [Rpt./6 units] I I I S

d. *Brain, Behavior and Computation (1) [Rpt./6 units] I I S

695p. May be convened with 500-level.

700. Methods in Neuroscience (4) I II (Identical with MCB 695e, which is home)

701. Communication in Neuroscience, 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 (520) 621-2551; FAX: (520) 621-8096

Professors Barry D. Ganapoli, David L. Hetrick (Emeritus), Roy G. Post (Emeritus), Robert L. Seale, Morton E. Wacks, John G. Williams

Associate Professors Morris Farr, 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) II 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, 3L, P, MATH 125b; CR PHYS 241.

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.


381. Introduction to Nuclear Reactor Engineering (3) II The analysis and design of nuclear assemblies, with emphasis on design. 1ES, 2ED, P, 380.

382. Introduction to Fusion (3) II Science and technology of fusion. 0.5ES. P, PHYS 242, MATH 254.

406. Nuclear Engineering Laboratory (4) I Experimental techniques for determining various parameters in nuclear systems; experiments using the critical and subcritical reactors. 3R, 3L, 1ED, P, 380 or 483. Non-majors may substitute 486 for the prerequisites. 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.

414a-414b. Nuclear Engineering Design (3-3) (a) 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, P, 381, CR, A ME 432. May be convened with 514a. (b) A multi-disciplined design project of modern energy systems. Covers: project management tools, design techniques, proposal and project reports, written and oral presentations. Comprehensive team project based on environmental impact, cost optimization, engineering analysis, and resource allocations. 3ED, P, 414a. May be convened with 514b.

440. Energy Utilization and Management (3) I Methods for evaluating the technical and economic aspects of energy conversion and utilization directed toward the effective utilization of resources, including economics, HVAC systems, electric power, lighting and industrial processes. 2ES, 1ED. (Identical with A ME 440) May be convened with 540.

441. Air Conditioning Engineering (3) I (Identical with A ME 441).

442. HVAC System Design (3) II Computer analysis and design of air conditioning systems for commercial and industrial buildings, including equipment and component selection. Energy-efficient concepts and controls 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 conditioners, battery storage principles, 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 photoelectric systems. 1ES, 1ED, P, A ME 230; or PHYS 142. (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.

481. Nuclear Fuel Cycles (3) II The processes, methods, and strategies of the nuclear fuel cycle. 2ES, 0.5ED, P, 482, A ME 230. May be convened with 581.

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 nuclear power plants. 0.5ES, 0.5ED, P, 380 or 486. May be convened with 582.

483. Reactor Dynamics and Control (3) II Nuclear reactor kinetics, integral transform methods, internal feedback effects, stability and control. 2ES, 0.5ED, P, 380. Non-majors may substitute 486 for the prerequisite. 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, 200, CR, MSE 331R. May be convened with 584.

485a-485b. Radiation Health Physics and Safety (3-3) (a) Study of health physics practices and safety, including instrumentation, regulations, record keeping and monitoring of facilities, 2ES, 1ED. May be convened with 585a. (b) Shielding methods, normal and off-normal working practices, national and international regulations and practices. 1.5ES, 1.5ED, P, 485a. May be convened with 585b.

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.

487a-487b. Introduction to Radioactive Waste Management (3-3) (a) Background in the technology of low level radioactive wastes from institutional, research and fuel cycle sources. 1.5ES, 1.5ED. May be convened with 587a. (b) Background in the technology of high level wastes, including reprocessing and disposal, from the fuel cycle, both national and international approaches. 1.5ES, 1.5ED, P, 487a. May be convened with 587b.

494. Practicum
   a. Operation of the University of Arizona TRIGA Reactor (2) II P, 380 or 588.

496. Seminar
   s. Advanced Nuclear Power Activities (1) II May be convened with 596s.


506. Nuclear Engineering Laboratory (4) I For a description of course topics, see 406. Graduate-level requirements include an in-depth research paper. 3R, 3L, P, 380, or 588, 483 or 583. Non-majors may substitute 486 or 586 for the prerequisites. 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 242. (Identical with CHEM 507)

514a-514b. Nuclear Engineering Design (3-3) For a description of course topics, see 414a-414b. Graduate-level requirements include an additional project involving more intensive application of techniques taught. May be convened with 414a-414b.

540. Energy Utilization and Management (3) I For a description of course topics, see 440. Graduate-level requirements include an in-depth research paper. (Identical with A ME 540) 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 A ME 541 and CHEE 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) I For a description of course topics, see 445. Graduate-level requirements include an in-depth design and/or systems analysis project. (Identical with ECE 546) May be convened with 446.

546. Photovoltaic Systems Engineering (3) I For a description of course topics, see 446. Graduate-level requirements include an in-depth research paper. (Identical with A ME 545) May be convened with 445.

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 142. (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 CHEE 338a; MATH 254. May be convened with 456.

563. Energy from Biomass (3) (Identical with ABE 563) May be convened with 463.

581. Nuclear Fuel Cycles (3) II For a description of course topics, see 451. Graduate-level requirements include an in-depth research paper. P, 582, A ME 230. May be convened with 451.

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, 380 or 486. May be convened with 482.

583. Reactor Dynamics and Control (3) II For a description of course topics, see 483. Graduate-level requirements include an in-depth research paper. P, 380 or 588. Non-majors may substitute 486 for the prerequisite. 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, 200; CR, MSE 331R. May be convened with 484.

585a-585b. Radiation Health Physics and Safety (3-3) For a description of course topics, see 485a-485b. Graduate-level requirements include an in-depth research paper. May be convened with 485a-485b.

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 non-majors. May be convened with 486.

587a-587b. Introduction to Radioactive Waste Management (3-3) For a description of course topics, see 487a-487b. Graduate-level requirements include an in-depth research paper. May be convened with 487a-487b.


596. Seminar
s. Advanced Nuclear Power Activities (1) [Rpt./3] II May be convened with 496s.

645. Advanced Solar Engineering (3) 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 CHEE 645)

681a. Analytical Methods of Transport Theory (3) I 1995-96 Application of the Boltzmann equation to neutron and photon transport problems; exact solutions, the method of singular eigenfunctions, spherical harmonic expansions, the moments methods, 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 sitting and operational procedures. P, 380.

683. Nonlinear Reactor Dynamics (3) II Nonlinear dynamics of nuclear reactors; shutdown mechanisms, inertial effects, nonlinear stability criteria, time-dependent neutron transport, neutron waves, and applications to pulsed reactors, start-up transients, reactor stability, and reactor safety. P, 583.


689. Reactor Theory II (3) 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**

(520) 626-6161; FAX: (520) 626-2211

Professors Suzanne Van Ort, Dean, Agnes M. Aamodt (Emerita), Eleanor E. Bauwens (Emerita), Pearl P. Coulter (Emerita), Sandra Ferketh, JoAnn Glittenberg, Margarita A. Kay (Emerita), Alice J. Longman (Emerita), Beverly A. McCord (Emerita), Carolyn Murdough, L. Claude Parsons, Linda R. Phillips, Arlene M. Patt (Emerita), Gladys E. Sorensen (Emerita), Joyce Verran

Associate Professors Terry Badger, Carrie Jo Braden, Judith Dempstee, Evelyn M. DeWalt (Emerita), Rose Gerber, Mary E. Hazzard (Emerita), Elaine B. Jones, Lillian Lynch (Emerita), Betty J. McCracken (Emerita), Virginia Miller (Emerita), Ida M. Moore, Alice Noyes (Emerita), Jessie V. Pergrin (Emerita), Lois E. Prosser (Emerita), Pamela Reed, Jacqueline J. Sherman, Gayle A. Taver, Mary J. Welty (Emerita), Mary O. Wolenin (Emerita), Anne Woodall

Assistant Professors Leanna Crosby, Julie Erickson, Joan Haase, Kathleen May, Carrie Merkle, Lee Sennott-Miller, Geraldine Paier

Senior Lecturers Judith L. Ayoub, Martha D. Cobb, Patricia A. King, Marylyn McEwen

Lecturers Janice Allen, Joyce Bowdish, Kathleen S. Brennan, Lucy M. Colbert, Carol Feingold, Diana S. Gomez, Margaret A. Knight, Gale E. Manke, Marlys Moekly, Elizabeth C. Tracy, Mary C. Vincenz

Adjunct Lecturers Jeanne Archer, Carol Bluth, Ruth Eskesen, Isela Luna, Linda Perlich, Julie Townsend

Clinical Instructors Patricia Harris-Murray, Laura McRee, Jane Sharber, Colleen Shehan-Bakewell, Connie Trice, Catherine Vanderboom

Adjunct Clinical Instructors Anna Guerra, Debbie Hagler, Kelly Mayer, Cheryl McGaffic

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 course (496), 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 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 Application of scientific knowledge to assessment of health 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 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.

350. Pathophysiology (3) I Provides a conceptual integrative approach to selected pathophysiological phenomena and human responses to illness. Majors who wish to enroll should consult the instructor and complete all prerequisites. P, CHEM 101a-101b, ECOL 181 and EXSS 201 and 202.

352. Nursing Skills for Care Provider (6) I 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, 12L. P, 263, 279, CR, 350, 372.

372. Nurse as Care Provider for Developing Families (5) I Concepts, principles and techniques for care with developing families; clinical practice focuses upon providing care
to newborns and their families. Open to majors only. 2R, 9L. P, 263, 279, CR, 350, 352.

478. 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 nurse students only. P, admission to College of Nursing.

381. Professional Nursing Role (1) I I Emphasis on socialization into professional nursing role. Open to registered nurse students only. P, admission to 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 (3) 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.

431. Professional Nursing Issues (2) [Rpt./1] II Contemporary professional issues influencing professional nursing practice. Credit is allowed for this course or NURS 488, but not for both. Open to majors only. Available only to students in the Accelerated Pathway for Second Degree Students program.


to the young, developing, and mature family. Open to majors only.

606. Social, Psychological Problems in Nursing (3) II Focus on concepts of stress and training, with emphasis on health-related outcomes. Nursing research on additions, 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. (Identical with PHL 607)

608. Cognitive Alterations (3) S Client problems related to the processing of sensory information including etiological factors. Research-based nursing interventions for clients with alterations are examined. Open to majors only.

609. Health Assessment (3) I Synthesize physical and psychosocial data by utilizing current research and theoretical models appropriate to advanced nursing practice. Emphasizes physical, psychological, cultural and psychosocial assessment. Provides a basis for understanding the normal ranges for adults including the older adult as well as emphasizes health promotion, maintenance and preventative practice. P, 580.

621. Educational Process (3) I Theoretical and practical application of teaching-learning process in classroom and clinical settings. Principles of teaching, learning, instructional design, testing. Microteaching included. 2R, 3L. Open to majors only. (Identical with PHL 621)

622. Nurse Educator Role (3) II Theoretical and practical application of curriculum development and process. Use of teaching-learning process. Preparation for nurse educator role. Directed practice teaching included. 1R, 4L. Open to majors only. P, 621. (Identical with PHL 622)

623. Clinical Agency Administration (3) II Practical application of administrative processes in a nursing care delivery setting. Focuses on the use of selected skills essential to effective administration. Open to majors only. P, 624.

624. The Administrative Process (3) I Theoretical background for nursing administration in care settings. Emphasizes on accountability, budgeting, management skills, constraints and influences as related to nursing administration. Open to majors only. (Identical with PHL 624)

625. Advanced Role Development (3) I Exploration of models of advanced practice during (APN) roles in the health care system. Emphasizes factors that influence process of defining and implementing advanced practice nursing roles. Open to majors only. P, 580.

626. Primary Care of Adults (3-4) II Basic concepts and knowledge needed to assess and manage therapeutically common acute and chronic health problems prevalent in adults. Emphasis will be placed on pathophysiology, abnormal aging, principles of pharmacology and medication use as therapeutic adjuncts, and the use of diagnostic procedures as aids to clinical decision making. Open to majors only. P, 609.

627. Advanced Psychiatric Mental Health Nursing II (3) I 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, 600b, graduate standing in nursing.

632. Research Utilization (3) S Development and use of models and tools for facilitating the use of research in science-based nursing practice within organizational settings. 2R, 3L. P, 530.

633. Evaluation Research (3) I Development and use of models and tools for assessing nursing processes, programs and performances. Approaches to and psychological reactants of evaluation are explored. Issues and development of market packages with cost consideration are discussed along with program grant preparation. (Identical with PHL 633)

635. Issues in Rural Health Care (3) II Topics include: community assessment, planning and evaluation; interdisciplinary practice; health care issues for southwestern ethnic minority populations. (Identical with MAP 635, PHL 635, PHSC 635 and PSYC 635)

696. Seminar
   a. Nursing Theory (1-3) I II

705. Nursing Metatheory (3) I Examination of philosophical and historical foundations of knowledge, and metatheoretical structures and processes of theory development. In-depth analysis of extant and emerging philosophical bases of nursing for scientific inquiry. Open to majors and minors in nursing. P, 504 or equivalent.

706. 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.

724a-724b-724c. Professional Role Development (1-1-1) I II S Assist student socialization into the role of nurse scientist. Ethics of research, development of grant proposals, dissemination of scholarly work through publication and presentation, balancing roles of scholar, educator and clinician. Open to majors only. P, admission to Ph.D. program.

725. Study of Social Influences (3) S In-depth examination of social forces affecting the health care system. Open to majors only. P, 705, 730, graduate level statistics. 781a is referred alternate summers.)

724a-724b-724c. Field Work in Nursing 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 or 600b or 600c or 600d or 600e, 633, 705, 730.

Nutritional Sciences (N SC)

Shantz Building, Room 309
(520) 621-1187; FAX: (520) 621-9446

Professors James W. Berry (Emeritus), Mary Ann Kight, K.Y. Lei, John A. Marchello, William F. McCaughey (Emeritus), Donald J. McNamara, Eugene Nelson (Emeritus), Franklin D. Rollins (Emeritus), Mitchell G. Vavich (Emeritus), Charles W. Weber

Associate Professors Ralph L. Price, Acting Head, Edward T. Sheehan, Ann M. Tinsley
Assistant Professors Wanda Howell, Ann A. Jerkins

The Department of Nutritional Sciences provides instructional programs in all areas of nutrition and food safety. These programs prepare students for careers in various phases of the governmental regulatory and consumer agencies, health care delivery systems, and for graduate study or professional schools of medicine, dentistry, physical therapy or veterinary medicine.

The department offers the degree of Bachelor of Science in Agriculture with a major in nutritional sciences and options in dietetics or nutrition.

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 five of the six 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 111 or ABE 120; EXSS 201, 202; MIC 205; PHYS 102, 181; CHEM 103a/103b, 104a-104b, 241a-241b, 243a-243b; ECON 201a; AREC 242; N SC 208, 251, 301, 340, 408, 441, 460; MATH 160 or 163. Select upper-division
electives to achieve total required by the University.

**Dietetics Specialization:** (Approved DPD/ADA) Course requirements in the nutritional sciences major with the specialization in dietetics are N SC 358, 440, 443, 458; ED P 310 or HLTTH 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 103, 182; 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 SC 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; 12 units from the following: 301, 310, 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 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.

120. Microcomputing Applications (3) I II (Identical with ABE 120)

197. Workshop
a. Fitness, Nutrition and Food Technology: Issues and Analysis (1) S Field trips. Offered only through Horizons Unlimited Summer Program.

208. Nutrition and Metabolism (3) I Introduction to nutritional sciences and the integration of the effects of nutrients and nutritional status of metabolic and physiological functions at the cellular, tissue, organ and system level in humans as related to health and disease. Designed for nutritional sciences majors and those with a background in biological and chemical sciences. P, EXSS 201 or MCB 181; P, CR, CHEM 241a.


280. Science of Meat and Meat Products (3) I II (Identical with AN S 280)

301. Nutrition and the Life Cycle (3) 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); EXSS 201 or 202.


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, 208, 301; CHEM 103B, 104b.

358. Institution Food Management (3) I Quantitative food preparation and service, factors affecting food purchasing, storage and inventory; menu planning for institutions, management of time and labor and use of institution equipment, equipment selection and maintenance. 2R, 3L. P, 101, 251.

396H. Honors Proseminar (3) I


411. Consumer Issues in Nutrition (3) S Effects of misinformation and fraud on nutritional status, general health and family economic means. P, 101 or 301, ECON 201a or 201b. (Identical with RCS 411 and HE E 411)

440. Nutritional Assessment and Management (4) I Methods and procedures in nutrition are applied in the clinical setting. Biochemical, clinical and dietary data collecting and analysis. Development of nutritional care plans to include formulations and planning for parenteral and enteral support. 2R, 3L. P, 340; CR 408.

441. Therapeutic Nutrition (4) I II Therapeutic principles of nutrient acquisition and utilization, including modification of the diet, for selected disease and/or deficiency states; factors of importance in client/patient care, re habilitation and education. P, 408. May be convened with 541.

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 (2) I II (Identical with PHPR 447) May be convened with 547.

448. Perspectives in Geriatrics (2) I II (Identical with PHPR 448)

458. Food Service Organization and Management (3) I Organization and management of food service systems; responsibilities of management for leadership, sanitation, maintenance, and care of food service plant and its equipment. P, 358.

460. General Biochemistry (3) I (Identical with BIOC 460)

463. Food Analysis (3) I II 1995-96 Laboratory procedures for chemical and physiochemical analysis of food products. 1R, 6L. May be convened with 563.

468. Food Processing (3) I 1995-96 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, MCI 205.

470. Food Microbiology and Sanitation (3) I II 1996-97 Microbiology in processing and handling of foods; relation of microorganisms, insects, and rodents to design and function of processing and handling equipment. P, MIC 317. (Identical with MIC 470) May be convened with 570.

471. Food Microbiology and Sanitation Laboratory (2) I II 1996-97 Laboratory procedures for assessment of sanitary quality of foods. P, 470 or CR. (Identical with MIC 471) May be convened with 571.

478. Food Processing (3) I 1996-97 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 Advanced physiology and biochemistry of nutrients with emphasis on present knowledge and current research topics in nutritional sciences. P, BIOG 460 or 462a.

540. Advanced Dietetics (3) I Nutrition and metabolism in patient care as applied by the advanced-level practitioner. Open to majors in nutritional sciences only.

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.

547. Perspectives in Geriatrics Laboratory (1) I II (Identical with PHPR 547) May be convened with 447.

548. Nutrition in Sport and Exercise (3) I II S

558. Advanced Food Science (3) I Food safety evaluation, microbiology of pathogens and beneficial organisms, chemistry, engineering, processing; analytical chemistry, laws, regulations. P, CHEM 241a-241b, 322; PHYSI 102a-102b; MATH 117R/S.

563. Food Analysis (3) I II 1995-96 For a description of course topics, see 463. Graduate-level requirements include an in-depth research paper on a current topic. May be convened with 463.

570. Food Microbiology and Sanitation (3) I II 1996-97 For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper on a current topic. May be convened with 470.
571. Food Microbiology and Sanitation Laboratory (2) II 1996-97 For a description of course topics, see 471. Graduate-level requirements include an in-depth research paper on a current topic. P, 470 or CR. May be convened with 471.

572. Food Laws, Standards, and Regulations (2) II 1996-97 Laws, standards, and regulations governing food marketing in the United States; emphasis on food safety, inspection procedures, additives, nutritional labeling and regulatory agencies. P, 6 units from the following: 468, 470; MKTG 470.

595. Colloquium c. Managing Clinical Dietetics (3) II
596. Seminar n. International Nutrition (2-3) II (Identical with FC M 596n)


602. Metabolic Integration (3) II Analysis of current knowledge regarding the interactions between the intake, absorption, transport, processing, storage, catabolism and excretion of nutrients and the regulation of metabolic homeostasis in the intact organism. Emphasis areas include interrelationships between protein, carbohydrate and fat metabolism and their regulation by dietary, hormonal and genetic factors in humans. P, BIOC 460 or BIOC 462a-462b.

609. Nutritional Biochemistry Techniques (3) II Biochemical methods for evaluating metabolic functions of nutrients. 1R, 6L. P, 408, CHEM 324 or 325, and 323 or 326. (Identical with AN S 609)

615. Chemistry and Metabolism of Lipids (3) II 1995-96 Chemistry and structure of lipids and their digestion, adsorption, transport and utilization; current research in lipid metabolism and the role of lipid in certain disease states. (Identical with AN S 615)


622. Mineral Metabolism (2) I 1995-96 Chemistry, metabolism and biological functions of minerals; current research in mineral requirements and toxicity. P, 408. (Identical with AN S 622)

628. Steroid and Lipoprotein Chemistry and Metabolism (2) II 1995-96 Biochemistry and metabolism of sterols and lipoproteins in mammalian systems; regulation of the biosynthesis and catabolism of steroids and lipoproteins in health and abnormalities related to disease; and dietary regulators of sterol and lipoprotein metabolism as related to cardiovascular disease risk and prevention. P, 602; BIOC 460 or BIOC 462a-462b.

640. Field Methods in Human Nutrition (3) II 1995-96 Case-oriented approach to nutritional assessment, diagnosis, prescription, plan and prognosis; application of dietary, clinical and biochemical methods. 2R, 3L. Open to majors in nutrition and other health sciences areas only.

663. Chemistry of Food Carbohydrates (2) II 1996-97 Chemical and physical properties of carbohydrates important to their presence in food. P, BIOC 460, 462a.

665. Analysis and Purification of Proteins (3) II 1995-96 (Identical with AN S 665)

672. Food Safety (2) I 1995-96 Significance and control of foodborne hazards associated with pathogenic microorganisms, microbial toxins, industrial chemicals, and other environmental contaminants. P, 471, CHEM 241b. (Identical with MBIM 672)

693. Internship a. Dietetic Internship, ADA Accredited (1-6) [Rpt./2] I II Field trip begins mid-August and continues for 46 weeks. Consult dept. before enrolling. Open to majors only. P, Course work equivalent to American Dietetic Association DPD.

696. Seminar b. Nutrition (1) [Rpt./6 units] I II (Identical with N USC 696b)

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**Nutritional Sciences (N USC)**

Shantz Building, Room 309
(520) 621-5630; FAX: (520) 621-9446

**Graduate Interdisciplinary Program in Nutritional Sciences**

**Committee:**

Professors David S. Alberts (Internal Medicine), Ronald E. Allen (Animal Sciences), Harris Bernstein (Microbiology and Immunology), David L. Earnest (Internal Medicine), Clemon D. Eskelson (Surgery), Charles Gerba (Soil and Water Science), J. Tal Huber (Animal Sciences), Mary Ann Kight (Nutritional Sciences), Otakar Koldovsky (Pediatrics), K.Y. Lei (Nutritional Sciences), Timothy Lohman (Exercise and Sport Sciences), Donald J. McNamara (Nutritional Sciences), Anthony F. Phillips (Pediatrics), William A. Stin (Animal Science), C. Brent Theurer (Animal Sciences), Marc E. Tischler (Biochemistry), Ronald R. Watson (Family and Community Medicine), Charles W. Weber (Nutritional Sciences)

Associate Professors Larry C. Clark (Family and Community Medicine), Carlos Flores (Pediatrics), Linda K. Houtkooper (Nutritional Sciences), Donald V. Lightner (Veterinary Sciences), Ralph L. Price (Nutritional Sciences), Cheryl K. Ritenbaugh (Family and Community Medicine), Edward T. Sheehan (Nutritional Sciences), Ann M. Tinsley (Nutritional Sciences)

Assistant Professors Iris R. Bell (Psychiatry), Wanda H. Howell (Nutritional Sciences), Ann A. Jenkins (Nutritional Sciences)

Research Associate Professor Maria Luz Fernandez (Nutritional Sciences)

Research Assistant Professor Anna Giuliano (Family and Community Medicine)

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**Research Entomologist Justin O. Schmidt**
(Carl Hayden Bee Research Center)
Associate Research Scientist Siraj I. Mufti (Pharmacology and Toxicology)

The interdisciplinary Committee on Nutritional Sciences administers a campus-wide, interdisciplinary program which 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 b. Nutrition (1) I II (Identical with N USC 696b)

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**Occupational Safety and Health**

(See Health-Related Professions)

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**Optical Sciences (OPTI)**

Optical Sciences Center, Room 401
(520) 621-4111; FAX: (520) 621-6778

**Graduate Interdisciplinary Program in Optical Sciences**

**Committee:**

Professors Richard C. Powell, **Director** (Materials Science and Engineering), J. Roger P. Angel (Astronomy), George H. Atkinson (Chemistry), Harrison H. Barrett (Radiology), Peter H. Bartels (Pathology), James J. Burke, William J. Dallas (Radiology), Eustace L. Deneriak (Electrical and Computer Engineering), Charles M. Falco (Physics), Peter A. Franken (Physics), B. Roy Frieden, Kenneth F. Galloway (Electrical and Computer Engineering), Jack D. Gaskill (Electrical and Computer Engineering), Hyatt M. Gibbs, Bobby R. Hunt (Electrical and Computer Engineering), Kenneth A. Jackson (Materials Science and Engineering), Stephen F. Jacobs, George L. Lamb, Jr. (Mathematics), Willis E. Lamb, Jr. (Physics), H. Angus Macleod (Electrical and Computer Engineering), Masud Marusjirup, Arvind S. Mathay, Aden B. Meinel (Emeritus), Pierre Meystere, Jerome V. Moloney (Mathematics), Dennis D. Patton (Radiology), Nassar Peyghambarian, John A.
Reagan (Electrical and Computer Engineering), Ralph M. Richard (Emeritus), Murray Sargent III, Dorr Sarid, Bernard O. Seraphin (Emeritus), Roland V. Shack, Robert R. Shannon (Emeritus), Richard L. Shoemaker (Radiology and Chemistry), Philip N. Slater, Orestes N. Stavroudis (Emeritus), A. Francis Turner (Emeritus), Donald R. Uhlmann (Materials Science and Engineering), William H. Wing (Physics), William L. Wolfe, Jr. (Radiology), James C. Wyant (Electrical and Computer Engineering)

Associate Professors Arthur F. Gmitro (Radiology), John E. Greivenkamp, Jr., (Ophthalmology) Raymond K. Kostuk (Electrical and Computer Engineering), Robert R. Schowengerdt (Electrical and Computer Engineering, Arid Lands Resource Sciences), Robin N. Strickland (Electrical and Computer Engineering), Ewan M. Wright (Physics)

Assistant Professors Rudolf H. Binder, Poul S. Jessen, Galina Khitrova, Thomas D. Milster, Mark A. Neifeld (Electrical and Computer Engineering), Jose Sasian

Associate Research Professor James M. Palmer

Research Associate Hans Roehrig

Qualified applicants holding undergraduate degrees in engineering, mathematics or physics are admitted to undertake graduate programs in optical sciences. Current active research areas include optical systems design, interferometry and optical testing, infrared technology, radiometry, remote sensing, optical detector systems, thin film deposition, image processing, scanning tunneling microscopy, nuclear, x-ray and MRI medical imaging, optical data storage, optical computing components, diffractive and binary optics, novel optical materials, adaptive optics, nonlinear optics, optical trapping and cooling of atoms, semiconductor and solid state laser physics. Interdisciplinary programs in progress involve the departments of Materials Science and Engineering, Mathematics, Astronomy, Chemistry, Electrical and Computer Engineering, Ophthalmology, Physics and Radiology, as well as Steward Observatory, the Arizona Research Laboratory, the Optical Circuity Cooperative and the Optical Data Storage Center.

The degrees of Master of Science and Doctor of Philosophy are offered with a major in optical sciences. For admission and degree requirements, please see the Graduate Catalog.

A related program in which the Optical Sciences Center plays a major role is the undergraduate optical engineering program administered by the Department of Electrical and Computer Engineering in the College of Engineering and Mines. (See the College of Engineering and Mines section of this catalog for specific information and requirements related to this program.)

210. Geometrical Optics (3) Basic principles of light, refraction, reflection, properties of optical glass, prisms, paraxial optics, pupils and stop, visual and other basic instruments, aberrations, measurement and testing. P, MATH 125a. (Identical with ECE 210)


342. Optical Systems Analysis (3) II Mathematical background, special functions, systems and operators, convolution, Fourier series, the Fourier transform, linear filtering, sampling, two-dimensional operations, applications in diffraction and image formation. P, MATH 223, PHYS 116 or 121.

350. Radiometry, Sources and Detectors (3) I Symbols, units and nomenclature, geometrical radiation transfer, radiometric instruments and measurements, blackbody radiation, practical radiation sources, noise and its effects, point and array detectors, detector interfacing. 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 Aberrations of optical systems, balancing of aberrations, image quality measures, system analysis using ray trace code, lens design, optimization, optical materials, optical testing, knife edge test, interferometric testing, phase shifting interferometry, optical fabrication, lens mounting. P, 412. (Identical with ECE 416)


470a-470b. Optics Laboratory (3-3) 470a: Beam alignment, data acquisition and signal processing, spectrometers, incoherent sources, thermal and quantum detectors, array detectors and video, image acquisition and processing, optical properties of materials, polarization, scanners and modulators. P, ECE 351a, CR 412.

470b: Coherent sources and gaussian beams, spatial filters, laser cavities and diode lasers, fiber optics, Fourier optics, holography, image quality and MTF, geometrical and interferometric optical testing. P, 470a, CR 416. (Identical with ECE 470a-470b)

473. Atomic and Molecular Spectroscopy for Experimentalists I (3) (Identical with PHYS 473) May be convened with 573.

474. Atomic and Molecular Spectroscopy for Experimentalists II (3) (Identical with PHYS 474) May be convened with 574.

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.


502. Introduction to Optical Design (3) I Rays and wavefronts, Snell's Law, mirror and prism systems, Gaussian imagery and cardinal points, paraxial ray tracing, stops and dispersion, systems of thin prisms, system analysis using ray trace code, chromatic aberrations and achromatization, monochromatic aberrations, ray fans, spot diagrams, balancing of aberrations, aspheric systems. 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, linear algebra, integral equations, green's functions. P, Math 223; PHYS 116 or PHYS 121.


506. Radiometry and Detectors (3) II Generation and propagation of blackbody and other radiation, projected areas, solid angle, inverse square law, and other laws, inverse square and other surfaces, absorption, reflection, transmission, scattering, imaging and non-imaging detectors, figures of merit, noise, vision, color, film, calibration and measurement, spectrometers and radiometers. P, 502.

507. Solid-State Optics (3) II 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, 503, 511 or PHYS 435.

Pathology
(See Veterinary Science)

Pharmaceutical Sciences (PHSC)
Pharmacy Building, Room 313
(520) 626-5730; FAX: (520) 626-4063


Associate Professors Edward P. Armstrong (Pharmacy Practice), Stephen Joel Coons (Pharmacy Practice), Jo-laine R. Draugalis (Pharmacy Practice), Martha Fankhauser (Pharmacy Practice), Marie Gardner (Pharmacy Practice), Martin D. Higbee (Pharmacy Practice), Joseph J. Hoffman, Michael D. Katz (Pharmacy Practice), Paul C. Langley (Pharmacy Practice), Michael B. Mayersohn, Neil McKenzie (Biochemistry)
Assistant Professors Suzanne Campell (Pharmacy Practice), Hsiao-Hui (Sherry) Chow (Pharmacy Practice), Victor A. Elsberry (Pharmacy Practice), Karen Ann Sauer (Pharmacy Practice)

The Department of Pharmaceutical Sciences offers courses leading to Master of Science and Doctor of Philosophy degrees with a major in pharmaceutical sciences. These are offered through the Graduate College. Concentrations within the major include: pharmacokinetics/biopharmaceutics, pharmaceutics, pharmacy administration/pharmaceutical economics and pharmaceutical chemistry/pharmacognosy.

For graduate admission and degree requirements, please the the Graduate Catalog. The department participates in the honors program.

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 437a-437b.

438. Pharmaceutical Analysis (2) II (Identical with PCOL 438)

507. Pharmacokinetics (4) I For a description of course topics, see PHPR 407. Graduate-level requirements include an in-depth analysis of a pharmacokinetic problem. P. 307. May be convened with PHPR 407.

508a-508b. Pharmacokinetics Discussion (1-1) I II For a description of course topics, see PHPR 408a-408b. Graduate-level requirements include an in-depth analysis of a pharmacokinetic problem. CR. 407 for 408a, 485 for 408b. May be convened with PHPR 408a-408b.

511. Advanced Pharmaceutical Care Systems (3) I History, organization and administration of pharmaceutical services within the institutional environment. (Identical with PHL 511)

512. Quantitative Structure-Activity Relationships (3) 1995-96 Approaches to the quantification of pharmacological actions of drugs on the basis of chemical structure.

513. Pharmaceutical Economics (3) II The application of the concepts and tools of the microeconomist to the assessment of the costs and the outcome of drug use in disease treatment and therapy interventions. A modeling approach is adopted to evaluating drug impacts within various institutional environments.

515. Toxicokinetics (3) II 1995-96 For description of course topics, see PHPR 415. Graduate-level requirements include different examination and/or writing of paper. (Identical with TOX 515) May be convened with PHPR 415.

527. Antineoplastic Drugs (2) II For a description of course topics, see PHPR 427. Graduate-level requirements include an extra paper or equivalent course project. May be convened with PHPR 427.

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.

542. Professional Practice Management (3) I For description of course topics, see PHPR 442. Graduate students will write either an additional paper or proposal. May be convened with PHPR 442.

545. Medication Use and the U.S. Health Care System (3) I For a description of course topics, see PHPR 445. Graduate students will write either an additional paper or proposal. May be convened with PHPR 445.

547. Perspectives in Geriatrics Laboratory (1) II P, CR, 448. (Identical with GERO 547 and NC 547) May be convened with PHPR 447.

548. Perspectives in Geriatrics (2) II For a description of course topics, see PHPR 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 and PHL 548) May be convened with PHPR 448.

561. Methodology in Pharmaceutical Research and Drug Literature Evaluation (3) I For description of course topics, see PHPR 461. Graduate students will write either an additional paper or proposal. May be convened with PHPR 461.

583. Perspectives of Cancer Care for Health Professionals (3) (5) (Identical with NURS 583) May be convened with PHPR 483.

585. Advanced Clinical Pharmacokinetics (3) II For description of course topics, see PHPR 485. Graduate-level requirements include an additional paper. May be convened with PHPR 485.

589. Clinical Pharmacotherapy of Mental Disorders (2) I For a description of course topics, see PHPR 489. Graduate-level requirements include a research paper on a single topic of psychopharmacology. (Identical with PHL 589) May be convened with PHPR 489.

596. Seminar a. Pharmaceutical Chemistry (1) [Rpt./5] II b. Pharmaceutical Chemistry Research (1) [Rpt./5] II c. Pharmaceutics Research (1 to 2) [Rpt./5] I II Open to majors only.

d. Pharmaceutics (1) [Rpt./5 units] I II e. Pharmacy Administration (1) [Rpt./5] I f. Pharmacy Administration Research (1) [Rpt./5] II

601. Advanced Physical Pharmacy (3) I II 1996-97 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.


611. Pharmaceutical Education Research (3) I Cultural, social, behavioral, and organizational foundations of pharmacy, including the development of the present state of practice. (Identical with PHL 611)

612. Pharmaceutical Outcomes 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. (Identical with PHL 612)

621. The Pharmaceutical Industry (3) I II Economic and organizational factors in the development, production, and distribution of drugs and the structure of the industry. (Identical with PHL 621)

630a-630b. Advanced Organic Medicinals (4-3) 1996-97 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.

632a-632b. Natural Medicinal Products (3-3) 1995-97 Origin and isolation of steroidal and alkaloidal drugs and other natural products of interest. P. 437b, PCOL 471b.

Pharmacology (PHCL)

College of Medicine, Room 5103
(520) 626-7218; FAX: (520) 626-4182

(De)partment, College of Medicine)

Professors I. Glenn Sipes, Head (Pharmacology and Toxicology, Anesthesiology), David S. Alberts (Medicine), H. Vasken Aposhian (Molecular and Cellular Biology), Klaus Brendel, Rubin Bressler (Medicine), Burnell R. Brown, Jr. (Emeritus, Anesthesiology), Thomas P. Davis, A. Jay Gandolfi (Anesthesiology, Pharmacology and Toxicology), Marilyn J. Halonen (Microbiology, Respiratory Sciences, Internal Medicine), Ryan J. Huxtable, David G. Johnson (Medicine), Eugene Morin (Medicine, Physiology), John D. Palmer (Medicine) Frank Porreca, Garth Powis (Pathology), Charles W. Putnam (Surgery), William R. Roese (Medicine), Henry I. Yamamura (Biochemistry, Arizona Research Labs, Psychiatry)

Associate Professors John W. Bloom (Medicine, Respiratory Sciences), Dean E. Carter (Pharmacology and Toxicology), Robert T. Dorr (Medicine), Timothy Fagan (Medicine), Edward D. French

Assistant Professors Bernard W. Futscher (Cancer Center), Josephine Lai, Douglas F. Larson (Surgery), Ronald Lynch (Physiology), Andrea J. Yool (Physiology)

The Department of Pharmacology in the College of Medicine cooperates with the Department of Pharmacology and Toxicology in the College of Pharmacy, through the Committee on Pharmacology and Toxicology, in offering programs leading to the Master of Science degree with a major in pharmacology (a specialization in perfusion sciences is also offered) and the Doctor of Philosophy degree with a major in pharmacology and toxicology. See Committee on Pharmacology and Toxicology for details on admission and degree requirements.

Pharmacology is a broad discipline involving the investigation of the actions of 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. Pharmacologic knowledge is applied to the understanding of the basic mechanisms of drug action, the diagnosis, prevention, cure or relief of the symptoms of disease and the promotion of optimal health. The emphasis on basic pharmacologic principles enables the student to develop techniques of problem-solving to keep abreast of advances in pharmacology and its applications to other sciences.

195. Colloquium

b. Toxicology: The Poisons Around Us (1) [Rpt. /1 unit]


501. The Pharmacological Basis of Therapeutics (6) I Actions of chemical agents upon living material at all levels of organization, with emphasis on mechanisms of action of prototype drugs; foundation for a rational approach to human therapeutics and toxicology. P, PSIO 580, 581 and graduate course equivalent to BIOC 562a or 501. (Identical with TOX 501)

520. Clinical Pharmacology (2) I Effects of drugs on natural history of disease; drug-drug interactions; drug testing designs; drug abuse; drug literature evaluation; aspects of clinical toxicology. P, 501.

545. Neurobiology of Drugs of Abuse (3) I For a description of course topics, see 445. Graduate-level requirements include a term paper on some aspect of drug abuse. (Identical with PCOL 544) May be convened with 445.

550. Drug Disposition and Metabolism (2) I Principles of absorption, distribution and excretion of drugs, with emphasis on mechanisms of drug metabolism. P, TOX 602a. (Identical with CBIO 550 and TOX 550)

551. Molecular Biology of Pharmacological Agents (3) I Molecular mechanism of drugs and toxins at the cellular and subcellular levels, including effects on control mechanisms, cell-cell interactions, organelles, and nucleic acid and protein synthesis. P, BIOC 462a, 462b, or 501, and PHCL 620. (Identical with TOX 551)


576. Environmental Toxicology (6) I (Identical with TOX 576)

582. Immunotoxicology (2) I (Identical with TOX 582)

586a-586b. Introduction to Pharmacology and Toxicology Research (1-1) Introduction to basic research techniques in pharmacology and toxicology through supervised laboratory rotations; student-initiated and faculty-structured lab. Exercises in modern pharmacological and toxicological techniques. (Identical with PCOL 586a-586b)

596. Seminar

a. Advanced Graduate Research (1 to 3) [Rpt. /3 units]

601. Analytical Instrumentation and Techniques (2-1) I (Identical with TOX 601)

602a-602b. Biotoxicology (3-1) (Identical with TOX 602a-602b)

605. Human Neuroscience (6) I (Identical with CBA 605)

620. Principles of Pharmacology (3) I Basic principles of the actions of drugs and of intercellular communication; drug-receptor theory; principles of laboratory investigation in pharmacology and toxicology; historical and philosophical foundations of pharmacology and toxicology. (Identical with PCOL 620 and TOX 620)

633. Neuropharmacology (3-4) I (Identical with PCOL 633)

670. Principles of Perfusen Techniques I (3) I An introduction to basic extracorporeal techniques through discussion of blood propelling devices, heat transfer, gas transfer, bio-materials, and perfusion pharmacology. P, CR 671, acceptance as degree graduate student. (Identical with SURG 670)

671. Perfusen Technology Laboratory (1) I An introduction to basic extracorporeal systems. P, acceptance as degree graduate student. (Identical with SURG 671)

672. Principles of Perfusen Techniques II (2) I Introduction to basic extracorporeal techniques through discussion of blood propelling devices, heat transfer, gas transfer, bio-materials and perfusion pharmacology. P, acceptance as degree track graduate. (Identical with SURG 672)

691. Preceptorship

I. Perfusen Science (3) [Rpt./9 units] I II S, P, admission into circulatory sciences option within pharmacology.

695. Colloquium

a. Cellular/Molecular Pharmacology (1-3) [Rpt./4 units] I II POOD 420a, 420b, 501a, 501b, and/or PHCL 551.

696. Seminar

a. Student Research I [Rpt./4 units] I (Identical with PCOL 696a and TOX 696a)

800. Research (1-6)

801. The Pharmacological Basis of Therapeutics (6) I

805. Human Neuroscience (6) I (Identical with CBA 805)

815. Subspecialty

a. Clinical Pharmacology (3-6) P, 801, and College of Medicine registration.

891. Preceptorship

a. Pharmacology (3-12) [Rpt./12 units] I II S, P, admission into circulatory sciences option within pharmacology.

895. Colloquium

a. Cellular/Molecular Pharmacology (1-3) [Rpt./4 units] I II POOD 420a, 420b, 501a, 501b, and/or PHCL 551.
Pharmacology and Toxicology (PCOL/TOX)
Pharmacy Building, Room 236 (520) 626-7218; FAX: (520) 626-4182
(Department, College of Pharmacy)

Professors I. Glenn Sipes, Head, James Blanchard (Pharmaceutical Sciences), G. Timothy Bowden (Radiation Oncology), Dean E. Carter, Lincoln Chin (Emeritus), Paul F. Consroe, James R. Halpert, Joseph J. Hoffman (Arid Lands Resource Sciences, Pharmaceutical Sciences), Wayburn S. Jeter (Emeritus), Hugh E. Laird II, Arnold Martin (Pharmaceutical Sciences), Albert L. Picchioni (Emeritus), William A. Reimers (Pharmaceutical Sciences), Findlay E. Russell, Karl H. Schram (Pharmaceutical Sciences), Barbara N. Timmermann (Arid Lands Resource Sciences, Pharmaceutical Sciences), Theodore G. Tong (Pharmacy Practice)
Associate Professor Daniel C. Liebler, Neil E. MacKenzie (Biochemistry, Pharmaceutical Sciences), Charlene A. McQueen, John W. Regan, Barbara N. Regan.
Assistant Professors William T. Bellamy (Pathology), Clifton D. Crutchfield (Health Education), William S. Dalton (Internal Medicine), Robert T. Dorr, Daniel C. Liebler, John Regan, John Sullivan (Emergency Medicine and Pharmacology), Mark D. Van Ert (Health Education)

The department of Pharmacology and Toxicology in the College of Pharmacy cooperates with the Department of Pharmacology in the College of Medicine, through the Committee on Pharmacology and Toxicology, in offering programs leading to the Master of Science degree with a major in toxicology (a specialization in industrial hygiene also is offered) and the Doctor of Philosophy degree with a major in pharmacology and toxicology. See Committee on Pharmacology and Toxicology for details on admission and degree requirements.

Pharmacology is the science concerned with the actions of drugs and other chemicals on living systems. Its primary aim is the discovery of chemical mechanisms by which cellular and molecular functions are regulated for the purpose of understanding how existing drugs act and to develop new drugs for treatment of diseases. The broad scope of interests of pharmacology ranges from the study of intermolecular reactions of chemical constituents of cells with drugs to the effects of chemicals in our environment on entire populations. See Committee on Pharmacology and Toxicology for details and degree requirements.

The Department of Pharmacology and Toxicology in the College of Pharmacy offers a curriculum leading to the Master of Science degree with a major in toxicology. See Committee on Pharmacology and Toxicology for details on admission and degree requirements.

Toxicology is the science concerned with the harmful effects of chemicals (including drugs) on living systems. Training in this area prepares students for careers in hospital laboratories, police crime laboratories, medical examiners' offices, industrial hygiene laboratories, and toxicology laboratories in industry, government, and universities. The broad scope of interests in toxicology ranges from determining the mechanisms by which chemicals produce adverse biological effects to identification and quantification of hazards resulting from occupational and/or environmental exposure to chemicals.

Industrial hygiene is the applied science concerned with the anticipation, recognition, evaluation and control of chemical and physical agents that can affect health status in occupational and environmental settings. An industrial hygiene concentration is offered in the Master of Science program. The concentration prepares students for professional practice in a wide range of both public and private sector organizations.

Pharmacology (PCOL)

195. Colloquium
a. Foundations of Modern Pharmacology (1)
   b. Toxicology: The Poisons Around Us (1) [Rpt.] I (Identical with TOX 195b)
   c. The Meaning of Life (1) II (Identical with PHCL 195c)

401. Human Gross Anatomy (3) II (Identical with CBA 401)

438. Pharmaceutical Analysis (2) II Modern methods and instrumentation used for qualitative and quantitative determination of drugs and metabolites. P, CHEM 323. (Identical with PHSC 428)

445. Neurobiology of Drugs of Abuse (3) II (Identical with PHCL 445) May be convened with 545.

471a-471b. Fundamentals of Pharmacology (4-4) Comprehensive study of the biochemical, physiological, and therapeutic effects of drugs, including mechanisms of drug action and drug toxicity, and drug literature evaluation. 3R, 3L. P, CBA 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 Pharmacodynamics, pharmacology, and adverse effects of commonly used drugs, with emphasis on clinical applications. Not available for elective credit in the College of Pharmacy or graduate credit in pharmacology-toxicology doctoral programs. Open only to nursing majors or with permission of the course coordinator. May be convened with 572.

474. Clinical Toxicology (2) I Prevention, characteristics, diagnosis and rational management of diseases caused by drug overdose, toxic household products, poisonous plants, venomous animals, environmental and industrial toxicants. P, 472 or 471b, PHSC 407. (Identical with TOX 474) May be convened with 574.

545. Neurobiology of Drugs of Abuse (3) II (Identical with PHCL 545) May be convened with 445.

571a-571b. Fundamentals of Pharmacology (4-4) For a description of course topics, see 471a-471b. Graduate-level requirements include an in-depth research paper on a current topic. P, CBA 401, BIOC 460, PSIO 480, 481; CR, PHPR 475a-475b and PHSC 437a-437b. (Identical with TOX 571a-571b) May be convened with 471a-471b.

572. Nursing Pharmacology (3) I For a description 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 description 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.

580. Systems Physiology (5) II (Identical with PSIO 580)

586a-586b. Introduction to Pharmacology and Toxicology Research (1-1) (Identical with PHCL 586a-586b)

596. Seminar
   a. Advanced Graduate Research (1-3) [Rpt.] I II (Identical with PHCL 596a)

620. Principles of Pharmacology (3) I (Identical with PHCL 620)

653. Neuropharmacology (3-4) II Role of various neurochemicals in the peripheral and central nervous systems and the effects of drugs on the nervous system, including their actions at receptors and their influence on synthesis, storage, and release of neurotransmitters. P, PHCL 501 or PCOL 471b, 561a, 596. (Identical with PHCL 653 and TOX 653)

695. Colloquium
   a. Research Conference (1-4) [Rpt.] I II (Identical with PHCL 695a)

696. Seminar
   a. Student Research (1) [Rpt./4] I II (Identical with PHCL 696a)

815. Pharmacy Subspecialty
   I. Research (5) II S 15-30L. P or CR, 10 units of 810. (Identical with PHPR 815I)

Toxicology (TOX)

195. Colloquium
   b. Toxicology: The Poisons Around Us (1) [Rpt.] I (Identical with PCOL 195b and PHCL 195b)

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 (5) II (Identical with VSC 423) May be convened with 523.

437. Vertebrate Physiology (4) I (Identical with ECOL 437)
Pharmacology and Toxicology

College of Medicine, Room 5103 (520) 626-7218; FAX: (520) 626-4182

Graduate Interdisciplinary Program in Pharmacology and Toxicology

Committee:

Professors A. Jay Gandolfi, Chair (Anesthesiology), David S. Alberts (Pharmacology, Medicine), H. Vasken Aposhian (Pharmacology, Molecular and Cellular Biology), Timothy Bowden (Radiotherapy Oncology), Klaus Brendel (Pharmacology), Rubin Bressler (Medicine, Pharmacology), Burnell R. Brown (Emeritus, Anesthesiology), Dean E. Carter (Pharmacology and Toxicology), Paul F. Consroe (Pharmacology and Toxicology), Thomas P. Davis (Pharmacology, Medicine), Marilyn Halonen (Microbiology, Pharmacology, Respiratory Sciences, Internal Medicine), James R. Halpert (Pharmacology and Toxicology), Ryan J. Huxtable (Pharmacology), David G. Johnson (Medicine, Pharmacology), Hugh E. Laird (Pharmacology and Toxicology), Eugene Morkin (Heart Center, Medicine, Physiology, Pharmacology), John D. Palmer (Pharmacology, Medicine, Asst. Prof.), Frank Porreca (Pharmacology), Garth Powis (Pathology, Pharmacology), Charles W. Putnam (Surgery, Pharmacology), William R. Roesske (Medicine, Pharmacology), Findlay E. Russell (Pharmacology and Toxicology), I. Glenn Sipes (Pharmacology, Pharmacology and Toxicology, Anesthesiology), Henry I. Yamamura (Pharmacology, Biochemistry, Arizona Research Labs, Psychiatry)

Associate Professors John W. Bloom (Pharmacology, Medicine, Respiratory Sciences), Robert D. Dorr (Pharmacology, Cancer Center, Medicine), Timothy C. Fagan (Pharmacology, Medicine), Edward D. French (Pharmacology), Daniel C. Liebler (Pharmacology and Toxicology), Michael B. Mayersohn (Pharmaceutical Sciences), Charlene A. McQueen (Pharmacology and Toxicology), John W. Regan (Pharmacology and Toxicology)

Assistant Professors William S. Dalton (Pharmacology, Pharmacology and Toxicology, Internal Medicine), Bernard W. Futscher (Pharmacology, Cancer Center, Medicine), Josephine Y. Lai (Pharmacology), Douglas F. Larson (Pharmacology, Surgery), Ronald M. Lynch (Physiology, Pharmacology), John B. Sullivan (Emergency Medicine, Pharmacology), Andrea J. Yool (Physiology, Pharmacology)

Research Associate Professors Ronald J. Lukas (Pharmacology), Thomas L. Smith (Pharmacology)

Research Assistant Professor Mark L. Witten (Pediatrics)

Research Lecturer John C. Gilkey (Pharmacology)

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 also offers M.S. degrees with majors in pharmacology and in toxicology. The program faculty are from the Departments of Pharmacology and Toxicology, Pharmacology, Anesthesiology, Internal Medicine, Surgery, Molecular and Cellular Biology, Radiation Oncology, Pharmaceutical Sciences and Pediatrics.

Admission requires the completion of a bachelor's degree with a major in chemistry, biology, pharmacy or other related science. Minimal prerequisites include one
year each of biology, organic chemistry and physics and coursework in mathematics through integral calculus. Applicants must submit general GRE scores, three letters of recommendation and a statement of purpose. Direct all correspondence and send all admission materials directly to: Chairperson, Graduate Program in Pharmacology and Toxicology. Graduate study programs are individually planned after consideration of the student's preparation and professional objectives. A dissertation/thesis is required.

For course descriptions, see Pharmacology (College of Medicine) and Pharmacology and Toxicology (College of Pharmacy).

Pharmacy Practice (PHPR)
Pharmacy Building, Room 318
(520) 626-5730; FAX: (520) 621-4063

Professors John E. Murphy, Head, J. Lyle Bootman, Jack R. Cole (Emeritus), Michael Mayersohn, Gary H. Smith, Theodore G. Tong, Samuel H. Yalkowsky
Associate Professors Edward P. Armstrong, Stephen Joel Coons, JoLaine R. Draugalis, Brian L. Erstad, Martha P. Fankhauser, Marie E. Gardner, Martin D. Higbee, Michael D. Katz, Paul C. Langley, Paul E. Nolan
Assistant Professors Suzanne Campbell, Hsiao-Hui (Sherry) Chow, Victor A. Elsberry, Kathryn L. Grant, Richard N. Herrier, Karen Ann Sauer
Adjunct Associate Professors Alan D. Barreuther, William F. Fritz, James R. Guidry, Carl E. Trinca
Adjunct Assistant Professors David A. Agpar, William N. Jones, Robert J. Lipsy, Gregory Morrill, Michael Noel, Sharon Peppler, Carol J. Rollins
Teaching Associate David Lee
Assistant Research Scientist Marion K. Slack

The Department of Pharmacy Practice offers courses leading to the Doctor of Pharmacy degree. Graduate study leading to the Master of Science and Doctor of Philosophy with a major in pharmaceutical sciences is offered by the Department of Pharmaceutical Sciences. 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 under Pharmaceutical Sciences (PHSC). 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) I

400. Pharmaceutical Calculations (2) I Pharmacuetical calculations pertinent to the selection, formulation, preparation, dosage and administration of drugs and their dosage forms.

401. 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, 402, 456.

402. 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.

403. Introduction to Pharmacy Practice (1) Orientation to career opportunities for pharmacists; medical terminology and abbreviations.

404. Interviewing and Counseling Skills (1) Basic communication skills and thinking strategies needed for effective medication history interviewing and patient counseling.


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. May be convened with PHSC 508a-508b.

409. Dosage Form Lab (1) II P, CR 401.

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) II Orientation to professional practice issues; pharmacy practice site visits. Involves weekly discussions, site visits to various pharmacy practices, and a written paper. Field trip. Open to majors only.

412a-412b. Nonprescription Drugs and Medical Devices (2-2) Presentations on the nonprescription drugs, remedies, and devices sold without a prescription (O.T.C.) for use in treating common minor medical problems. Designed to guide the pharmacist in providing professional advice to the self treating public.


414. Pharmacy Practice Lab (1) II Laboratory for PHPR 413.

415. Toxicokinetics (3) II 1995-96 Introduction to the principles of pharmokinetics as they are applied to the biological and chemical sciences for the quantitative study of drugs and toxic agents. Toxicokinetics involves the development of quantitative models to describe the time course of absorption


427. Antineoplastic Drugs (2) II Discovery and development of parent and synthetic antineoplastic drugs; preclinical screening and toxicity evaluation; phase I, II, and III clinical studies in humans. P, 437b or CR. May be convened with PHSC 527.

442. Professional Practice Management (3) I Management of professional situations and the interaction among patients, colleagues, and other health-care providers, with application to institutional, community, and clinical pharmacy practice. P, 445. May be convened with PHSC 542.

443. Pharmacy Laws (2) I Legal concepts covering professionalism, negligence, liability, legal processes and semantics; pertinent federal, state and local statutes and regulations.

444. 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 PHSC 545.

447. Perspectives in Geriatrics Laboratory (1) II P, CR, 448. (Identical with GERO 447 and N SC 447) May be convened with 547.

448. Perspectives in Geriatrics (2) 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 SC 448) May be convened with PHSC 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) 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 PHSC 561.

475a-475b-475c. Pharmacotherapy (6-6-8) 475a: II; 475b: I; 475c: II Common diseases that afflict humans. Their management based on pharmacotherapeutic considerations of epidemiology, etiology, diagnosis, pathophysiology, and prognosis. P, BIOC 460, PSIC 480.

485. Perspectives of Cancer Care for Health Professionals (3) S (Identical with NURS 483) May be convened with PHSC 583.

485. Advanced Clinical Pharmacokinetics (3) II Advanced pharmacokinetic principles emphasizing the application of mathematical toxicity, especially as it relates to the drug or toxin disposition. Issues in experimental design, extrapolation of data from animals to humans, and aspects of risk assessment. May be convened with PHSC 515.
relationships to therapeutic drug monitoring in patient care situations. P, PHSC 407, 408a, or consult department before enrolling. May be convened with PHSC 585.

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 PHSC 589.

495. Colloquium
a. Issues in Pharmacy (2) II

800. Pharmacy Practice Project (2) 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 three 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 815l and PCOL 815k)
   Note: 815a-l are six-week courses.

Philosophy (PHIL)
Social Sciences Building, Room 213 (520) 621-3129; FAX: (520) 621-9559
Professors Ronald D. Milo, Head, Julia Annas, Henry C. Byerly, Joseph L. Conlan (Emeritus), Robert Cummins, Joel Feinberg (Emeritus), Alvin I. Gold-

man, Jean Hampton, Robert M. Harnish, Richard Healey, Henning Jensen (Emeritus), Keith Lehrer, J. Christopher Maloney, John L. Pollock, Francis V. Raab (Emeritus), Holly M. Smith Associate Professor Joseph T. Tollier Assistant Professors Thomas Christiano, 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 major in philosophy assumes a general knowledge of mathematics. Students can acquire this knowledge by taking MATH 122 to fulfill the mathematics requirement. Advance work in certain specialized areas within philosophy may require higher mathematical knowledge. Students preparing to pursue graduate work in these areas should consult with Undergraduate Advisor about appropriate mathematics courses.

The supporting minor should be chosen with 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 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, pseudo-science, and their relation to philosophy and culture; impact of science and technology on society and its values and religion.

196. Proseminar
a. Topics in Philosophy (1)

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) 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.

263. From Hegel to Nietzsche: 19th Century Philosophy (3) Survey of influential 19th century philosophers, including Hegel, Marx, J.S. Mill, Kierkegaard, and Nietzsche. Their views on the individual and society, and human nature.

305. Introduction to the Philosophy of Science (3) Basic issues in the logic of science:
321. Medical Ethics (3) Ethical issues that arise in relation to medicine and health care: abortion, euthanasia, the allocation of scarce medical resources, socialized medicine, doctor-patient confidentiality, paternalism, etc.

322. Business Ethics (3) II Selected ethical issues in business, including corporate responsibility, preferential hiring and reverse discrimination, advertising practices, environmental responsibility.

344. Issues and Methods in Analytic Philosophy (3) Designed to improve ability to think analytically, with emphasis on analytic methodology:Selected readings on the nature of mental states, the analytic/synthetic distinction, personal identity, the concept of knowledge and justified belief, the theory of reference, and the distinction between science and pseudo-science. Writing-Emphasis Course. 

P, satisfaction of the upper-division writing-probability 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) A survey of basic issues in the philosophy of language. (Identical with LING 376)

403. Foundations of Mathematics (3) II 1996-97 (Identical with MATH 403) May be convened with 503.

410a-410b. History of Moral and Political Philosophy (3-3) Reading and analysis of selected texts from the Greeks to the present. 410a focuses on the history of moral philosophy and 410b on the history of social and political philosophy. May be convened with 510a-510b.

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 quantificational theory, natural deduction, axiom systems, elementary metatheorems, introduction notions 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 problems concerning justification 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 1995-96 (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.

425. Philosophical Issues in Feminism (3) Issues in philosophy raised by feminism and recent studies of gender. Possible topics: the source of gender differences; gender and the nature of knowledge; gender differences in conceptions of morality; feminist political theories; the nature of mothering. May be convened with 525.

430a-430b. Ethical Theory (3-3) 430a: Metaphysics—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.

432. Natural Language Processing (3) I Identical with LING 432) May be convened with 532.

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 ontology. May be convened with 540.

441. Theory of Knowledge (3) Critical examination of some of the major problems concerning evidence, justification, knowledge, memory, perception and induction. May be convened with 541.

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. P, two philosophy courses. May be convened with 542.


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 and action. May be convened with 551.

455. Philosophy and Artificial Intelligence (3) Interdisciplinary problems lying at the interface of philosophy and artificial intelligence. (Identical with PSYC 455) May be convened with 555.

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. Pragmatism (3) II Study of language use, its relationship to language structure and context; topics such as speech acts, presupposition, implication, performatives, 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./1] 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. Ancient Philosophy (3) [Rpt.] A philosophical introduction to the major works of
503. Foundations of Mathematics (3) II 1996-97 (Identical with MATH 503) May be convened with 403.

510a-510b. History of Moral and Political Philosophy (3-3) For a description of course topics, see 410a-410b. Graduate-level requirements include an in-depth research project on a central theme or topic of the course. May be convened with 410a-410b.

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 paper on a central theme or topic of the course. (Identical with ECOL 521) May be convened with 421.

522. Linguistic Semantics and Lexicology (3) II 1995-96 (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.

525. Philosophical Issues in Feminism (3) For a description of course topics, see 425. Graduate-level requirements include an in-depth research paper on a central theme or topic of this course. May be convened with 425.

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.

532. Natural Language Processing (3) I (Identical with LING 532) May be convened with 432.

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 project 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) 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. (Identical with L S 543) May be convened with 443.

545. Neural Network Modeling: What and Why (3) II (Identical with PSYC 545) May be convened with 445.

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. 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 requirements include a greater number of assignments and a higher level of performance. (Identical with LING 565) May be convened with 465.

567. Frege and the Rise of Analytic Philosophy (3) For a description of course topics, see 467. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. May be convened with 467.

570. Greek Philosophy (3) [Rpt./1] For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. (Identical with CLAS 570) May be convened with 470.

571a-571b. Rationalism and Empiricism (3-3) For a description of course topics, see 471a-471b. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. May be convened with 471a-471b.

572a. Ancient Philosophy (3) [Rpt.] For a description of course topics, see 472a. Graduate-level requirements include an in-depth research paper on a central theme or topic of the course. (Identical with CLAS 572a) May be convened with 472a.

596. Seminar
   a. Ethics (3) [Rpt./2]
   b. Metaphysics (3) [Rpt./2]
   c. Epistemology (3) [Rpt./2]
   d. Social and Political Philosophy (3) [Rpt./2]
   e. Philosophy of Law (3) [Rpt./2] (Identical with LAW 596g)
   f. Philosophy of Physical Science (3) [Rpt./2] (Identical with PHYS 596h)
   g. Philosophy of Mind (3) [Rpt./2]
   h. Philosophy of Language (3) [Rpt./2]
   i. History of Philosophy: Ancient (3) [Rpt./2]
   j. History of Philosophy: Recent (3) [Rpt./2]
   v. Philosophy and Cognitive Science (3) [Rpt./2]

Physics (PHYS)

PAS Building, Room 260
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The department offers two undergraduate degrees: Bachelor of Science with a major in physics and Bachelor of Science in Engineering Physics; the first degree is offered through Arts and Sciences — the second is offered through the College of Engineering and Mines. Either of these two degrees would be a good choice for students planning graduate work in physics. At the graduate level, the department offers degrees of Master of Science and Doctor of Philosophy with a major in physics; for graduate admission and degree requirements, consult the Graduate Catalog. Bachelor of Science in Education and Master of Education degrees are available with a teaching major in physics.

The major in physics: 45-48 units, in addition to the general education requirements for the Bachelor of Science degree described in the Arts and Sciences section of this catalog. Physics majors are normally required to take 151, 152 in their freshman year and 251, 252 in their sophomore year; entering freshmen who are exceptionally well prepared in calculus or who enter with advanced placement in physics are advised to take 141H, 142H, 241H and 242H instead. Special circumstances may justify the substitution of 141, 142, 241, 242 for 151, 152 and 251, 252; this requires the approval of a Physics Department academic advisor. Further major requirements include 205 and at least 11 upper-division physics courses. These must include 321, 325, 331, 332, 371, 381, 382, 422, 472, plus a minimum of 6 units chosen from the following list: 320, 450, 460, 473, 475, 476, 481, 482. The Physics Department strongly recommends that physics majors take CHEM 103a-b, 104a-b or 105a-b. MATH 254 is a prerequisite requirement for upper-division physics and MATH 215 is strongly recommended.

The major in engineering physics: Refer to the College of Engineering and Mines section of this catalog.

The teaching major: 30 units, including one of the following three sequences — 151, 152, 251, 252, or 141H, 142H, 241H, 242H or 141, 142, 241, 242, — and 433, 381, 382. Courses in related fields, such as astronomy, may be chosen with the approval of the Physics Department's academic advisor for this program.

The teaching minor: 18 units, including one of the following four sequences — 151, 152, 251, 252, or 141H, 142H, 241H, or 141, 142, 241, or 102, 103, 181, 182 — and 433, 481. The remaining units may be chosen in consultation with the department's academic advisor.

Undergraduate research: The department strongly encourages its majors to become involved in research at the undergraduate level. Students may obtain academic credit for such research either through 482 or independent research credit 499(H). In addition, a theoretical astrophysics concentration is available to physics majors. This concentration does not lead to a special degree but is instead an informal program of advising and research opportunities. Students interested in such research opportunities should contact their Physics Department academic advisors.

101. Physics in the Modern World (4) I II Basic concepts and the societal impact of physics. Topics include mechanics, wave motion, energy, light, nuclear and atomic physics, and astrophysics. 3R, 3L. Open to nonmajors only. P, high school algebra.

102.* Introductory Physics II (3) I II CDTH 499(H). In addition, a theoretical astrophysics concentration is available to physics majors. This concentration does not lead to a special degree but is instead an informal program of advising and research opportunities. Students interested in such research opportunities should contact their Physics Department academic advisors.

103.* Introductory Physics II (3) I II CDTH Continuation of 102. P, 102. Those wishing to take this course as a lecture-laboratory should register concurrently for 181.

107. The Physics of Music (4) I II Sound production, musical instruments, frequency analysis, physics of hearing, psychological and physiological effects, harmony and scales, hall acoustics, electronic production and recording. 3R, 3L.

131.* Introductory Physics with Calculus I (4) I Designed for liberal arts and life science majors with calculus background. Principles of kinematics, dynamics, wave motion and acoustics. P, MATH 125a, CR, MATH 125b. Those wishing to take this course as a lecture-laboratory course should register concurrently for 181.

132.* Introductory Physics with Calculus II (4), II Designed for liberal arts and life science majors with calculus background. Thermodynamics, electricity and magnetism, geometrical and physical optics, optical instruments, atomic and nuclear physics. P, MATH 125a, CR. Those wishing to take this course as a lecture-laboratory course should register concurrently for 181.

141.* Introductory Mechanics (4) I II CDTH Vector concepts; kinematics, statics and dynamics for point masses, particle systems and rigid bodies; conservation laws of energy, momentum and angular momentum; fluid statics and dynamics. 4R, 2L. P, MATH 125a, CR, MATH 125b.

141H.* Honors Introductory Mechanics (4) I II Kinematics and dynamics of point masses, particle systems and rigid bodies; conservation laws of energy, momentum and angular momentum; fluid statics and dynamics. 4R, 2L. P, MATH 125a, CR, MATH 125b.

142H.* Introductory Optics and Thermodynamics (2-3) I II Temperature scales, heat, thermodynamics, heat engines and kinetic theory; geometrical optics, lenses, mirrors and optical instruments; physical optics, diffraction, interference and wave theory. 2R (1R, 2L). P, 141, CR, MATH 223.

142.* Honors Introductory Optics and Thermodynamics (2-3) I II Temperature scales, heat, thermodynamics and heat engines; kinetic theory and statistics of many particle systems; geometrical optics, lenses, mirrors and optical instruments; physical optics, diffraction, interference and wave theory. 2R (3L). P, 141H or 141 with approval of instructor, CR, MATH 223.


181. Introductory Laboratory I (1) I II Quantitative experiments in physics, both illustrative and exploratory. Designed to accompany 102 or 131; sections are established corresponding to each course. P, CR, 102 or 131.

182. Introductory Laboratory II (1) I II Quantitative experiments in physics, both illustrative and exploratory. Designed to accompany 103 or 132; sections are established corresponding to each course. P, CR, 103 or 132.

195. Colloquium

a. Creation of the Universe (1) I

205. Computational Physics (3) I Introduction to numerical techniques for solving physics problems. Includes introduction to programming. Sample problems might include chaotic motion, nonlinear mechanics, particle trajectories, Monte Carlo simulation of phase transitions or stellar structure. P, 241 or 251.

241.* Introductory Electricity and Magnetism (4) I II CDTH Field concepts, electrostatics, magnetostatics, currents, electromagnetic phenomena and electromagnetic waves. 4R, 2L. P, 141, CR, MATH 223.

242.* Introductory Relativity and Quantum Physics (3) I II CDTH Introduction to 20th century concepts. Relativity and quantum theory will be emphasized. Other topics may be chosen from the following list: atomic and molecular structure, nuclear and elementary particle physics, quantum statistics and condensed matter. P, 141, 142, 241: MATH 223.

242H.* Honors Introductory Relativity and Quantum Physics (3) I II Special relativity, including Lorentz transformations, invariant intervals, relativistic dynamics, electricity and magnetism; old quantum theory; modern
quantum mechanics, including uncertainty principle, Schrödinger equation, simple one-dimensional problems, harmonic oscillator, angular momentum, hydrogen atom and spin. P. 141H, 142H, 241H or 141, 142, 241 with approval of instructor; MATH 223.

251. Introduction to Electricity and Magnetism (4) I Laws of electric and magnetic fields, DC and AC circuits, Maxwell’s equations. 4R, 2L. P. 152, CR, MATH 223.

252. Introduction to Optics and Quantum Theory (4) I Continuation of 251. EM waves, physical and geometrical optics, and quantum theory. 4R, 2L. P. 152.

*Credit will be allowed for only one of the following sequences of courses: 102-103 with 181-182; 131-132 with 181-182; 141-142-241-242; 151-152-251-252.

320. Optics (3) II Electromagnetic waves; rays, interference, diffraction, scattering; applications to imaging systems, Fourier methods, holography, and crystal optics. P. 242 or 252, MATH 223.

321. Theoretical Mechanics I (3) I II CDT Newton’s laws; rectilinear and rotational motion; simple, damped and rotational oscillators; Lagrangian and Hamiltonian formulations; central forces and orbital motion; noninertial reference frames; rigid bodies; coupled oscillators. P. 241H or 251, MATH 223, CR, 254.

325. Thermodynamics (3) I II Approximately equal time spent on classical and statistical thermodynamics; basic laws of thermal equilibrium; heat engines; ideal and non-ideal gases; phase transitions; irreversible processes; kinetic theory and statistical thermodynamics. P. 242 or 252, MATH 223.

351. Electricity and Magnetism I (3) I Electromagnetic phenomena leading to Maxwell’s equations; static and time-dependent solutions. P. 321 or MATH 422a.

332. Electricity and Magnetism II (3) II Continuation of 381. Both 381 and 382 are offered each semester, but students are encouraged not to enroll simultaneously.

422. Theoretical Mechanics II (3) II Advanced classical mechanics and modern dynamical systems. Topics include: canonical transformations, Hamilton-Jacobi theory, continuum mechanics, fluid dynamics and nonlinear systems. Special topics covered in the latter may include discrete maps, fractals, chaos, differential flows and solitons. P. 321, MATH 254.

430. Introduction to Biophysics (2) 1995-96 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. 103 or 132, CHEM 103a-103b. (Identical with MISC 430) May be convened with 530.

433. Physics Demonstrations (1-3) II Introduction to teaching materials and laboratory demonstrations illustrating principles of classical and modern physics, with emphasis on inexpensive techniques and direct experience. Advanced degree credit available for nonmajors only. P. two semesters of physics. May be convened with 533.

445. Experimental Physics 445a-445b-445c are three five-week lecture courses; none is prerequisite to any other.

a. Experimental Spectroscopy (1) I II Laboratory experiments with spectroscopic sources, spectrometers, instrument functions, detectors, light collection optics, spectral recording and analysis. P. 141, 142, 241 or consult department before enrolling. May be convened with 545a.

b. Experimental Acoustics (1) I I Laboratory experiments with sound sources, oscilloscopes, spectrum analyzers, sound level meters, filters, musical instruments, recording, measurement. May be convened with 545b.

c. Experimental Microscopy, Light Scattering and Optics of Small Particles (1) I II Laboratory experiments with microscopes and polarized scattered light to characterize small particles and surfaces, optical constants, lasers, remote sensing. P. 141, 142, 241 or consult department before enrolling. May be convened with 545c.

450. Nuclear and Particle Physics (3) II Nuclear forces; nuclear phenomenology. Reactions and stability; nuclear models. Radiation and decay. The structure of nucleons; particle phenomenology; the standard model. P. 371, MATH 254. May be convened with 550.


473. Atomic and Molecular Spectroscopy for Experimentalists I (3) Experimental techniques to generate, analyze and detect photons from X-ray to infrared; interpretation of spectra from gases, liquids, solids and biological macromolecules, light scattering, polarization. P. 242 or 252. (Identical with OPTI 473) May be convened with 573.

474. Atomic and Molecular Spectroscopy for Experimentalists II (3) Continuation of 473. P. 473. (Identical with OPTI 474) May be convened with 574.


481. Methods of Experimental Physics III (1-3) Continuation of 482, with emphasis on individual work. 3 or 6L. P. 382; 10 units of upper-division physics. Both 481 and 482 are offered each semester, but students are encouraged not to enroll simultaneously.

482. Methods of Experimental Physics IV (1-3) Continuation of 481, with heavy emphasis on individual work. Both 481 and 482 are offered each semester, but students are encouraged not to enroll simultaneously.

502. Medical Physics (3) I 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. 132 or 103 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. 321.

513. Topics in Advanced Mechanics (3) I Modern topics in classical mechanics, including canonical perturbation theory, invariant mappings, nonintegrated system stochastic behavior and applications to semi-classical quantum theory. P. 511.


525. Advanced Thermodynamics and Kinetic Theory (3) I 1995-96 First and second laws of thermodynamics and their applications; Boltzmann transport equation; H-theorem; mean free path methods applied to viscosity, thermal conductivity and diffusion. P. 325.

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-Bohr statistics. P. 476.
529. Information and the Formation of Physical Laws (3) [Identical with OPTI 529]

530. Introduction to Biophysics (2) I For a description of course topics, see 430. Graduate-level requirements include extra assignments. P, 103, 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 assisting with undergraduate lecture planning and demonstrations. Advanced degree credit available for nonmajors only. P, two semesters of physics. May be convened with 433.

535. Advanced Atomic Physics (3) II 1996-97 Details of atomic structure; interactions of atoms with electromagnetic fields, electrons and ions; techniques for calculating unperturbed and perturbed energy levels, transition probabilities and atomic interaction cross sections. P, 511, 515b, 570b.

545. Experimental Physics 545a-545b-545c are three five-week lecture courses; none is prerequisite to any other.

a. Experimental Spectroscopy (1) 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, 141, 142, 241 or consult department before enrolling. May be convened with 445b.

b. Experimental Acoustics (1) 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, 141, 142, 241 or consult department before enrolling. May be convened with 445b.

c. Experimental Microscopy, Light Scattering and Optics of Small Particles (1) II S For a description of course topics, see 445c. Graduate-level requirements include an in-depth research report on a topic selected in consultation with the instructor. P, 141, 142, 241 or consult department before enrolling. May be convened with 445c.

550. Introductory Nuclear Physics (3) II For a description of course topics, see 450. Graduate-level requirements include additional special topics, to be determined by the instructor. P, 242 or 252, MATH 254. May be convened with 450.

551. Nuclear Physics (3) I 1996-97 Theory of nuclear systems, including stability, decay, nuclear forces, scattering, reactions, structure and interaction with electromagnetic radiation. CR, 570a-570b.


556. Electrodynamics of Conducting Fluids and Plasmas (3) 1996-97 (Identical with PTYS 556)


560. Solid-State Physics (3) I II For a description of course topics, see 460. Graduate-level requirements include an in-depth paper on a topic in solid-state physics. P, 325, 371. May be convened with 460.

561. Physics of the Solid State (3) II Elementary excitations in solids, phonons, electrons and holes, excitons, biexcitons, interaction of light with semiconductors, polaritons, high excitation phenomena, dielectric anamolies 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, 475, 476 recommended but not required.

571. Symmetry Groups in Physics (3) I Algebraic results of the theory of groups that find repeated applications in atomic, molecular, nuclear and particle physics. Continuous groups, Lie algebras, discrete groups, irreducible tensors. P, 570a-570b.

572. Applications of Introductory Quantum Theory (3) I II For a description of course topics, see 473. Graduate-level requirements include additional homework problems. P, 371. May be convened with 473.

573. Atomic and Molecular Spectroscopy for Experimentalists I (3) For a description of course topics, see 473. Graduate-level requirements include homework problem assignments at an advanced level. P, 242 or 252. (Identical with OPTI 573) May be convened with 473.

574. Atomic and Molecular Spectroscopy for Experimentalists II (3) Continuation of 573. P, 573 (Identical with OPTI 574) May be convened with 474.

575. Methods of Mathematical Physics I (3) For a description of course topics, see 473. Graduate-level requirements include advanced examinations, as determined by the instructor. P, 321, MATH 254, CR, 331. May be convened with 475.

576. Methods of Mathematical Physics II (3) For a description of course topics, see 473. Graduate-level requirements include advanced examinations, as determined by the instructor. P, 575, MATH 254, CR 332. May be convened with 476.

577a-577b. Theory of Relativity (3-3) 1996-97 Special theory of relativity and its application to mechanics and electrodynamics; tensor calculus and general relativity; relativistic astrophysics and cosmology. P, 476.

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, 472.

582. High Energy Astrophysics (3) I (Identical with ASTR 582)

585. Stellar Pulsation (1-3) [Rpt./S] I II Stellar pulsation, the solar atmosphere, solar seismology and long-term solar variability related to climate.

586. Techniques in Particle Physics (3) II 1996-97 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)

596. Seminar I For a description of course topics, see 496a. Graduate-level requirements include homework problem assignments. P, 321, 252, MATH 254. May be convened with 496b.

a. Current Problems in Molecular Biology (1) I II [Rpt.] (Identical with MBIM 596a)

b. The Physics of Thin Films (3) II P, 460.

c. The Physics of Thin Films (3) II P, 460.

597. Philosophy of Physical Science (3) [Rpt./F] I For a description of course topics, see OPTI 597.

b. Philosophy of Physical Science (3) [Rpt./F] I For a description of course topics, see OPTI 597.

c. The Physics of Thin Films (3) II P, 460.

650. 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.

655. Colloquium I For a description of course topics, see 555. Graduate-level requirements include additional special topics, to be determined by the instructor. P, 242 or 252, MATH 254. May be convened with 555.

a. Problems in Computational Science (3) [Rpt./1] I II (Identical with MATH 697a)

b. Applied Mathematics Laboratory (3) I II (Identical with MATH 697b)

**Physiological Sciences**

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Graduate Interdisciplinary Program in
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Assistant Professors Parker B. Antin (Animal Sciences), Erik J. Henriksen (Exercise and Sport Sciences), Gail F. Koshland (Physiology), Howard Y. Lien (Internal Medicine), Ronald M. Lynch (Pharmacology), Ana M. Pajor (Physiology), Mark E. Wise (Animal Sciences), Andrea M. Yool (Pharmacology)

Research Associate Professors Thomas M. Hamm (Physiology), 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. Research training is an integral part of the Ph.D. program. The research areas of the faculty in the program can be broken down into five broad catagories: cardiovascular biology, cell physiology, exercise physiology, neurobiology and renal and transport physiology.

For admission and degree requirements, consult the Graduate Catalog.

Physiology for Engineers (4) 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 CHEE 418 and ECE 418)

419. Physiology Laboratory (2) 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 CHEE 419 and ECE 419)

466. Physiology Laboratory (3) (Identical with ECOL 466) May be convened with 566.

468. Comparative Physiology (3) (Identical with ECOL 468) May be convened with 568.

503. Cellular Physiology (5) Through examination of fundamental cellular processes, the integration function of diverse cell types is discussed. Topics include: mechanisms involved in protein expression, intracellular protein targeting, and regulation of protein function; membrane transport phenomena; cell signaling mechanisms-excitability, ion channels, synaptic function; muscle and vascular function. P, CHEM 103b, 104b, 241b, 243b; PHYS 102b; MATH 125a-125b; BIOL 460.

566. Physiology Laboratory (3) (Identical with ECOL 566) May be convened with 466.

568. Comparative Physiology (3) (Identical with ECOL 568) May be convened with 468.

575. Special Topics in Biological Imaging (2) I 1995-96 (Identical with CBA 575)

580. Sytems Physiology (5) Principles of systems physiology. Designed for graduate students throughout the University. Consult department before enrolling. P, 503 or equivalent.

582. Topics in Neural Development (2) I 1995-96 (Identical with NRSC 582)

585. Neural Mechanisms of Behavior (2) II 1995-96 (Identical with NRSC 585)

588. Principles of Cellular and Molecular Neurobiology (4) I (Identical with NRSC 588)

589. Principles of Systems Neurobiology (4) II (Identical with NRSC 589)

Colloquium

a. Mathematical Techniques in Physiology (2) [Rpt. /12 units] 1 II P, MATH 125a-125b, STAT 160.

b. Muscle Physiology (2) 1 II P, 503.

c. Endocrinology (2) II

d. Renal Physiology (2) I II P, 580 or equivalent.

e. Molecular and Cellular Excitability (2) II

f. Peripheral Vascular Physiology (2) II P, 580 or equivalent.

g. Membrane and Transport (2) II

h. Systems Neurophysiology (2) II

*Available as both 595 and 895
Planetary Sciences (PTYS)
Space Sciences Building, Room 325
(520) 621-6963; FAX: (520) 621-4933

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 consult the list of required courses under Department of Geosciences.

Undergraduate students may obtain a minor in planetary sciences. The PTYS minor must include PTYS 403, 407, 411, and 3 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.

105a. The Universe and Humanity: Origin and Destiny (3) I II Form 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 105a, BIOC 105a, MCB 105a)

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. (Identical with ASTR 106 and GEOS 106)

107. Planet Earth: Evolution of a Habitable World (3) 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 117R/S. (Identical with ASTR 107 and GEOS 107)

201. Image Processing for Scientific Discovery (3) I II Image processing as a tool for exploration, discovery and analysis of digital images in a variety of sciences. The emphasis is on hands-on image processing with applications to various sciences using a variety of activities and data sets. For science, non-science and science education majors. 2R, 2L. (Identical with TTE 211)


411. Geology of the Solar System (4) I 1996-97 Geologic processes and landforms on satellites and the terrestrial planets, their modification under various planetary environments, and methods of analysis. 3R, 3L. (Identical with GEOS 411)

418. Modern Astronomical Instrumentation and Techniques (3) 1995-96 May be convened with 518.

419. Global Tectonic Processes (3) I 1996-97 May be convened with 519.

441a-441b. Dynamic Meteorology (3-3) I 1995-96 May be convened with 541a-541b.

503. Physics of the Solar System (3) I 1995-96 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 424 or PHYS 425. (Identical with ASTR 503 and GEOS 503) May be convened with 403.


510. Principles of Cosmochemistry (3) I 1996-97 Chemical compositions of solar system objects; equilibrium and nonequilibrium chemical processes applied to planets; cosmochronology. (Identical with GEOS 510)


519. Global Tectonic Processes (3) I (Identical with GEOS 519) May be convened with 419.

520. Meteorites (3) I 1996-97 Classification; chemical, mineralogical and isotopic composition; cosmic abundances; ages; interaction with solar and cosmic radiation; relation to comets and asteroids. P, 510. (Identical with GEOS 520)

530. Chemical Evolution of the Earth (3) II (Identical with GEOG 530) May be convened with 430.

541a-541b. Dynamic Meteorology (3-3) (Identical with ATM 541a-541b) May be convened with 441a-441b.

544. Physics of High Atmospheres (3) II 1996-97 Physical properties of upper atmospheres, including gaseous composition, temperature and density, ozonosphere, and ionospheres, with emphasis on chemical transformations and eddy transport. (Identical with ATM 544)

545. Stellar Atmospheres (3) I 1995-96 (Identical with ASTR 545)


554. Evolution of Planetary Surfaces (3) II 1996-97 The geologic processes and evolution of terrestrial planet and satellite surfaces including the Galilean and Saturnian and Uranian satellites. Course includes one or two field trips to Meteor Crater or other locales. (Identical with GEOS 554)

555. Remote Sensing of Planetary Surfaces (3) II 1995-96 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)


567. Inverse Problems in Geophysics (3) (Identical with GEOS 567)

571. Terrestrial Planets (3) I 1995-96 Geophysical and geochronological 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) (Identical with ASTR 582)

583. Thermodynamics in Geosciences (3) (Identical with GEOS 583)

589. Topics in Theoretical Astrophysics (3) [Rpt.] (Identical with PHYS 589)

594. Practicum
   a. Planetary Geology Field Studies (1) [Rpt./3] Field trip

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 52 units: 27 units of core course work and 21 units in a chosen area of concentration. Core courses include 500, 501, 504, 544, 584, 605, 611, 660, 693. Areas of concentration include: sustainable community design, environmental resource planning, land use and transportation planning and international/border lands planning.

The program requires completion of a projects course. A comprehensive written examination or professional report must be completed as part of the 52 units of course work. Internship experience is required and students are exposed to field applications in other course work as well. The program is specifically designed to expose students to the interdisciplinary nature of most planning problems. The course work provides a mixture of theoretical and practical perspectives on diverse planning issues.

Interested persons should contact the Program chair for further information.

110. Regional Land Use (3) I II (Identical with GEOG 110)

301. Introduction to Regional Planning (3) I II (Identical with GEOG 301)

379. Urban Growth and Development (3) I II (Identical with GEOG 379)

427. Aging and Public Policy (3) II (Identical with PA 427) May be convened with 527.

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) I 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) [Rpt./1] II S (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 497) May be convened with 597.

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) II (Identical with PA 527) May be convened with 427.
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.
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 (Identical with CE 568) May be convened with 468.
571. Problems in Regional Development (3) I II (Identical with GEOG 571) May be convened with 471.
573. Geology and the Urban Environment (3) II (Identical with GEOG 573) May be convened with 473.
581. Computer Cartography (3) II (Identical with GEOG 581) May be convened with 481.
583. Geographic Applications of Remote Sensing (3) II (Identical with GEOG 583) May be convened with 483.
584. Planning the Built Environment (2) I (Identical with ARCH 584) May be convened with 484.
593. Internship
596. Seminar
605. Planning Theories and Perspectives (3) I (Identical with GEOG 605)
611. Projects in Regional Planning (1-5) [Rpt./5 units] II (Identical with GEOG 611)
657. Spatial Analysis (3) II (Identical with GEOG 657)

660. Land Use Planning (3) I Review of the principal legal devices available to implement planning decisions on community design (official map, subdivision control), the use of land (nuisance, convenants and zoning) and housing needs (including urban renewal). Special attention will be paid to the significance and legal effect of a comprehensive plan and to the social and economic effects of planning decisions. (Identical with LAW 660)
668. Urban Public Transportation Systems (3) I 1995-96 (Identical with CE 668)
669. Preservation of Historic Environments (3) II 1995-96 Current planning and legal methods to enhance the preservation of historic urban areas and structures; concentrated analysis of selected case studies. Field trips.

696. Seminar
b. Financing Public Services (3) I (Identical with ARCH 696b)
 i. Land-Use Regulation (3) II (Identical with MAP 696li)
 j. Legal Inquiry in Policy and Planning (3) II (Identical with MAP 696ji)
 k. Environmental Planning (3) I II (Identical with MAP 696ki)

Plant Pathology (PL P)
Forbes Building, Room 104
(520) 621-1828; FAX: (520) 621-9290
Professors Merritt R. Nelson, Head, Stanley M. Alcorn (Emeritus), Robert L. Gilbertson, Richard B. Hine (Emeritus), Michael A. McClure, Michael E. Stanghellini, Hans D. Van Etten
Associate Professors H. Earl Bloss (Emeritus), Martha C. Hawes, Christina K. Kennedy, Iraj J. Misaghi
Assistant Professors Marc Orbach, Leland S. Pierson III, Zhongguo Xiong
Adjunct Professors George Cummins, John S. Niederhauser
Research Associate Professor Mary Olsen
Research Assistant Professor Elizabeth Pierson
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 area specialties within the department include mycology, nematology, virology, microbiology and epidemiology. Research programs within these specialties emphasize basic and applied research in the areas of plant-microbe interactions and include pathogenic, symbiotic and beneficial interactions. Research programs include studies at the molecular, cellular, organismal and ecosystem level and a number of programs emphasize rhizosphere interactions.
Applicants to the department should have a bachelor's degree and a solid background in biology, biochemistry, botany, molecular biology or microbiology and must submit scores on the tests of the Graduate Record Examination to the department. Additional information and requirements for the graduate program can be obtained by directly contacting the department.
For graduate admission and degree requirements, consult the Graduate Catalog.

195. Colloquium
b. Agriculture as a Science (1) I (Identical with PL S 195b)
197. Workshops
a. Genetic Engineering (1) S Open to participants in Horizons Unlimited Summer Program (Identical with PL S 197a)
305. Introductory Plant Pathology (3) I Detailed study of representative plant diseases, with emphasis on basic concepts of diagnosis, control, epidemiology, and control, P, PL S 100 or MCB 181. (Identical with MIC 305)
402. Agriculture and the Environment: Focus on Pesticides (3) II (Identical with AGTM 402) May be convened with 502.
421a-421b. Microbiological Techniques (3-3) (Identical with MIC 421a-421b)
427R. General Mycology (3) I General mycology, with emphasis on the microfungi. P, 205. (Identical with MIC 427R)
427L. General Mycology Laboratory (2) I General mycology laboratory, with emphasis on the microfungi. P, 427R or CR. (Identical with MIC 427L)
428. Microbial Genetics (3) II Prokaryotic gene structure, replication, transfer, and recombination; control of gene expression. Plasmids, bacteriophage, mobile elements; their use in genetic analysis and biotechnology. P, MIC 317 or ECOL 320 or PL S 312. (Identical with ECOL 428, MCB 428, MIC 428, S W 428 and V SC 428)
451. Biology and Characterization of Plant Pathogenic Agents (4) II Examines the biological properties of the various groups of plant pathogens and the contemporary methods used to characterize these agents and the diseases they cause. 3R, 3L, P, S 305 and at least one laboratory course (e.g., MCB 205, MCB 181/182, etc.) or consent of instructor. May be convened with 551. (Identical with MIC 451)
496. Seminar
a. Contemporary Topics in Plant Pathology (1-3) [Rpt. /3] I II May be convened with 596a.
502. Agriculture and the Environment: Focus on Pesticides (3) II (Identical with AGTM 502) May be convened with 502.
550. Advanced Plant Pathology (4) I 1996-97 Topics include major concepts in classical and molecular genetics of plant-pathogen interactions; physiology, biochemistry, and molecular-
551. Biology and Characterization of Plant Pathogenic Agents (4) II For a description of course topics, see 451. Graduate-level requirements include additional assignments. 3R, 3L. P, 305 and at least one laboratory course (e.g., MIC 205, MCB 181/182, etc.) or consent of instructor. May be convided with 451.

575. Advanced Mycology (3) I 1995-96 Biology of fungi, including morphology, physiology, classification, genetics, ecological significance, and economic importance; emphasis on plant pathogens and environmentally essential fungi. 2R, 3L. P, ECOL 104 and PL S 100.

596. Seminar
a. Contemporary Topics in Plant Pathology (1-3) [Rpt. /8] I II May be convided with 496a.
b. Research Discussions (1-3) [Rpt. /3] May be convided with 496b.


612. Biological Electron Microscopy (4) I (Identical with MCB 612)


630. Tropical Weeds (3) I 1995-96 Principles and practices of weed science and planning for weed control. 2R, 3L. P, 100 or CR.

640. Practicum
b. Teaching Techniques in Plant Pathology (1-3) [Rpt. /2] I II P, 551.

650. Colloquium
a. Plant Biology (1) I (Identical with MCB 695a and PL S 695a)
b. Plant Pathology (1) II (Identical with MCBb and PL S 695b)

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, 360, 450, 459a, SW 200, 201. 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 305, ENTO 151 R and L or 175 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.

Required courses include PL S 100, 101, MCB 181R, 181L, ECOL 260. In addition to above and core courses, a minimum of 8 additional units from PL S 220-495. 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) 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) II Laboratory exercises in plant sciences. 3L. P, 100 or CR.

120. Microcomputing Applications (3) I II (Identical with ABE 120)

195. Colloquium
b. Agriculture as a Science (1) (Identical with ENTO 195b and PL P 195b)

197. Workshop
a. Genetic Engineering (1) S Open to participants in the Horizons Unlimited Summer Program (Identical with PL P 197a)

250. Intermediate Plant Sciences (3) II Principles of plant classification, reproduction, ecology and evolution. Intended for majors in all fields of biology. Field trips. 2R, 3L. P, 100 or 100H and MCB 181R, 181L.

305. Weed Science (4) II Principles and effects of controlling agronomic and horticultural weeds, with emphasis on chemical control methods; weed identification. 3R, 3L. P, 360 and SW 200 (ECOL 302 recommended).

306. Crop Science and Production (3) II 1995-96 An examination of the fundamental aspects of plant science as applied to crop production. Laboratory exercises require the small scale production of vegetable crops. 2R, 3L. P, PL S 100 or PL S 100H; PL S 250, S W 200.

312. Plant Genetics (4) II Principles of heredity as they apply to all living organisms, with an emphasis on plants, from molecular to populations with laboratory experience and problem solving. 3R, 3L. P, 100 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.

335. Plant Materials (4) II (Identical with AR 335)


354. Landscape Horticulture (3) II 1995-96 Horticulture practices which influence performance of plants in the landscape. Installation,
establishment and maintenance of plants in the landscape. 2R, 3L. P, 100, 101, S W 200.

355. Turfgrass Science and Culture (3) I 1996-97 Species, growth and development, use and establishment, and environmental stresses influencing cultural practices. P, 100, 101, and 360 or MCB 181.


401. Cotton Production (3) II Principles and practices of growing and harvesting cotton crops, with emphasis on cotton production, fiber technology, and utilization. Offered in Yuma only to AGTM majors.

403. Citrus Production (3) II Cultural practices used in citrus production and the physiological basis for those practices. P, basic biology knowledge; consent of instructor.

408. Arid Land Crop Ecology (3) 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.

410. Cell Biology (3) II (Identical with MCB 410)

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) II Principles and theory of plant tissue culture. Commercial and experimental applications of micropropagation, plant cell/protoplast culture, and plant transformation techniques. 2R, 3L. P, 312, 330, 360 or consent of instructor. May be convened with 530.

450. Developmental Plant Anatomy (4) II Structure, function and development of vascular plants. 3R, 3L, P, 100 or MCB 181. May be convened with 550.

463. Plant-Water Relations (3) 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, 360 or ECOL 260. (Identical with WS M 463) May be convened with 563.

465. Vegetable Physiology (3) II 1995-96 Examination of the growth, development and maturation of vegetable crops with special emphasis on postharvest processes. Designed for upper level undergraduates and graduate students with some prior knowledge of plant biochemistry and physiology. P, 360, 560 or BIOL 460. May be convened with 565.

470. Environmental Physiology of Horticulture Crops (4) I Light, temperature, water, nutrient and growth regulator effect on plant growth at biochemical/cellular level. Relevance to horticultural (woody and herbaceous) crops. P, 360 and 100 or MCB 181. May be convened with 570.

473. Recombinant DNA Methods and Applications (4) II (Identical with MCB 473)

475. Physiology of Crop Production (3) II Plant processes, modifications, and environmental interactions in relation to growth of crop plants, with emphasis on recent advances and research techniques. P, 360. May be convened with 575.

495. Colloquium
a. Senior Report (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-Pathology Interactions (1) [Rpt./5] I II (Identical with ENTO 496d) May be convened with 596d.

508. Arid Land Crop Ecology (3) II For a description of course topics, see 408. Graduate-level requirements include written reports of topics from current literature, and an oral class presentation. P, ECOL 260, MCB 181, MCB 182. May be convened with 408.

509. Information Sources for Agricultural Scientists (1) I Information systems and retrieval techniques, with particular reference to concepts, uses and limitations; emphasis on abstracts, indexes, alerting services, journals and government documents. (Identical with LI S 509)


515. Principles of Plant Breeding (3) I For a description of course topics, see 415. Graduate-level requirements include participation in computer-aided exercises in simulated recurrent selection. P, 312 or ECOL 320. May be convened with 415.

530. 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 in transgenic plants. P, 312, 330, 360 or consent of instructor. May be convened with 430.

541. Economic Botany of Arid Lands (3) I 1995-96 Examines past, present, and potential future industries based on plant resources in arid lands. Survey of useful products from arid lands plants, their biosynthesis and physiological function, taxonomic and geographic sources, and their role in local and global economies. P, 360. (Identical with AR L 541)

550. Developmental Plant Anatomy (4) II For a description of course topics, see 450. Graduate-level requirements include preparation of an in-depth research project. 3R, 3L, P, 100 or MCB 181. May be convened with 450.

560. Current Advances in Plant Physiology (3) I Investigation of the physiological, biochemical and molecular mechanisms that allow a plant to perceive and respond to environmental and chemical signals during normal growth and development and when it is experiencing a stress. P, 360, CHEM 462a-462b. (Identical with ECOL 560 and MCB 560)

563. Plant-Water Relations (3) II For a description of course topics, see 463. Graduate-level requirements include preparation of an in-depth research project. P, 360 or ECOL 260. (Identical with WS M 563) May be convened with 463.

565. Vegetable Physiology (3) III 1995-96 For description of course topics, see 465. Graduate-level requirements include an additional term paper. May be convened with 465.

570. Environmental Physiology of Horticulture Crops (4) I For description of course topics, see 470. Graduate-level requirements include preparation of an in-depth research proposal (USDA format). May be convened with 470.

575. Physiology of Crop Production (3) II For description of course topics, see 475. Graduate-level requirements include preparation of an in-depth research project. P, 360. May be convened with 475.

596. Seminar
d. Plant-Insect Interactions (1) [Rpt./5] I II (Identical with ENTO 596d) May be convened with 496d.

620. Plant Biochemistry (3) I 1995-96 Current topics in bioengineering, photosynthesis; carbohydrates; nitrogen and lipid metabolism. This course deals with biochemical processes specific to plants and allows students to gain an understanding and appreciation of how chemical components are synthesized and utilized by the plant during growth and development. P, BIOC 462a and 462b, PL S 560.

627. Advanced Genetics (3) II 1996-97 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)

629. Plant Cell Biology (3) I 1996-97 In-depth analysis of the empirical evidence, experimental methods, and theoretical background that underlies our understanding of modern plant cell biology. P, MCB 410 or equivalent.


695. Colloquium
a. Plant Biology (1) I (Identical with PL P 695a)

696. Seminar
a. Plant Science (1) [Rpt./4] I II

Political Science (POL)

Social Sciences Building, Room 315
(520) 621-7600; FAX: (520) 621-5051

Professors Edward N. Muller, Head, James W. Clarke, Richard C. Cortner, William J. Dixon, John A. Garcia, Jerrold D. Green, Helen M. Ingram, Conrad F. Joyner (Emeritus), Clifford, M. Lytle, Lyn Ragsdale, Jerrold G. Rusk,
John E. Schwarz, Michael P. Sullivan, Peter A. Toma (Emeritus), Gordon T ullock, John C. Wahlke (Emeritus), Allen S. Whiting, Edward J. Williams, Clifton E. Wilson (Emeritus)

Associate Professors Phillip C. Chapman, Jeanne Nieanaber-Clarke, John E. Crow (Emeritus), Donald R. Hall (Emeritus), Deborah R. Mathieu, Barbara Norrander, Daniel J. O'Neil, Thomas J. Volgy, John P. Wibben

Assistant Professors David Gibbs, Bradford S. Jones, Paulette Kurzer, Cary Nederman, V. Spike Peterson, David E. Spiro, David Wilkins

Lecturer Peter A. Goudinoff

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 major in political science assumes general knowledge of mathematics. Students may satisfy this requirement with MATH 122; the department also will accept MATH 117 or 121 or higher.

The minor: Twenty units of course work must be taken. 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, 102, 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, 230; 102, 214. An additional option is the certification examination, which carries no university credit.

Fields of study: The department is divided into six substantive areas or fields of study. These fields of study, with appropriate course listings, are as follows:

4. Political Theory: 290, 321, 322, 323, 326, 427, 428;
5. Comparative Politics: 240, 242, 244, 247, 270, 437, 440, 441, 443, 444, 445, 447, 448, 449, 450, 468; and

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. Prewill 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 and 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 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 and 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 Basic issues in political thought, with emphasis on contemporary problems of democracy, liberty, authority, obligation, and ideology.


206. Public Policy and Administration (3) I and II Theory and practice of executive agencies, including policy making and other functions, processes, personnel and fiscal management, and administrative law. P, 102. (Identical with PA 206)


231. American Political Parties (3) I American two-party system; history of political parties; role of parties in nominations, campaigns and elections; functions of parties in government; discussion of party organization and party activists; speculation on the future of party politics. P, 102.


242. Western European Political Systems (3) Examination of the ideological framework, political culture, functions and processes of the Western European political systems. P, 140.

244. British Politics (3) An examination of the British process of politics and government, the political system that both gave birth to our own and which also stands today as the major alternative way of democratic politics to that of the United States. P, 140.

247. Introduction to Latin-American Politics (3) I Survey of the political forces and social groups important in shaping contemporary Latin America; examination of Indians, slaves, peasants, landlords, labor, the middle sectors, and the military; discussion of theories of instability. P, 140.

250. Contemporary International Politics (3) I Analysis of conflicts of national interests; decision making in the present international system; role-playing and simulation experience. P, 120.

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)

290. Politics and the Novel (3) I and 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 a. U.N. (3) I and II Open to participants in Model U.N. programs only.


315. Political Sociology (3) I (Identical with SOC 315)

321. Ancient and Medieval Political Theory (3) I Development of Western political theory from the Greeks through Machiavelli. P, 102, 160 or PHIL 110, 113, or 121. Writing-Emphasis Course
322. Early Modern Political Theory (3) II Western political theory from the Reformation to the French Revolution. P, 102, 160 or PHIL 110, 113, or 121. Writing-Emphasis Course*

323. Late Modern Political Theory (3) I II Western political theory from the Utilitarians through the 1930s. P, 102, 160 or PHIL 110, 113, or 121. Writing-Emphasis Course*

326. American Political Thought (3) II American political ideas from colonial times to the present. P, 102, 160 or PHIL 110, 113, or 121. Writing-Emphasis Course*

330. Minority Groups and American Politics (3) I II Political problems of the poor; analysis of systematic poverty in the U.S. and theories of causation; selected policy problems: education, housing, job training, enforcement of antidiscrimination statutes; future of “power” movements. (Identical with AAS 330)

332. Politics of the Mexican-American Community (3) 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) 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 constrictions of masculinity and femininity shape and are shaped by interacting economic, political, and ideological practices. P, W S 100 (Identical with W S 335)

340. Politics in Advanced Industrialized States (3) I II Analysis of how variations in social structures and political configurations influence governmental policy and determine international competitiveness of states. Industrial sectors in five major economies are examined to determine how political systems differ, what kinds of policies enhance competitiveness, and where countries rank in terms of innovation of key industrial sectors. P, 140. (Identical with PA 340)

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.

360. International Political Economy (3) Analysis of politics of international economics and, to a lesser extent, of the economic determinants of international politics. Survey of the history of international political economy and theories that seek to explain it. P, 120. (Identical with PA 360)

373. Political Geography (3) II (Identical with GEOG 373)

377a-377b. Modern Israel (3-3) (Identical with JU 377a-377b)

388. Immigration and Refugee Policy (3) I 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)

393. Internship
a. Administrative Internship (1-6) [Rpt./6 units] I II
b. Public Defender (1-6) II
1. County Attorney (1-6) II
d. Senatorial Internship (1-12) I II Open to majors only.
e. Congressional Internship (1-12) I II Open to majors only.
 f. Legal Internship (1-6) [Rpt./6 units] I II

396H. Honors Seminar (3) I II

400. International Political Economy (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.

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, 230. May be convened with 512.

427. The Marxist Legacy (3) II A critical survey of the main currents of Marxism from Marx to the present. P junior standing, 160, or PHIL 110, PHIL 113 or PHIL 121. May be convened with S27. Writing-Emphasis Course*

428. Problems in Contemporary Political Theory (3) II Intensive examination of selected problems and concepts in political theory. P, 160 or PHIL 110, 113, or 121. May be convened with 528.

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 II 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. Socialization, Violent Crime, and Political Order (3) II Description and analysis of how and why people wield, and respond to, authority. Based on presumption that people's reactions to the public order are influenced by the private order—or disorder—their minds and the way they learned to respond to the private authorities of their childhoods. P, 102, plus an introductory level course in psychology, sociology, or anthropology. May be convened with 536. Writing-Emphasis Course*

437. Democracies, Emerging and Evolving (3) I Causal analysis of conditions of stability and breakdown of democratic regimes with particular emphasis on the developing democracies of the third world. P, 102. (Identical with LA S 437) May be convened with 537. Writing-Emphasis Course*

438a-438b. Philosophy of Law (3-3) (Identical with PHIL 438a-438b) May be convened with 538a-538b.


441. Arab-Israeli Conflict (3) I 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 and Post-Soviet Politics (3) I Surveys the Leninist system and the transition to post-Soviet institutions and norms. Focus on decision-making and models of autocracy and pluralism. Particular attention to Russia, but overview of other post-Soviet successor states. P, 120.

444. East European Politics (3) II Divergent models of Communist development, from East Germany to Yugoslavia; political, economic, social, and cultural reform. P, 140 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, 140. (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, 140. (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, 140. May be convened with 549.
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) I II (Identical with NES 542) May be convened with 442.

543. Soviet and Post-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) 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) II For a description of course topics, see 449. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 449.

550. Religion and Politics (3) II For a description of course topics, see 450. Graduate-level requirements include additional readings, research, and paper(s). (Identical with LA S 550) May be convened with 450.

551. Soviet and Post-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.

554. Theories of International Relations (3) I For a description of course topics, see 454. Graduate-level requirements include additional assignment/paper. May be convened with 454.

555. American Foreign Policy (3) I II For a description of course topics, see 455. Graduate-level requirements include additional assignment/paper. May be convened with 455.

556. International Law (3) For a description of course topics, see 456. Graduate-level requirements include research readings and paper(s). 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 additional research papers. (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 students will do a classroom presentation, 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 II 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.

567. Population and Development in the Middle East (3) I (Identical with NES 567) May be convened with 467.

568. Government and Politics of Africa (3) I II For a description of course topics, see 468. Graduate-level requirements include an additional paper and readings. May be convened with 468.

570. Constitutional Law: Federalism (3) I II For a description of course topics, see 470. Graduate-level requirements include an additional paper and readings. May be convened with 470.

571. Constitutional Law: Civil Liberties (3) I II For a description of course topics, see 471. Graduate-level requirements include an additional paper and reading. May be convened with 471.

573. Government and Economic Well-being (3) I II For a description of course topics, see 473. Graduate-level requirements include additional reading assignments and a more detailed paper. (Identical with PA 573) May be convened with 473.

574. Administrative Law (3) I For a description of course topics, see 474. Graduate-level requirements include an additional paper and readings. May be convened with 474.

576. Women and the Law (3) I For a description of course topics, see 476. Graduate-level requirements include additional research, readings, and paper(s). May be convened with 476.

578. American Indians and the Supreme Court: Environmental Policy (3) II For a description of course topics, see 481. Graduate-level requirements include additional readings and a substantial research paper of at least 25 pages in length. (Identical with HWR 581 and RNR 581) May be convened with 481.

582. Research and Methodology (4) II Quantitative techniques and computer applications in political science.

583. Urban Public Policy (3) I II For a description of course topics, see 483. Graduate-level requirements include additional readings, research, and paper(s). May be convened with 483.

584a-584b. Development of Federal Indian Policy (3-3) 584a: European colonial precedents through the treaty-making period. 584b: End of treaty-making to the present. 584a is not a prerequisite to 584b. (Identical with AINS 584a-584b and LAW 584a-584b)

585. Political Risk and Intelligence Analysis (3) II Examination of political risk and intelligence analysis with emphasis on forecasting political developments in nations.

586. Political Systems of India and Pakistan (3) I II (Identical with NES 586) May be convened with 486.

587a-587b. Race and Public Policy (3) I II For a description of course topics, see 487a-487b. Graduate-level requirements include additional reading, usually bibliographic in nature. P, 587a (Identical with AINS 587a-587b) May be convened with 487a-487b.

589. Public Choice (3) I II (Identical with ECON 589) May be convened with 489.

590. Teaching Political Science (3) I II Methods and problems involved with college teaching in general, and specifically in Political Science. Students are required to take this course as early as possible in their curriculum. Students must teach in the classroom under the supervision of a faculty member. P, graduate student status.

595. Colloquium a. American Politics (3) I II c. Political Theory (3) I II d. Comparative Politics (3) I II e. International Relations (3) I II g. Public Policy (3) (Identical with PA 595g)

596. Seminar a. American Politics (3) [Rpt./2] I II b. Political Behavior (3) [Rpt./2] I II c. Political Theory (3) [Rpt./2] I II d. Comparative Politics (3) [Rpt./2] I II e. International Relations (3) [Rpt./2] I II g. Public Policy (3) [Rpt./2] I II (Identical with PA 596g)

h. American Indian Law and Policy (3) [Rpt./2] I II (Identical with AINS 596h) i. Management and Policy for Ecological Sustainability (3) [Rpt.] I II (Identical with PA 596i and RNR 596i)

696. Seminar i. International Water Resource Management (1-3) [Rpt./2] (Identical with HWR 696i) v. Public Choice I (3) I II (Identical with ECON 696v; which is home) w. Public Choice II (3) I II (Identical with ECON 696v)
Psychology (PSYC)
Psychology Building, Room 312
((520) 621-7447; FAX: (520) 621-9306)

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), Jeff Greenberg, Barbara Gutek (Management and Policy), Travis Hirschi (Sociology), Sigmund Hsiao (Emeritus), William H. Ittelson, Marvin V. Kahn, Alfred Kaszniaik, James E. King, Mary P. Koss (Family and Community Medicine), Bruce McNaughton, Amnon Rapoport (Management and Policy), Carl A. Ridley (Family and Consumer Resources), Michael Rohrbaugh (Family and Consumer Resources), David Rowe (Family and Consumer Resources), Bruce D. Sales, Gary Schwartz, Lee Sechrest, Mary C. Wetzl, David B. Wexler (Law), Robert L. Wrenn

Associate Professors Harold S. Arkowitz, Felice Bedford, Merrie L. Brucks (Marketing), Aurelio J. Figueiredo, Laura McCloskey, Irene M. Pepperberg (Ecology and Evolutionary Biology), Mary Petersen, Ronald H. Pool, Christopher Puto (Marketing), Rosemary A. Rosser, Catherine Shisslak (Family and Community Medicine), Varda Shoham, Linda Swisher (Speech and Hearing Sciences), Gary Wenk

Assistant Professors Geoffrey Ahern (Neurology), John Allen, Iris Bell (Psychiatry), Paul Bloom, Elizabeth Glisky, Kerry Green, Elizabeth Krupinski (Radiology), Akiva Liberman, Chad Marsolek, Janet Nicol (Linguistics), Tamra Pearson-d'Estree, Cyma Van Petten, Karen Wynn

The Department of Psychology offers courses that provide a scientific understanding of the biological, cognitive and social processes involved in behavior and mental life, including normal and abnormal processes.

Degrees awarded are the Bachelor of Arts, Bachelor of Science, Master of Arts and Doctor of Philosophy. The master’s degree is awarded during doctoral training; there is no terminal Master of Arts program.

The major for the B.A.: Majors must complete 36 units of psychology, of which at least 18 units must be in upper-division course work. Everyone is required to take PSYC 101, 230 and 290. The remaining 27 units must include at least one Writing-Emphasis Course at the 400 level, and may include up to 3 units in 94 series of practicum or 99 series of independent study.

Majors also must satisfy the departmental distribution requirements by completing at least one course in each of the following three areas: Psychobiology and Neuroscience (PN); Cognition and Emotion(CEM); and Individual and Social Processes (ISP).

PSYC courses are numbered 300-324 and 400-424, 439, 478.

CEM courses are numbered 319, 325-349 and 402, 419, 425-449, 461.

ISP courses are numbered 350-387, 419, 424, 450-487.

The major in psychology assumes moderate knowledge of mathematics. Students must complete either MATH 117 or MATH 121 or equivalent. At present, the psychology department offers an equivalent course, PSYC 230. Successful completion of PSYC 230 currently fulfills the math requirement for the B.A. degree. Students intending to major in psychology are encouraged to complete 101 by the end of their freshman year, 230 and 290 by the end of their sophomore year and 300-level courses by the end of their junior year.

PSYC 101 is a prerequisite for all other psychology courses; 300-level course lay the foundations for courses at the 400 level, and 230 and 290 are prerequisites for courses numbered 400 and above.

The major for the B.S.: Requirements for the B.S. include all the requirements for the B.A. listed above. In addition, students must complete 8 units in a biological laboratory science; 8 units in chemistry or 8 units in physics with laboratory; and 6 units of mathematics, including MATH 117R/S or MATH 121 and either MATH 119 or 123.

The minor: A minor in psychology requires 20 units of psychology, of which at least 9 units must be in upper-division course work. Minors must take 101, 230 and 290. In addition, minors must either take one course in each of the three distribution areas (PN, CE and ISP), or may develop a thematic minor around some particular topic in psychology.

Students planning to attend graduate school in psychology should major in psychology (either B.A. or B.S), complete PSYC 297a, 489, 490 and should consult with a faculty mentor of their own choice no later than their sophomore year. Recommended minors are biological, physical or social sciences, philosophy, linguistics, mathematics or computer science. Students are also encouraged to enroll in the honors program.

The department participates in the Honors program. The Honors program is especially designed for psychology majors who intend to continue into psychology as a career, and will use the Honors program to enhance their preparation and entrance into graduate and professional study. Courses 101, 230, 297a, 296, 396, 496; independent study courses 199-499, Preceptorship 491, and Senior Project 498 are available for Honors credit.

101. Introduction to Psychology (3) I II S Survey of psychology including history, systems, and methods; structure and functions of the nervous and endocrine systems; learning; motivation and emotion; sensation and perception; memory; thought and language; personality; development; social interaction; psychopathology and psychotherapy. Required for admission to all other Psychology courses. CR, library research leading to modest writing assignment.

195. Colloquium
a. When Bad Things Happen to Healthy People (1) I
b. The Psychology of Death in Our Life (1) I I Credit is allowed for this course or other freshman seminar.

205. Do Animals Think? (3) I 1995-96 (Identical with ECOL 205H)

230. Psychological Measurement and Statistics (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 P, acceptance into honors program.

297. Workshop

302. Introduction to Biopsychology (3) I II S Survey of the basic principles of nervous system function in relation to perception, learning, memory, emotion, and thinking. P, 101 or 8 units of biology lab science.

312. Primate Behavior (3) I II S Survey of psychological research on nonhuman primates; includes sensory processes, learning, development, social and abnormal behaviors. P, 101


340. Introduction to Cognitive Development (3) I II Introduction to the development
of cognition, intelligence and language from conception to adolescence. P. 101.

341. 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. (Identical with LING 341)

350. Minds, Brains and Computers (3) [Rpt.] I (Identical with PHIL 350)

352. Personality (3) I II Basic concepts and issues in personality theory and research; approaches to personality description and assessment. P. 101.

357. Psychology of Gender (3) II Analysis of gender differences and their source in biology and culture. P. 101. (Identical with W S 357)

358. Psychology of Consciousness (3) II Introduction to theory and research on both normal and altered states of consciousness, from a natural science and cognitive psychology viewpoint. Topics reviewed include philosophical foundations, brain systems and consciousness, introspection, sleep and dreaming, hypnosis, meditation, and psychedelic drugs. P. 101.

360. 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.

374. Environmental Psychology (3) I Basic concepts in environmental psychology; the relationship between the individual and the large-scale environment. P.101.

375. Industrial-Organizational Psychology (3) II S Application of the principles of psychology to industrial and social organizations, including personnel, human factors, organizational and consumer psychology. P. 101.

381. Abnormal Psychology (3) I II S Survey of the symptoms and syndromes of abnormal behavior, with emphasis on a scientific, empirical view; primary focus is the description of various symptoms and diagnosis of illness, but research and theories concerning etiology and treatment also will be briefly covered. P. 101.


401a. Principles of Psychophysiology (3) Overview of the principles, theory and applications of psychophysiological assessment; an introduction to theory and research in major areas of human psychophysiology with a particular emphasis on the relationship of psychological correlates and physiological substrates of cognition, affect and psychopathology. May be taken alone or concurrently with 401b. P. 290, 302 and 490. CR, 401b. May be covered with 501a.

401b. Psychophysiology Laboratory (1) Provides a pragmatic "hands-on" experience in psychophysiological recording and analysis. Involves learning all facets of psychophysiological signal acquisition and analysis. P. 290, 302 and 490. CR, 401a. May be covered with 501b. Writing-Emphasis Course*.


403a. 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 403a) May be covered with 503a. Writing-Emphasis Course*.

403b. Laboratory in Mammalian Systems Neurophysiology (3) I II Neurophysiology laboratory including stereotaxic surgery, microelectrode recording of neural signals, electrical and chemical stimulation, and principles of analog and digital signal processing. P. 290, 302. (Identical with NRSC 403b) Open only to psychology majors and IDS majors with a psychology subject area. May be covered with 503b. Writing-Emphasis Course*.

406. Principles of Mammalian Systems Neurophysiology (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 neurobiology, biological or cognitive psychology, one advanced course in math or computer science. May be covered with 506. Writing-Emphasis Course*.

407. Neurobiology (4) I (Identical with MCB 407)

411. Animal Behavior (3) I II 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 covered with 511. Writing-Emphasis Course*.

412. Animal Learning (3) I 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 covered 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 covered with 513. Writing-Emphasis Course*.

417. Invertebrate Behavior Laboratory (3) I II Animal behavior laboratory in behavioral manipulation, observation, and data recording with invertebrate animals. 3L, 2R. P. 101, 230 and 290. May be covered with 517. Writing-Emphasis Course*.

419. Field-Based Human Learning (3) I II Learning principles in terms of behavioral ecology. Naturalistic study with video and computer methods of human services and academic settings. P. 101, 319. May be covered with 519. Writing-Emphasis Course*.

421. 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 424) May be covered with 524. Writing-Emphasis Course*.

426. Human Memory Systems (3) I II Examines the processing systems that underlie human learning, memory and cognition; emphasizing cognitive, neuroscientific and computational approaches to research and theory. P. 290, 325. May be covered with 526. Writing-Emphasis Course*.


432. Natural Language Processing (3) I (Identical with LING 432) May be covered with 532. Writing-Emphasis Course*.

438. Computational Linguistics (3) I (Identical with LING 438) May be covered with 538. Writing-Emphasis Course*.

439. Animal-Human Communication (3) II (Identical with ECOL 439) May be covered with 539.

440. Advanced Cognitive Development (3) II Examination of major theories and research findings in cognitive development, with emphasis on infant cognition and conceptual development through childhood. Topics include concept representation and development, naive theories of the world and knowledge restructuring. P. 230, 290, 340 or background in cognitive psychology, 325 or consent of instructor. May be covered with 540. Writing Emphasis Course*.

441. Language Acquisition (3) II (Identical with SP H 441) May be covered with 541 Writing-Emphasis Course*.

443. 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 development. P. senior standing or consult department before enrolling; one lower-division course in cognitive psychology, developmental psychology, or linguistic theory. (Identical with LING 443) May be covered with 543. Writing-Emphasis Course*.

445. Neural Network Modeling: What and Why (3) II Hands-introduction to basic neural modeling. Examination of ways in which modeling is and is not relevant to understanding the architecture of cognitive systems. P. 346 or 325 or 402 or graduate standing, college-level algebra skills, familiarity with either Macintosh or PC compatible microcomputers. (Identical with PHIL 445) May be covered with 545.

447. 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 covered with 547. 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*

452. Advanced Personality (3) I I II In-depth consideration of topics, issues and research in personality. P. 352. May be convened with 552. Writing-Emphasis Course.*

455. Philosophy and Artificial Intelligence (3) (Identical with PHIL 455) May be convened with 555. Writing-Emphasis Course*

456. Psychology of Death and Loss (3) I 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 556. Writing-Emphasis Course*

459. 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 459) May be convened with 559. Writing-Emphasis Course*

460. Advanced Social Psychology (3) I I II Social psychology, with emphasis on theory and method. P. 290, 360. Open only to psychology majors and IDS majors with a psychology subject area. May be convened with 560. Writing-Emphasis Course*

461. Social Cognition (3) [Rpt./6 units] I I Analysis of social phenomenon from a cognitive perspective; perception, memory, thought and language concerning self, others, and social situations. P. 290, 325, 360, or permission of instructor. May be convened with 561. Writing-Emphasis Course.*

462. Mental Health Law & Policy (3) [Rpt./3] I I III 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*

463a-463b. Forensic Assessment: Intervention, and Treatment (3-3) I Theory, research and practice in the assessment and treatment of, and intervention with, persons involved with the legal process who have clinical problems. P. permission of instructor. May be convened with 563a-563b.

468. Speech Perception (3) II (Identical with SP H 468)

474. Field Methods in Environmental Psychology (3) I I 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. 374. (Identical with ARCH 474 and L AR 474) May be convened with 574. Writing-Emphasis Course*

476. Environmental Cognition (3) [Rpt./I I II Recent advances in the area of environmental cognition, with an emphasis on cognitive aspects of environmental psychology. May be convened with 576. Writing-Emphasis Course*

477. Psychology, Law and Social Policy (3) [Rpt./3] Critical review of theory, methods and research in the psychology, law and social policy interface. P. 360. 6 units of a social science, or graduate standing. May be convened with 577. Writing-Emphasis Course*

478. Sleep and Sleep Disorders (3) I I II Topics include sleepwake rhythms, sleep deprivation, dreams, and the diagnosis and treatment of sleep disorders. P. 290, 302. May be convened with 578.

481. Psychopathology (3) I I II In-depth study of current theoretical and research formulations in psychological disorders; various approaches to behavior change. P. 290, 381. May be convened with 581. Writing-Emphasis Course*

484. Advanced Health Psychology (3) [Rpt./I 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./I 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*

486. Ethical Issues in Psychology (3) I 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 586. Writing-Emphasis Course.

489. History of Psychology (3) I I II 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 589. Writing-Emphasis Course*


f. Cognitive Psychology (3) [Rpt./I I I I Identical with LING 496f) May be convened with 596f.

496H. Honors Seminar (3) I I "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. Current Issues in Psychological Theory and Research (3-3) I Intensive examination of a range of content areas addressed in contemporary psychological theory and research. Open to psychology graduate students only.

501a. Principles of Psychophysiology (3) For a description of course topics, see 401a. Graduate-level requirements include a more comprehensive literature review. P, graduate status or 290, 302 and 490. CR. 501b. May be convened with 401a.

501b. Psychophysiology Laboratory (1) For a description of course topics, see 401b. Graduate-level requirements include more sophisticated data analysis and statistics. P, graduate status or 290, 302 and 490. CR. 501a. May be convened with 401b.

502. Principles of Neuroanatomy (4) II (Identical with CBA 502)

503a. Principles of Mammalian Systems Neurophysiology (2) I I II For a description of course topics, see 403a. Graduate-level requirements include Graduate-level requirements for an additional term paper 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 588; CR, PSYC 403a. (Identical with NRSC 503a) May be convened with 403a.

503b. Laboratory in Mammalian Systems Neurophysiology (3) I I II For a description of course topics, see 403b. Graduate-level requirements include an in-depth research paper on a single aspect of a current problem in neurological psychology. P, 290, 302. (Identical with NRSC 503b) May be convened with 403b.


506. Principles of Mammalian Systems Neurophysiology (3) I I II For a description of course topics, see 406. Graduate-level requirements include Graduate-level requirements for an in-depth research paper on a single aspect of neural encoding. (Identical with NRSC 506) May be convened with 406.

507a-507b. Statistical Methods in Psychological Research (3-3) Statistical research design, methods and metascience. 507a: Bivariate and multiple regression, application of structural equations modeling to manifest variable (path analysis) and latent variable (multivariate) causal analysis. 507b: Application of the general linear model to analysis of variance, covariance and multiple comparisons, exploratory and confirmatory factor analysis, the canonical correlation, discriminant function analysis and multivariate analysis of variance. Open to majors only.

508. Methods for Field Research (3) I I II For a description of field research problems and methods particularly relevant to field research. The logic of inquiry and approaches to data analysis appropriate to field trials and quasi-experimental research.

509. History of Psychological Theories and Research (3) I Development of psychology as a science; schools, systems, theories, major advances, famous investigators. Open to majors only.

511. Animal Behavior (3) I For a description of course topics, see 411. Graduate-level requirements include an in-depth research paper on a single aspect of animal behavior. P. 290. May be convened with 411.
For a description of course topics, see 412. Graduate-level requirements include an in-depth research paper on an aspect of animal learning. P, 290. May be convened with 412.

513. Drugs, Brain and Behavior (3) II For a description of course topics, see 414. Graduate-level requirements include an additional term paper pertinent to the course topic. P, 101, 230, 290, 302. May be convened with 413.

517. Invertebrate Behavior Laboratory (3) II For a description of course topics, see 417. Graduate-level requirements include an additional paper or presentation to the class. May be convened with 417.

519. Field-Based Human Learning (3) II For a description of course topics, see 419. Graduate-level requirements include advanced research applications in psychology or related areas. P, 101, 319. May be convened with 419.

524. Gerontology: A Multidisciplinary Perspective (3) II For a description of course topics, see 424. Graduate-level requirements include an in-depth research paper on a single aspect of gerontology. (Identical with GERO 524 and NRSC 524) May be convened with 424.

526. Human Memory Systems (3) II For a description of course topics, see 426. Graduate-level requirements include an in-depth research paper on human memory and cognition. P, 290, 325 or graduate standing. May be convened with 426.

528. Cognitive Neuroscience (3) [Rpt./1] II Recent advances in analysis of the neural bases of cognitive functions, such as learning, memory, and thinking.

529. Advanced Perception (3) [Rpt./2] II For a description of course topics, see 429. Graduate-level requirements include an additional paper on a particular issue. P, 230, 290. May be convened with 429.

532. Natural Language Processing (3) II (Identical with LING 532) May be convened with 432.

536. Visual Cognition (3) [Rpt./1] II Recent advances in the areas of perception and attention, with an emphasis on visual process.

538. Computational Linguistics (3) I (Identical with LING 538) May be convened with 438.

539. Animal-Human Communication (3) II (Identical with ECOL 539) May be convened with 439.

540. Advanced Cognitive Development (3) For a description of course topics, see 440. Graduate-level requirements include an in-depth research paper on the relation between human and cognitive development.

541. Language Acquisition (3) II (Identical with SP H 541)

542. Psycholinguistics (3) [Rpt./1] II Recent advances in the area of psycholinguistics, with an emphasis on sentence processing and the contribution of linguistic theory to an understanding of psychological mechanisms. (Identical with LING 542)

543. Lexical and Syntactic Development (3) II For a description of course topics, see 443. Graduate-level requirements include a written paper on a subject pertinent to topic area. (Identical with LING 543) May be convened with 443.

545. Neural Network Modeling: What and Why (3) II For a description of course topics, see 445. Graduate-level requirements include a more substantial modeling project. (Identical with PHIL 545) May be convened with 445.

547. Cognitive and Affective Bases of Behavior (3) [Rpt./1] II For a description of course topics, see 447. 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 447.

548. Topics in Language and Cognition (3) [Rpt./1] 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. (Identical with LING 548)

550. Psychological Assessment and Testing (3) 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.

552. Advanced Personality (3) II For a description of course topics, see 452. Graduate-level requirements include an in-depth research paper on an aspect of personality study. P, 290. May be convened with 452.

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, 481. May be convened with 454.

555. Philosophy and Artificial Intelligence (3) (Identical with PHIL 555) May be convened with 455.

556. Psychology of Death and Loss (3) II For a description of course topics, see 456. Graduate-level requirements include an in-depth research paper on an aspect of psychology of death or loss. P, 290 or graduate standing. May be convened with 456.

559. Adult Development and Aging (3) I For a description of course topics, see 459. Graduate-level requirements include an in-depth research paper on an aspect of specific psychological problem of the aged. P, 290 or 101 and two courses in gerontology or human development; or graduate standing. (Identical with GERO 559) May be convened with 459.

560. Advanced Social Psychology (3) II For a description of course topics, see 460. Graduate-level requirements include an in-depth research paper on a single aspect of the theory or method of social psychology. May be convened with 460.

561. Social Cognition (3) [Rpt./6 units] II For a description of course topics, see 461. Graduate-level requirements include a research paper pertinent to the topic of social cognition. May be convened with 461.

562. Mental Health Law & Policy (3) [Rpt./3] 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. (Identical with LAW 562) May be convened with 462.

563a-563b. Forensic Assessment: Intervention and Treatment (3-3) For a description of course topics, see 463a-463b. Graduate-level requirements include a different grading system for class participation and exams. May be convened with 463a-463b.

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.

567. Experimental Phonetics: Physiology (3) (Identical with SP H 567)

568. Speech Perception (3) II (Identical with SP H 568)

574. Field Methods in Environmental Psychology (3) II For a description of course topics, see 474. Graduate-level requirements include an in-depth research paper on an aspect of environmental psychology field methods. P, 374. (Identical with ARCH 574 and L AR 574) May be convened with 474.

576. Environmental Cognition (3) [Rpt./1] II For a description of course topics, see 476. Graduate-level requirements include an in-depth research paper on a single aspect of environmental cognition. May be convened with 476.

577. Psychology, Law and Social Policy (3) [Rpt./3] II Critical review of theory, methods, and research in the psychology, law and social policy interface. May be convened with 477.

578. Sleep and Sleep Disorders (3) II For a description of course topics, see 478. Graduate-level requirements include a critical review of the research literature of a relevant topic. P, 290, 302. May be convened with 478.

580. Clinical Neuropsychology (3) II Cognitive and affective sequelae of human central nervous system disease/damage, with emphasis on clinical evaluation, management and rehabilitation.

581. Psychopathology (3) II For a description of course topics, see 481. Graduate-level requirements include an in-depth research paper on psychopathology. May be convened with 481.

582. Advanced Psychopathology (3) [Rpt./1] II Advanced survey of current theory and research in symptoms, causes and treatment of the major psychological disorders.

584. Advanced Health Psychology (3) [Rpt./1] II For a description of course topics, see 484. Graduate-level requirements include an additional paper pertaining to the course topic. May be convened with 484.

585. Contemporary Issues in Psychology (3) [Rpt./1] 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.
586. Ethical Issues in Psychology (3) I II For a description of course topics, see 486. Graduate-level requirements include an in-depth research paper on a single aspect of the course topic. May be convened with 486.

589. History of Psychology (3) I II For a description of course topics, see 489. 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 489.

596. 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
(520) 621-7965; FAX: (520) 621-4171

Professors H. Brinton Millward, Director, Michael Gottfredson (Management and Policy), Helen Ingram (Political Science), Theodore Koff, John Schwarz (Political Science), Arthur Silvers, 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 not-for-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 Informal and exploratory approaches to the analysis of empirical data in a managerial context. P, MATH 119

206. Public Policy and Administration (3) II (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.

241. Criminal Justice Administration (3) II Theory and practice of criminal justice organizations: police, courts and correctional institutions. (Identical with SOC 241)

321. Health Care Policy and Institutions (3) II Examine 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) II (Identical with SOC 341)

342. Criminology (3) II (Identical with SOC 342)

343. The Crime Problem (3) II 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) II Analysis of selected principles of criminal law, criminal procedure and correctional law. (Identical with SOC 344)

400. Quantitative Methods for Administrators (3) II 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)

410. Introduction to Public and Nonprofit Financial Management (3) I Issues and techniques of financial management and budgeting in the public and nonprofit sectors. P, ECON 300; ACCT 200 or 272.

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 and ECON 300 or 361. (Identical with ECON 422)

424. 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. May be convened with 524.

427. Aging and Public Policy (3) II Policy framework for administration of programs, plans, priorities, and legislation related to the needs of the aging in modern society (Identical with GERO 427 and PLNG 427) May be convened with 527.

435. International Management (3) I (Identical with MAP 435) May be convened with 535.

441. Women and Youth in the Justice System (3) III Examines the treatment of juveniles and women in the American criminal justice system. (Identical with SOC 441)

442. Crime and Public Policy (3) I Role of government in the prevention and control of crime. (Identical with SOC 442)

457. Law of the Elderly (2) II (Identical with GERO 457). May be convened with 557.


473. Government and Economic Well-being (3) I II (Identical with POL 473) May be convened with 573. Writing-Emphasis Course
501. Public Organization Theory (3) I Course focuses on understanding and analyzing interactions, effectiveness and complexities of organization structures.

502. Organization Theory and Behavioral Relations (3) I (Identical with MAP 502)

503. Politics and the Policy Process (3) I Various theories of how public policy is formulated.

504. Public and Policy Economics (3) II Applications of economics 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) II Techniques for analyzing the effects of public policies and programs. P, MKTG 552 or permission of instructor.


513. Government and the Nonprofit Sector (3) II Governments have drastically altered the way they deliver public services. While government spending on services has grown, nonprofit organizations under contract to government increasingly deliver public services in health, welfare and many other areas. This course will map the dimensions of this new relationship; discuss the consequences of third party management of public services; and develop skills in contracting, monitoring and measuring performance.

514. Analytic Methods in Planning and Management (3) II Methods and models for program planning and policy analysis; forecasting, service demand, facility location in capital investment programming, task sequencing, program analysis and evaluation. P, MKTG 552, GEOG 557 or permission of instructor. (Identical with PLNG 514)

521. Social Policy (3) II Design, implementation and outcomes of social policy initiatives in the U.S. and abroad. Themes include historical overview of antipoverty 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) II 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) II Examines public policy issues in health, including recent developments in health policy and planning at the national, state and local levels, and their impact on administrative behavior. P, 522 (Identical with PLNG 523)

524. Management of Long Term Care Facilities and Programs (3) I For description of course topics, see 424. Graduate-level students will be required to produce more papers for the class at administrative level. May be conve ned with 424.

525. Comparative Management in Health Administration (3) I Assists students in applying general management principles to particular types of health agencies. Models of organizational behavior are used to develop a paradigm for comparative analysis. P, 522

526. Health Economics (3) I Applies microeconomic theory, industrial organization and public finance to efficiency and equity problems in the acute and chronic health-care sectors. Explores solutions to these problems. P, 522, ECON 500, or permission of instructor. (Identical with ECON 526)

527. Aging and Public Policy (3) II For description of course topics, see 427. Graduate-level students will be required to produce more papers for the class at higher level. (Identical with GERO 527 and PLNG 527) May be conve ned with 427.

528. Topics in Public and Nonprofit Financial Management (3) II Advanced issues in public-sector financial management. P, 506 or FIN 511 (Identical with FIN 528)

530. International Management (3) (Identical with MAP 535) May be conve ned with 435

540. Theories of Crime and Public Policy (3) II Theories of crime applied to public policy issues. The relationship between scientific analysis of crime and formation of public policy. (Identical with LAW 540 and SOC 540)

541. Deviance and Social Control (3) (Identical with SOC 541)

547. Law of the Elderly (2) II (Identical with GERO 557) May be conve ned with 457.

557. Government and Economic Well-being (3) I (Identical with POL 473) May be conve ned with 473.

596. Colloquium
i. Management and Policy for Ecological Sustainability (3) [Rpt.] II (Identical with POL 596i, which is home)

Range Management
(See Renewable Natural Resources)

Public Health (PHL)
Arizona Health Sciences Center, Room 1115
(520) 626-3200
Arizona Graduate Program in Public Health
Executive Committee:
Cheryl Ritenbaugh, Director
Professors James E. Dalen (Internal Medicine), Sandra Ferketch (Nursing), Bill Johnson (Health Administration and Policy, ASU), Ron Pust (Family and Community Medicine), Ted Tong (Pharmacy Practice and Pharmacology and Toxicology), Ronald Vogel (Public Administration and Policy and Economics), Anthony Vuturo (Family and Community Medicine)
Associate Professors Patricia Moore (Nursing, ASU), John Sciacca (Health, Physical Education, Exercise Science and Nutrition, NAU), Douglas Taren (Family and Community Medicine)
Assistant Professor Scott Leischow (Family and Community Medicine)

The Master of Public Health is an interdisciplinary professional degree in public health. Public health graduates apply scientific, behavioral and technical knowledge to prevent disease, disability and premature death and to promote community health through organized community effort. Students who enter the program choose one of 10 concentration areas of study: community health, community health nursing, environmental and occupational health, epidemiology, generalist track, health administration and policy, health education and health promotion, international health and public health nutrition.

The MPH degree requires a minimum of 33 units including a minimum of 3 units for internship. However, individual requirements vary by concentration area, student backgrounds and career goals. Each student must submit a final technical report of the internship experience. Potential students are advised to contact the AzGPPH office to obtain specific information for a specific concentration area.

All students will take five core courses, required concentration courses, internship and elective courses. The core courses are: Social and Behavioral Aspects of Public Health (PHL/FCM 577); Basic Principles of Epidemiology (PHL/FCM 596R); Biostatistics (PHL/FCM 576); Health Administration and Policy (PHL/FCM 574); Environmental and Occupational Health (PHL/FCM 575).

Please see the Graduate Catalog for admission requirements.

500. Research (2-16) [Rpt./2] (Identical with FCM 500)

502. Organization Theory and Behavioral Relations (3) I (Identical with MAP 502)

511. Advanced Pharmaceutical Care Systems (3) I (Identical with PHSC 511)

512. Advanced Pharmacy Management (3) II (Identical with PHPR 512)

527. Psychology of Sport and Exercise (3) I (Identical with EXSS 527)

530. Methods in Nursing Research (3) II (Identical with NURS 530)
548. Perspectives in Geriatrics (2) II (Identical with PHSC 548)

554. Industrial Toxicology and Chemical Exposures (2-4) I (Identical with OSH 554)

570. Issues and Trends in Public Health (3) I II S (Identical with FCM 570)

571. International Comparison of Health Care Systems (3) I II S (Identical with FCM 571)

572. Population Dynamics and Family Planning (3) I II S (Identical with FCM 572)

573. Health Issues of Women and Children (3) I II S (Identical with FCM 573)

574. Health Administration and Policy (3) I II S (Identical with FCM 574)

575. Environmental and Occupational Health (3) I II S (Identical with FCM 575)

576. Biostatistics in Public Health (3) I II S (Identical with FCM 576)

577. Social and Behavioral Basis of Public Health (3) I II S (Identical with FCM 577)

578. Public Health Nutrition (3) II (Identical with FCM 578)

587. Poverty and Health (3) II (Identical with PHSC 587)

589. Clinical Pharmacotherapy of Mental Disorders (2) I (Identical with PHSC 589)

593. Internship

a. Public Health (1-12) [Rpt./12 units] (Identical with FCM 593a)

596. Seminar

a. Basic Principles of Epidemiology (3) [Rpt./1] (Identical with EPI 596a)

b. Occupational Disease (1-2) [Rpt./4 units] II (Identical with FCM 596a)

c. Prevention and Control of Disease (1-2) [Rpt./4 units] I Consult department before enrolling. (Identical with FCM 596b)

d. Practice of Community-Oriented Medicine in Rural Areas (2) II (Identical with FCM 596c)

59. Seminar

a. International Nutrition (2-3) II (Identical with FCM 596a)

b. Managed Health Care (3) [Rpt.] I (Identical with FCM 596b)

c. Tropical Disease Problems (2) (Identical with FCM 596d)

98. Seminar

a. Principles and Practice of Home Health (2) I II Consult department before enrolling. (Identical with FCM 896e)

98. Seminar

s. Diet and Disease Prevention (2) (Identical with FCM 896f)

*Available as both 596 and 896.

### Religious Studies (RELI)

Modern Languages Building, Room 371
(520) 621-7416; FAX: (520) 621-3678

**Committee on Religious Studies**

Professors Norman Austin (Classics), Richard Cosgrove (History), Richard Eaton (History), Robert Gimello (East Asian Studies), Associate Professor Robert A. Burns (Religious Studies), Chair

Assistant Professors Elizabeth Harrison (East Asian Studies), Janet Jakobsen (Women's Studies), J. Edward Wright (Judaic Studies)

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) (Identical with NES 140)

142. Chinese Humanities (3) (Identical with CHN 142)

144. Japanese Humanities (3) II (Identical with JPN 144)

220. Japanese Religion (3) 1995-96 (Identical with JPN 220)

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 W S 225)

233. Philosophy of Religion (3) I (Identical with PHIL 233)

245. Existential Problems (3) (Identical with PHIL 245)

271. The History of Christianity (3) S (Identical with HIST 271)

273. Introduction to Judaism (3) I (Identical with JU S 273)

300. Christian Literature and Thought (3) II Development of Christian thought from the New Testament through the Protestant Reformation. 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)

301. Catholic Thought in the 20th Century (3) II Development of Roman Catholic thought beginning with the neo-Thomistic revival under Pope Leo XIII and stressing the documents and theology of the Second Vatican Council.

302. 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.

303. Greek and Roman Religion (3) I II S 1993-94 (Identical with CLAS 305)

306. The Transformation of a Society: Christianity in the Greco-Roman World (3) I 1995-96 (Identical with CLAS 306)

307. Spirituality in the Arts (3) I (Identical with HUM 307)

320a-320b. Literature of the Bible (3-3) (Identical with ENGL 320a-320b)

322. Sociology of Religion (3) I II (Identical with SOC 322)

324. Women and Religion in the U.S. (3) 1996-97 Considers the place of women in multi-cultural U.S. society by placing them in historical perspective with regard to religious communities. Pursues historical encounters between women and their religions. (Identical with WS 324)

326. Religion and Sexuality (3) 1995-96 Places questions of religion and sexuality in historical perspective as well as investigating the import which issues of sexuality continue to have for religion and society.

331. Taoist Traditions of China (3) I (Identical with CHN 331)

333. Buddhist Meditation Traditions (3) I (Identical with EAS 333)
Remote Sensing (REM)

845 N. Park Ave. Tucson, AZ 85719
(520) 621-7896; FAX: (520) 621-3816

Graduate Interdisciplinary Program in Remote Sensing

Committee:

Professors Victor R. Baker (Geosciences), Robert E. Dickinson (Atmospheric Sciences), Lloyd W. Gay (Renewable Natural Resources), Benjamin M. Herman (Atmospheric Sciences), Donald E. Myers (Mathematics), John W. Olsen (Anthropology), John A. Reagan (Electrical and Computer Engineering), Richard W. Reeves (Geography and Regional Development), William J. Shuttleworth (Hydrology and Water Resources), Philip N. Slater (Optical Sciences), Soroosh Sorooshian (Hydrology and Water Resources), Spencer R. Titley (Geosciences)

Associate Professors Charles F. Hutchinson (Arid Lands Resource Sciences), Chair, Charles E. Glass (Mining and Geological Engineering), Alfredo R. Huete (Soil and Water Science), Stuart E. Marsh (Arid Lands Resource Sciences), Robert A. Schowengerdt (Electronic and Computer Engineering, Arid Lands Resource Sciences), Robert B. Singer (Lunar and Planetary Laboratory, Geosciences)

Assistant Professors Kurtis J. Thome (Optical Sciences)

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 1995-96 A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science. (Identical with ATM 490, G EN 490, GEOS 490, HWR 490, MNE 490, OPT 490, RNR 490, SW 490) May be convened with 490.

590. Remote Sensing for the Study of Planet Earth (3) II 1995-96 For a description of course topics, see 490. Graduate-level requirements include an additional term paper. (Identical with AR L 590, ATM 590, G EN 590, GEOS 590, HWR 590, MNE 590, OPT 590, RNR 590, SW 590) May be convened with 490.

696. Seminar


Renewable Natural Resources

(RNR/L AR/RA MWS MW/FSC)

Biological Sciences East, Room 325
(520) 621-7255; FAX: (520) 621-8801

Professors C. P. Patrick Reid, Director, Hanna J. Cortner, Terry C. Daniel (Psychology), Peter F. Follitt, Martin M. Fogel (Emeritus), Lloyd W. Gay, Robert L. Gilbertson (Plant Pathology), Martha W. Gilliland (Civil Engineering and Engineering Mechanics), Frank Gregg (Emeritus), William L. Halverson, William H. Havens, Richard H. Hawkins, Malcolm K. Hughes (Tree-Ring Laboratory), Robert R. Humphrey (Emeritus), Warren D. Jones (Emeritus), David A. King, James O. Klemmedson (Emeritus), Philip N. Knorr (Emeritus), Paul R. Krausman, Donald V. Lightner (Veterinary Science), R. Wil-
Graduate admission and degree requirements, consult the Graduate Catalog.

Renewable Natural Resources (RNR)

105. Survey of Landscape Architecture (2) I Survey of the profession of landscape architecture.

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) S Field trips. Offered only through the Horizons Unlimited Summer Program.

b. Computer Applications in the Natural Sciences (1) S Open to participants in the Horizons Unlimited Summer Program. P. basic computer experience.

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.

201. Natural Resources — Plant Identification (3) I Plant classification, identification and nomenclature, with emphasis on the grass, rose, legume, composite, pine, and other plant families containing important forest and range plants. Use of dichotomous keys and recognition of representative species will be utilized to develop plant identification skills. 1R, 6L.

271. Natural Resources — Computer Applications (3) I Application of microcomputer software for management of renewable natural resources. Includes spreadsheets, data base management systems, and statistical programs with emphasis on the introduction to geographic information systems and their applications. 2R, 3L. Open to majors only. P, STAT 160 or 263, prior computer experience.

316. Natural Resources — Ecology (4) I Principles of plant, animal, and community ecology important to the understanding and management of renewable natural resources. Field trips. P, ECOL 182, RNR 202; CR, SW 200, 201.

321. Natural Resources — Measurements (3) I 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) I (Identical with AREC 375)

384. Natural Resources — Management Practices (4) I 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, wildlife 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 1996-97 (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 GEG 417 and SW 417) May be convened with 517.


422. Photointerpretation (2) I Reading and interpretation of aerial photographs; natural resource inventory from aerial photographs; remote sensing techniques. 1R, 3L. May be convened with 522.


438. Fire Ecology (3) I 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. Environmental Law and Economics (3) I (Identical with AREC 476)

478. Global Change (3) I (Identical with GEOS 478) May be convened with 578.

480. Natural Resources — Policy and Administration (3) I Resource policy formation; ethics of resource use; administration and organization for resource management; analysis of present policy and trends. P, 200. May be convened with 580. Writing-Emphasis Course*.

481. Environmental Policy (3) I (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.
506. Conservation Biology (3) II 1996-97
(Identical with ECOL 506) May be convened with 406.

517. Introduction to Geographic Information Systems (3) I For a description of course topics, see 417. Graduate-level requirements include a thorough bibliographic review and a scholarly paper on a current application of geographic information systems in the student’s major field. P, basic knowledge of computer operations. (Identical with GEOG 517 and S W 517) May be convened with 417.

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.

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.

527. Artificial Intelligence in Resource Management (3) I 1995-96 Use of artifical 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 1996-97 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) I 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)
576. Advanced Natural Resource Economics (3) II (Identical with AREC 576)
578. Global Change (3) II (Identical with GEOS 578) May be convened with 478.
580. Natural Resources - Policy and Administration (3) II For a description of course topics, see 480. Graduate-level requirements include an in-depth policy analysis paper. May be convened with 480.
581. Environmental Policy (3) II (Identical with POL 581) May be convened with 481.
586a-586b. Natural Resources - 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. 589a 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 (Identical with ECOL 595) May be convened with 495.
596. Seminar (Identical with ECOL 596) May be convened with 496.

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 697a will be awarded only upon completion of 697b.

Landscape Architecture (L AR)
The curriculum leading to the Bachelor of Landscape Architecture will be phased out by summer 1998. Students currently enrolled in the professional phase of the program shall have completed the following required courses: CHEM 101a, 102a; ECOL 130; ENGL 101, 102 or 103H, 104H; L AR 101, 103, 104, 201, 202; MATH 117R/S, 118; PL S 100; RNR 200, 201, 271, 312; SW 200, 201.
In addition, the following courses are required as part of the professional program in landscape architecture: ARH 118, 207 or ARCH 324, 334; COMM 100, 102; ECON 201a; ENGL 308; GEOG 103b; L AR 301, 302, 332, 335, 401, 402, 404, 438, 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.
Students should check with the program chair for the scheduled elimination of courses as the program is phased out.
302. Urban Landscape Design (4) II Landscape architectural design problems in urban environments. 1R, 85. P, 301.
332. Introduction to Computer-Aided Design for Landscape Architecture (3) II CDT 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. 1R, 45. P, RNR 271.
335. Plant Materials (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 (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 (1) II 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, 3S, P, 401.

407. The American Landscape (3) II (Identical with GEOG 407) May be convened with 507.

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 the contemporary and postmodern 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) I Professional services, contract documents, contract administration, office organization, ethics, professional registration, roles of the landscape architect, the practice of landscape architecture. 2R, 6L, P, 402. May be convened with 560. Writing Emphasis Course.*

474. Field Methods in Environmental Psychology (3) II (Identical with PSYC 474) May be convened with 574.

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 497), which is home) May be convened with 597.

*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. 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.

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) I 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) II 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.

550. Landscape Ecology (3) II Principles and theories of spatial ecology presented in the context of land management problems in Southern Arizona. Practical application of productivity theory emphasized. Field trips. 2R, 3L.

551. Site Engineering (4) I For a description of course topics, see 451. Graduate-level requirements include additional readings and exercises in techniques and applications relative to site engineering. Field trips. 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 453. Graduate-level requirements include a topical research paper on an irrigation design subject. May be convened with 453.

560. Professional Practice (3) 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.

574. Field Methods in Environmental Psychology (3) II (Identical with PSYC 574) May be convened with 474.

582. Professional Practice Studio (5) II For a description of course topics, see 482. Graduate-level requirements include a 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 g. Professional Leadership (1) [Rpt./4 units] II

597. Workshop i. Community Design for Non-Designers (3) I (Identical with ARCH 597), which is home) May be convened with 497.

694. Practicum a. Landscape Architecture Teaching (1-2) I II

696. Seminar a. Landscape Architecture (1) [Rpt.] II

**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 105H, 104H; 307 or 308; COMM 100, 102; ECON 201a; AREC 375; MCB 181; ECOL 182; 260 or PL S 360; CHEM 103a-103b, 104a-104b; STAT 160 or 163; S W 200, 201; AN S 330; 477 or 474; RNR 200, 201, 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: RNR 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 163. Required courses in the minor total 15 units and are RNR 384; RNR 202 or RA M 382; RA M 436, 446, and 456. An additional requirement of five credits of upper-division courses should be selected in consultation with an advisor in the faculty of range management.


436. Grazing Ecology and Management (3) I Application of animal diet and nutrition, grazing behavior, and vegetation-soil-herbivore interactions in management of grazing animals for improved livestock production, wildlife habitat, watershed protection, forest reproduction or other land use objectives. Includes design of water developments, fences and other structural range improvements. May be convened with 536.

446. Range Vegetation Improvement (3) I Rangeland habitat manipulation through vegetation control and establishment including mechanical, chemical, and burning treatments. Revegetation techniques for range land and drastically disturbed semiarid lands. 2R, 3L. P, MCB 181, ECOL 182, S W 200. May be convened with 546.

456. Rangeland Inventory and Monitoring (3) I Techniques of mapping and measuring attributes of vegetation and soils for inventory and monitoring of rangelands. Interpretation of data with respect to range condition and trend, watershed protection, value for livestock and wildlife habitat. P, RNR 202, 321. May be convened with 556. Writing-Emphasis Course.*

487. Rangeland Management Plan (2) II Conduct a field inventory, develop management alternatives, and provide environmental and economic analyses of alternative management proposals in a written plan. 6L. All-day field trips. P, 456. May be convened with 587. Writing-Emphasis Course*

*Writing-Emphasis Courses. P, satisfaction of the upper-division writing- proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

436. Grazing Ecology and Management (3) I For a description of course topics, see 436. Graduate-level requirements include additional required readings and research papers on selected topic. May be convened with 436.

546. Range Vegetation Improvement (3) I For a description of course topics, see 446. Graduate-level requirements include a research paper on an aspect of rangeland improvements. P, MCB 181, ECOL 182, S W 200. May be convened with 446.

556. Rangeland Inventory and Monitoring (3) I For a description of course topics, see 456. Graduate-level requirements include additional assigned readings and discussion periods. P, RNR 202, 321. May be convened with 456.


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.


696. Seminar a. Rangeland Management (1) [Rpt.] II Watershed Management (WS M) 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 use and protection of forests and 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 curriculum in natural resources, students majoring in watershed management must complete: CHEM 103a-103b, 104a-104b; ECON 201a; ENGL 101, 102 or 103H, 104H; 307 or 308; MCB 181; ECOL 182; GEOS 101, 103; MATH 125a-125b, 1260; PHYS 102a-102b; RNR 200, 202, 271, 316, 321, 384, 480, 486a-486b; S W 200, 201; COMM 100, 102; ABE 406; AREC 375; ATMO 171; ENGR 170; 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 including S W 200, 201; RNR 200, 321, 384. The remaining units may be selected from WS M 408, 410, 460 and 462 in consultation with a watershed faculty advisor.

330. Introduction to Remote Sensing (3) I (Identical with GEOG 330)

408. Wildland Fire Management (3) I Principles of fire behavior in forest, range and other vegetation types; interrelationships of fuels, weather, and topography; pyrolysis and combustion processes; effects of fire; fuels inventory; prevention, detection, and control techniques; fire danger rating and fire behavior modeling. May be convened with 508.

410. Silviculture (3) II Principles and technical procedures for reproducing and growing stands of woody plants for a variety of uses; ecologically-based forest management. Weekend field trips. P, RNR 316. May be convened with 510.

435. Water Management in Dryland Ecosystems (3) I 1996-97 Hydrol microscopic principles as applied to arid and semiarid ecosystems with water management applications in dryland resources management. For non-major courses. P, STAT 160 or 263; S W 201. May be convened with 535.

460. Watershed Hydrology (4) I Application of fundamental principles to quantifying the basic hydrologic processes occurring on watersheds. P, GEOS 101, S W 200, 201; STAT 160 or 263. 3R, 3L. (Identical with HWR 460) May be convened with 560.


462. Watershed Management (4) II Evaluating hydrologic impacts of management activities on watersheds to include silviculture, range, mining, and recreation use. 3R, 3L, P, 460 or one course in hydrology. May be convened with 562.

463. Plant-Water Relations (3) I (Identical with PL S 463) May be convened with 563.

464. Introduction to Dendrochronology (4) I (Identical with GEOS 464) May be convened with 564.

467. 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, 460. May be convened with 567.

468. Wildland Water Quality (3) I Introduction to water quality and its influences in natural environments. Interactions with land management and relationships to the larger issues of environmental quality. Field trips. May be convened with 568.

497c) Dendrochronology (2) 3L. May be convened with 597c. (Identical with GEOS 497c)

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 area. May be convened with 408.

510. Silviculture (3) II For a description of course topics, see 410. Graduate-level requirements include additional exams. Weekend field trips. P, RNR 316. May be convened with 410.

531. Dryland Forest Management (3) II 1996-97 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 1995-96 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 1996-97 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 1996-97 For a description of course topics, see 435. Graduate-level requirements include a report and oral presentation on a topic related to hydrology or water management in dryland ecosystems. For non-majors only. (Identical with AR L 535) May be convened with 435.

560. Watershed Hydrology (4) 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. 3R, 3L. P, GEO 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 (4) II For a description of course topics, see 462. Graduate-level requirements include the development of a watershed management scenario and accompanying report. 3R, 3L. P, 460 or one course in hydrology. 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.

567. 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.

568. 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)
  f. Dendrochronology: Biological Applications (3) [Rpt./2] I II (Identical with GEOS 595f)
  g. Dendrochronology: Chronometric Applications (3) [Rpt./2] I II (Identical with GEOS 595g)

597. Workshop
  c. Dendrochronology (2) 3L. May be convened with 497c. (Identical with GEOS 597c)


605. Watershed Modeling (3) I Distributed modeling of hydrological and sedimentation processes at the watershed scale; emphasis on current concepts and applications. P, 560 and computer programming.

696. Seminar
  a. Watershed Management (1-2) [Rpt.] I II

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 non-governmental 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 163; RA M 382; RNR 200, 202, 271, 316, 321, 384, 480, 486a-486b; WS M 410; WFS 444, 446, 448, 455R. The wildlife ecology option also requires: V SC 400a or 400b; two courses from WFS 483, 484, 485. The fisheries science option also requires: CHEM 241b, 243b; WS M 468; WFS 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 163, MCB 181; ECOL 182, and S W 200, 201. Required courses in the minor are RNR 200, 202, 216, 271, 316, 321, 384, 480, 486a-486b; WS M 410; WFS 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)

330. Principles of Nutrition (3) II (Identical with AN S 330)

405. Aquatic Entomology (3) II 1996-97 (Identical with ENTO 405) May be convened with 505.

441. Limnology (4) I Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters. P, 6L. Weekend 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 in study and utilization of 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; censuses, productivity, diagnosis, and control of avian populations. 3R, 3L and field work. Weekend field trips. P, RNR 384. May be convened with 546.

448. Current Problems in Wildlife Ecology (1) [Rpt.] I Discussions and assignments covering current problems, including the biological, economic, aesthetic, political, and sociological phases of wildlife management. P, 444 or 446.

449. Diseases of Wildlife (3) II (Identical with V SC 449) May be convened with 549.

455R. Fishery Management (3) II Methods and concepts pertaining to fishery investigations and management; application of principles for enhancement of fisheries and aquatic habitats. P, 441 or 444. May be convened with 555R. Writing-Emphasis Course.*

459L. Fishery Management Laboratory (1) I Field and laboratory methods pertaining to fishery investigations and management. P, 455R, 482. May be convened with 555L.


475. Freshwater Algae (4) II 1995-96 (Identical with ECOL 475) May be convened with 575.

482. Ichthyology (4) I 1995-96 (Identical with ECOL 482) May be convened with 582.

483. Herpetology (4) II (Identical with ECOL 483) May be convened with 583.

484. Ornithology (4) II (Identical with ECOL 484) May be convened with 584.

485. Mammalogy (4) I (Identical with ECOL 485) May be convened with 585.
583. Ichthyology (4) I (Identical with ECOL 582) May be convened with 485.
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.

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).

505. Aquatic Entomology (3) II 1996-97 (Identical with ENTO 505) May be convened with 405.

541. Limnology (4) I For a description of course topics, see 441. Graduate-level requirements include a report that synthesizes literature on an area of study, and an oral presentation. Weekend field trips. P, 6 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 445R. Graduate-level requirements include a report on a current issue in management and a report on a research issue, plus several discussion meetings. Weekend field trips. P, 441 or 444. May be convened with 445R.

555L. Fishery Management Laboratory (1) II For a description of course topics, see 445L. 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 445L.

556. Aquaculture (3) II 1995-96 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.

575. Freshwater Algae (4) I 1995-96 (Identical with ECOL 575) May be convened with 475.


582. Ichthyology (4) I 1995-96 (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.


649. Fishery-Water Quality and Toxicology (3) I Pertinent water quality parameters essential for fish life, and the effects of various substances and their interactions on fish and aquatic organisms. 2R, 3L. P, 441 or 455R; CHEM 241a. (Identical with V SC 649)

695. Colloquium a. Advanced Issues in Fisheries and Wildlife Science (2) [Rpt.].

696. Seminar (1-3)

Russian and Slavic Languages (RUSS)

Modern Languages Building, Room 340 (520) 621-7341; FAX: (520) 621-7341

Professors George Gutsche, Head, John Garrard, Joe Malik, Jr. (Emeritus)
Associate Professors Alexander Dunkel, Grace Fielder, Margaret Gibson (Emeritus), Delbert Phillips, Boris Roberts (Emeritus)
Assistant Professors Galina De Roeck, Teresa Polowy
Lecturer Roza Simkhovich

The Department of Russian and Slavic Languages provides instruction designed to develop competence in the Russian language, awareness of cultural traditions, and an understanding of literature and the arts. All Russian conversation courses are oriented toward developing proficiency skills as determined by nationally recognized proficiency guidelines. The basic training received by Russian majors prepares them for government service, international business careers, teaching, graduate study, and research. The Study Abroad Programs in Russia provide an opportunity for Russian language study in St. Petersburg and Moscow. In addition, the Study Abroad Programs in Russia offer an intensive business Russian program with internships in Russian and foreign firms that do business in Moscow. Information regarding these semester and summer programs may be obtained in the Russian department, Modern Languages 340.

The degrees available are Bachelor of Arts and Master of Arts with a major in Russian. Students in the College of Education may earn a Bachelor of Arts in Education with a teaching major in Russian. The Master of Arts with a major in teaching and teacher education provides an option for 15 hours of study in Russian. For graduate admission and degree requirements, consult the Graduate Catalog.

The major: 28 units beyond 200-level courses including 301a-301b, 305a-305b, 307a-307b, 310 (Writing-Emphasis course) and 9 units from 405a-405b and 407a-407b. No more than 3-6 units of independent study can apply to the major. It is recommended that students contemplate graduate study in Russian take 330, 340, 350, Russian Literature in Translation, and/or 250a-250b, Russian Humanities in Translation. The major assumes general knowledge of mathematics. Students may choose MATH 122 or a more advanced course to complete their mathematics requirement. No more than 6 units of independent study can apply to the major.

The supporting minor: 20 units selected from university-wide disciplines with the assistance and approval of the major advisor.

The Russian minor:
Concentration in Grammar/Reading: 201a-201b, 301a-301b, 305a-305b.

Concentration in Reading/Conversation: 201a-201b, 207a-207b, 305a-305b, 307a.

310 is highly recommended for either concentration.

The teaching major: 22 units beyond the 200-level courses including 301a-301b, 305a-305b, 307a-307b, 407a-407b. 310 is highly recommended.

The teaching minor: 10 units beyond the 200-level courses including 301a-301b, 307a-307b.

The department participates in the honors program. Prospective honors students must consult with the department advisor.

101a-101b. Elementary Russian (4-4) Both 101a and 101b are offered each semester. (The first year of work offered in a foreign language shall not be counted toward a minor.)

120. Russia Today (3) I II Introduction to contemporary Russian society.

201a-201b. Intermediate Russian (4-4) P, 101b.

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.


250a-250b. Russian Humanities in Translation (3-3) 250a: I II The Search for Identity: Russia's cultural heritage—literature, art, music, architecture, religious tradition—from the earliest beginnings through the 19th century. 250b: I II The Quest 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.


292. Business Russian Level I (3) An introduction to modern written and spoken Russian with an emphasis on business terminology.

293. Internship  
a. Business Internship Level I (3)

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.


309. Reading Russian Newspapers (2) I II Reading Russian newspapers in order to develop comprehension of the written word and to build vocabulary.

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).

316. Russian Phonetics and Intonation (1) I II Practice in Russian language with emphasis on phonetics and intonation of spoken Russian.

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 from the 19th century.

350. Twentieth Century Russian Literature (3) Readings and discussion in English of representative Russian literary works from the 20th century.

396H. Honors Proseminar (3) I


405a-405b. Survey of Russian Literature (3-3) Historical survey of Russian literature from the earliest times to the Soviet period; designed to acquaint students with literary terminology and facilitate comprehension of lectures in Russian. P, 301b or 305b. May be convened with 505a-505b.

406. Survey of Russian Literature (2) I II An overview of Russian literature with readings from selected authors; discussion in Russian.


408. Conversation and Composition (5) I II Development of oral communication skills through various conversational tasks of writing skill through composition.

492. Business Level Russian II (3) Modern written and spoken Russian with an emphasis on business terminology and grammatical structures commonly found in commercial documents. Intermediate level.

493. Internship  
a. Business Internship Level II (3) P, two years of college level Russian or equivalent.

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.

505a-505b. Survey of Russian Literature (3-3) For a description of course topics, see 405a-405b. Graduate-level requirements include additional assignments. May be convened with 405a-405b.

507a-507b. Advanced Russian Conversation (3-3) Emphasis is on political, economic and business Russian. (ACTFL), P, 407b.

510. Theory and Methods (3) I II Provides broad theoretical, critical and bibliographical 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 (5) [Rpt./6 units] I (Identical with GER 585) May be convened with 485.

587. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)


686. Russian Drama (3) Examination of the major dramatic works of nineteenth- and twentieth-century Russian playwrights. P, 405b.

692. Business Russian Graduate Level (3) Modern written and spoken Russian with an emphasis on business terminology and grammatical structures commonly found in commercial documents. Advanced level. P, four years of college level Russian or equivalent.

693. Internship  
a. Business Internship Graduate Level (3) P, four years of college level Russian or equivalent.

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)

Modern Languages, Room 340  
(520) 621-7341; FAX: (520) 621-7341

Committee on Russian and Soviet Studies

Professors George Gutsche, Acting Director, Robert Browder (Emeritus, History), Richard Reeves (Geography and Regional Development), William Welsh (Political Science), Allen Whitling (Political Science)

Associate Professors Alexander Dunkel (Russian and Slavic Languages), Frederick Kellogg (History), John Olsen (Anthropology), Grace Fielder (Russian and Slavic Languages), 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 Eastern Europe, Russia and other states of 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, 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.

The major assumes general knowledge of mathematics. Students may choose MATH 122 or a more advanced course to complete their mathematics requirement.

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 the following departments: Geography and Regional Development, History, 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 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)

374. The Holocaust (3) II (Identical with HIST 374)

409. 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 Revolutions (3) (Identical with HIST 424)

425. History of the Soviet Union (3) I (Identical with HIST 425)

443. Soviet and Post-Soviet Politics (3) I (Identical with POL 443)

451. Soviet and Post-Soviet Foreign Policy (3) I (Identical with POL 451)

496. Seminar
   a. Russian and Soviet Studies I (3) P, RUSS 301b. (Identical with POL 496)
   b. Russian and Soviet Studies II (3) P, 496a.

543. Soviet and Post-Soviet Politics (3) I (Identical with POL 443)

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**Second Language Acquisition and Teaching (SLAT)**

Modern Languages Building Room 347
(520) 621-7391; FAX: (520) 621-7391

Graduate Interdisciplinary Program in Second Language Acquisition and Teaching

Committee:

Professors Renate A. Schulz (German Studies), Chair, Robert Ariew (French and Italian), 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), D. Terence Langendoen (Linguistics), Adrienne Lehrer (Linguistics), Judy Nichols Mitchell (Language, Reading and Culture), Manuel T. Pacheco (President), Susan Phillips (Anthropology), Frank Pialorsi (English), Hamdi Qafsheh (Near Eastern Studies), Muriel Saville-Troike (English), Rudolph C. Troike (English)

Associate Professors H. Douglas Adams (English), Shirin Antia (Special Education and Rehabilitation), Donna M. Johnson (English), Luis C. Moll (Language, Reading and Culture), Richard Ruiz (Language, Reading and Culture), Karen L. Smith (Spanish and Portuguese), Linda Swisher (Speech and Hearing Sciences), Mary Wildner-Bassett (German Studies), William J. Wilson (Near Eastern Studies), Ofelia Zepeda (Linguistics)

Assistant Professors Andrew Bars (Linguistics), Eloise Jelinek (Linguistics), Kimberly A. Jones (East Asian Studies), Simin Karimi (Near Eastern Studies), Feng-Hsi Liu (East Asian Studies), Teresa L. McCarty (Language, Reading and Culture), Cecile M. McKee (Linguistics), Janet Lee Nicol (Linguistics), Sini Prosper Sanou (French and Italian), Robert N. Smed (Spanish and Portuguese), Samuel J. Supalla (Special Education and Rehabilitation), Octaviana Trujillo (Language, Reading and Culture), Cynthia White (Classics), MaryAnn Willie (Linguistics), 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 and teaching. The cooperating departments include Anthropology; Classics; East Asian Studies; Educational Psychology; English; French and Italian; German Studies; 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 acquisition (theory and research), (2) second language acquisition (theory and research), (3) second language processes and learning (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.

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**Sociology (SOC)**

Social Sciences Building, Room 400
(520) 621-3533; FAX: (520) 621-9875


Associate Professors James T. Borhek (Emeritus), Courtney B. Cleland (Emeritus), Patricia L. MacCorquodale, Jerry L.L. Miller (Emeritus), Calvin K. Morrill, Kathleen S. Schwartzman, James W. Shockey

Assistant Professors Sun-Ki Chai, Susan Gonzalez Baker (Public Administration and Policy), Elisabeth S. Clemens, Hector Delgado, Donald S. Grant, Alfonso Morales, Michael Polakowski (Public Administration and Policy), James Ranger-Moore, Marc Schneiber

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, 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.

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. Most of these services are available through the department's Office of Undergraduate Services located in Social Sciences, Room 437. The office is open five days a week and administers a wide range of programs for undergraduate majors. These programs include: (1) a comprehensive advising system designed to aid students in choosing a major, planning a course of study and in designing and pursuing a post-graduate career plan; (2) an internship program designed to give eligible majors course credit for work experience in a variety of community agencies; (3) a Majors Club designed to better integrate our majors into the intellectual and social life of the department. More information on these and other services can be obtained by visiting the office or by reading the rel-
eral interests, academic plans and the suitability of the major for their intellectual and career development. Appointments with faculty advisors should be scheduled through the Office of Undergraduate Studies.

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 upper-division.

The teaching minor: 21 units, including 101 and 300.

The department participates in the honors program.

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 experiences 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.

195. Colloquium
   a. The University as Sociology (1) I

195H. Honors Colloquium (2) I

201. American Social Problems (3) I II An examination of current theoretical, perspectives and research on social problems.

241. Criminal Justice Administration (3) I II (Identical with PA 241)

251. Sociology of Education (3) I II Educational system as the basis of a 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, 274.

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-
zations and their relations to the individual and society.

434. Kinship and Social Organization (3) II (Identical with ANTH 434)

436. Social Structure and The Self (3) Relation between the person and the group; social factors in character formation.

441. Women and Youth in the Justice System (3) II (Identical with PA 441) Open to sociology majors.

442. Crime and Public Policy (3) I (Identical with PA 442) Open to sociology majors.

444. Group-Process Methods in Management (3) II (Identical with MAP 444) Open to sociology majors.

450. Social Equality (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) II (Identical with F 547)

459. Sociology of Gender (3) II Social construction, variation and consequences of gender categories across time and space. Topical (decision-making, deviance) and institutional (family, religion, politics) approaches. (Identical with W 549)

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) Theory and research on the modern world-system.

508. Sociology of Culture (3) Theory and research on the nature of cultural systems, cultural production and consumption, and strategies of interpretive analysis. P, consult department before enrolling.

509. Objects and Methods of Cultural Analysis (3) From content analysis to statistical analysis, means of gathering and analyzing data on cultural objects.

510. Political Sociology (3) Basic approaches in political sociology, with emphasis on the relationship of economic and political processes.

511. Rational Choice Sociology (3) Survey of the rapidly growing literature that applies the basic principles of rational choice theory to classic sociological problems such as the emergence of effective norms, the causes of marriage and divorce, the attainment of group solidarity, the causes of collective action, and the effects of institutions on social order.

514. The State and Social Policy (3) Examination of the historical development of the state, processes of policy formation, and the political economy of modern welfare and regulatory regimes.

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) II (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. adaptation, evolutionary dynamics.

525. Organization Theory (3) Basic review of classic and contemporary approaches to the study of complex organizations; formation, development, and internal processes.

527. Social Networks (3) The logic and methods of social network analysis. Emphasis on theoretical underpinnings and applications to sociological research.

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.

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 what we perceive and react emotionally to the social world. Topics include social attribution, stereotyping, attitude-behavior relations, social accounts, emotion culture and emotion 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)

542. Criminology (3) A comprehensive review of classic and contemporary approaches to crime, its nature, causes and consequences.

543. White Collar and Organizational Crime (3) I (Identical with MAP 543)

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.

552. 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 interface 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 WS 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)

577. Experimental Methods (3) The logic, design and analysis of experiments in social science research. Topics include the relation of experimentation to theory, experimental design, and practical issues. P, 575 or consult department before enrolling.

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
   a. Introduction to Graduate Study (1)
and water. This focus is primarily on pollution relating to land and water. It includes hazardous waste, landfills, surface and groundwater, and processes in the vadose zone. 2) Environmental microbiology This focus primarily addresses the remediation of contaminated sites, using microbiological methods. 3) Environmental engineering science This focus is a hybrid of science and engineering, developed cooperatively with the Department of Chemical and Environmental Engineering. Remaining courses may be taken as electives. A total of 130 credits are needed for graduation.

A major in soil and water science must satisfy the general education requirements of the College of Agriculture and must complete the following courses: CHEM 103a-103b, 104a-104b, 241a or 322, 323, PHYS 102a, 180a, MCB 181, MATH 101 or 110, and MATH 123. The University Writing-Emphasis Course requirement can be met by completion of SW 411, 426, 450, 461 or 470. A major with a focus in soil and water science emphasizes the physical, biological, and chemical interactions in the soil environment. Course requirements are SW 200, 201, 325, 411, 431 and two of the following: SW 450, 453, 470. HWR 250, SW 105, 201, 325, 411, 431 and two of the following courses are required: SW 200, 201, 316, 317, 431, ABE 250 or 404, SW 411, 470.

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, focusing on soil-plant-nutrient-water relationships or soil science, is available to students from other disciplines. Requirements include SW 200, 201 and three of the following: 316 and 317, 411, 425, 431 and 470. In addition, students must take six units (at least three upper-division units) of geosciences, hydrology, irrigation or soil and water science. For the B.S. degree in Agriculture with a major in microbiology, the MIC crosslisted courses in this department satisfy the 13-unit College of Agriculture requirement.

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/Matthias

106. Environmental Science Laboratory: Land, Water and Air (1) I II Laboratory exercises and field trip experiences to study environmental problems related to land, water, and air resources. Basic physical, chemical and biological principles that relate to understanding environmental problems will be stressed. Field trips. P. algebra and high school chemistry recommended. Matthiess

Sociology—Soil and Water Science 341

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

201. Soils Laboratory (1) I II CDT Laboratory exercises for 200. P, CR. 200. Post/Bohn

Water and Its Uses (3) I GRD Identical with ABE 250

305. Pollution Science (3) I Introduction to abiotic and biotic scientific processes within the soil/water/air/atmosphere continuum that affect the fate and transport of pollutants. Evaluation of the extent, fate, mitigation and impact of environmental pollution. P. CHEM 241a, MIC 205, MATH 125a, PHYS 102. Pepper/Gerba

316. Soil Fertility and Plant Nutrition (3) I Chemical and biological properties of soil as they affect soil nutrient availability and crop production. Principles of plant nutrition and nutrient acquisition will also be discussed. Additional topics are fertilizers and fertilization, irrigation water quality, soil salinity, environmental impacts of fertilizers, and principles of soil and plant tissue testing. P. 200. Thompson

317. Soil Fertility and Plant Nutrition Laboratory (1) I II Practical discussion and application of the principles of soil fertility and plant nutrition. Laboratory and greenhouse exercises involve soil and plant tissue testing and fertilizer response experiments. P. field trip. P, CR. 316. Thompson

325. General Microbiology and Microbial Physiology (3) I Microbial cell structure and function; physiology and metabolism; growth; characterization of major microbial groups. P, CR. CHEM 241a. (Identical with MIC 325, VSC 325) Sinclair

330. 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 water, soil and crop management under arid and semi-arid conditions, the use of diagnostic procedures for evaluating soils and waters, reclamation, and economics of irrigation project development. 2R. 3L. Field trips. P, 200. May be convened with 501. SoilTooth/Watson

404. Irrigation Principles and Management (3) I II 1995-96 GRD (Identical with ABE 404) May be convened with 504.

405. Environmental and Soil Analysis (3) I Principles and methods of chemical analysis of soils, water and biological materials emphasizing properties of agricultural and environmental significance. 1R, 6L. P, CHEM 322,
43. Remote Sensing of the Environment (3) II Remote sensing techniques and applications for improved natural resource utilization 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 PHYS 102b. May be convened with 553. Huete

461. Soil and Water Conservation (3) II 1995-96 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 production and environmental problems related to land degradation by erosion. 2R, 3L. Field trips, P, 200. May be convened with 561. Post

464. Environmental Chemistry (3) II Physical and chemical processes influencing the behavior of contaminants in the subsurface environment. Includes equilibrium and kinetic theory of solubilization-dissolution, volatilization, sorption, hydrolysis, photolysis, surface catalysis and radioactive decay. P, CHEM 103b, 480a, PHYS 110. May be convened with 564. Brusseau

466. Soil and Groundwater Restoration (3) II 1995-96 Methods for remediation contaminated soil and groundwater; factors influencing efficacy of remediation systems. Emphasis on scientific basis of restoration. May be convened with 566. Brusseau

470. Soil Physics (3) II CDT Soil structure and physical constitution of soils; the physical properties of soil-water systems, movement and exchange of gases in the soil, and physical laws governing the movement and availability of soil water. 2R, 3L. P, 200, PHYS 102b, CR, MATH 125a. May be convened with 570. Warrick

475. Freshwater Algae (4) II 1995-96 (Identical with ECOL 475)


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. Silvertooth/Watson

504. Irrigation Principles and Management (3) II 1995-96 GRD (Identical with ABE 504) May be convened with 404.

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 322, 323, PHYS 102b, 180b. May be convened with 405. Hendricks/Artiola

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. 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 1995-96 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, PHYS 102b. Matthias


526. Environmental Microbiology Laboratory (2) I For a description of course topics, see 426. Graduate-level requirements include additional assignments. P, 525 (Identical with MBIM 526) May be convened with 426.

530. Environmental Monitoring (2) I For a description of course topics, see 430. Graduate-level requirements include preparation of a term project. 1R, 3L. P, HWR 450 or 517 or SW 511 or equivalent. May be convened with 430. Artiola/Brusseau/Matthias

531. Soil Morphology, Classification and Interpretations (3) I 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 1995-96 For a description of course topics, see 440. Graduate-level requirements include a short oral presentation about a refereed 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 1996-97 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

544. Applied Environmental Law (3) II For a description of course topics, see 444. Graduate-level requirements include extra term papers and case studies. May be convened with 444.

546. Environmental Biotechnology (2) II 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) Pepper/Kerba

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. Field trips, P, 330 or PFYS 102b. May be convened with 453. Huete

561. Soil and Water Conservation (3) II 1995-96 For a description of course topics, see 461. Graduate-level requirements include an

564. Environmental Chemistry (3) II For a description of course topics, see 464. Graduate-level requirements include an in-depth research project. May be conve ned with 464. Brusseau

565. Contaminant Transport in Porous Media (3) II 1996-97 The transport of contaminants in the subsurface environment. Effects of dispersion, interphase mass transfer, transformation reactions, and porous-media heterogeneity on transport; covers aqueous (dissolved) and multiphase (immiscible liquid-gas) systems. P, 570 or HWR 518 or 531. Brusseau

566. Soil and Groundwater Restoration (3) II 1995-96 For a description of course topics, see 466. Graduate-level requirements include a research paper. May be conve ned with 466. Brusseau

570. Soil Physics (3) II CDTF For a description of course topics, see 470. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic. P, 200, PHYS 102b, CR, MATH 125a. May be conve ned with 470. Warrick

573. Monitoring Biosphere Processes (2) I II 1996-97 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. Huete

590. Remote Sensing for the Study of Planet Earth (3) II 1995-96 (Identical with REM 590) May be conve ned with 490.

602. Soil-Plant Relationships (3) I Principles of soil solution and colloid chemistry, soil-plant 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

603. Soil-Water Dynamics (3) II 1996-97 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 HWR 605) Warrick

694. Practicum

696. Seminar
a. Topics in Soil, Water and Environmental Science (1) [Rpt.4] I II

Southwest Studies

1052 North Highland Avenue
(520) 621-2484; FAX: (520) 621-9922

The Southwest Center

Director Joseph C. Wilder

Southwest Studies are designed to bring new perspectives to regional subjects through an interdisciplinary approach. Courses on the Southwest are taught through many university departments and programs, including American Indian Studies, anthropology, English, geography, history, Latin American studies, linguistics, Mexican American studies, political science, sociology, Spanish and Portuguese, and women's studies. For information, contact the Southwest Center.

Spanish and Portuguese

(SPAN/PORT)

Modern Languages Building, Room 545 (520) 621-3123; FAX: (520) 621-6104

Professors A. Dolores Brown (Emerita), Jack Emory Davis (Emeritus), John J. Gilabert, Lanin A. Gyurko, Richard P. Kinkade, Miguel Méndez, Judith Nantell, Dana A. Nelson, José Promis, Eliana S. Rivero, Charles M. Tatum

Associate Professors Gilbert E. Evans (Emeritus), Karl C. Gregg, Karen L. Smith, H. Reynolds Stone (Emeritus), Amy R. Williamsen

Assistant Professors María José Barbosa, June Jaramillo, Mary Zampini Lecturers Adalberto Guerrero (Emeritus), M. Nieve Pereira Parsons, Ana Perches

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 Fortaleza, Brazil. 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 a Master of Arts with a major in teaching and teacher education; and the Doctor of Philosophy with a major in Spanish. For further information regarding the graduate programs, please consult the Graduate Catalog.

The Spanish for Native Speakers Program consists of a series of courses designed for the student who learned Spanish from early childhood at home or with relatives (as opposed to a second language or foreign language in school). The SNS program emphasizes writing, grammar, speaking skills and cultural awareness. The SNS courses follow the same requirements for the major and minor in Spanish with equivalences as follows: 203=202; 253=251; 323=325; 333=330 and 343=340. Completion of 203 alone fulfills the University's second language requirement. For more information, contact the Spanish for Native Speaker coordinator.

The major in Spanish for the B.A. shall consist of 36 upper-division units, consisting of two qualifying courses of 3 units each, 323/325 and 330/333, 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.

The major assumes general knowledge of mathematics. Students should complete MATH 122 or any more advanced mathematics course.

All Spanish majors will complete 350 and either 340/343 or 452 as part of the program.

In the language and literature concentration all students will complete one of the three possible survey courses: 400, 401 or 403 and another Mexican/Mexican-American literature course. The Senior Thesis in Literature (496a) is an optional course 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 either 340/343 or 452.

Language and linguistics concentration students will complete 340/343, 425 or 450, 452, 453, 457 and one of the culture and civilization courses (430, 431 or 433), as well as the Seminar in Linguistics (459), which will vary with the faculty member teaching the course. This course is designed to be a culminating synthesis of the coursework in linguistics and to train the student in research methods and materials. The complementary literature component shall consist of 350 and one semester of any of the surveys listed above.

The major in Portuguese for the B.A. shall consist of 30 units, beginning with 206 or higher.

The Interdisciplinary Major in Spanish shall consist of at least 24 units, of which 12 shall be upper-division, and shall include 201, 202/203, 251/252, 323/325, 330/333, 340/343 and 350.
The teaching major for the B.A. in Education: 24 units in upper-division coursework: 323/325, 330/333, 340/343, 350, 425 or 450, one semester of the literature surveys (400, 401 or 403), one of the cultural surveys (430, 431 or 433) and either 457 or 473.

The minor in Spanish shall consist of no less than 20 units of work beyond the 102 level, and must include at least 9 units of upper-division coursework, chose from 323/325, 340/343 and 350.

The teaching minor for the B.A. in Education shall be the same as the general minor in 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 fall and the spring semesters to all incoming freshmen and the summer to incoming freshmen and 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 undergraduate 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 grammar or language-skill 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 either 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. Writing and Oral Skills for the Native Speaker of Spanish (4) Designed for students who learned most of their Spanish in a home environment. Introduces students to written Spanish. (Students receiving credit for 203 will not receive credit for 202, but can receive credit for 201.) This course fulfills the University's foreign language requirement.

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. 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.

251. Intermediate Spanish (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 253, but not both. P, 202.

253. Intermediate Spanish for the Native Speaker (3) I I For native speakers of Spanish who wish to continue to improve their writing, spelling, grammar and vocabulary within a dynamic cultural context. (Native speakers should take 253 instead of 251; credit is not allowed for both.)

277. Eroticism and Love in the Middle Ages (3) I II 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. Complete immersion in the study of intermediate Spanish, teaching all four skills. P, 202. Credit allowed for this course or 325, but not for both.

323. Intermediate Grammar and Writing for the Native Speaker (3) I I I For the native speaker of Spanish who has had some formal instruction of the language and who wishes to improve grammar and writing. (Native speakers should take 323 instead of 325; credit is not allowed for both.) P, 251/253.

325. Intermediate Grammar and Writing (3) I I Essential points of grammar, with emphasis on syntax and development of writing skills. P, 251.


333. Intermediate Composition and Conversation for the Native Speaker (3) I I I For the native speaker of Spanish. Students write compositions and do oral presentations on various cultural topics. (Native speakers should take 333 instead of 330; credit is not allowed for both.)


343. Phonetics for the Native Speaker (3) I II For native speakers of Spanish. Basics of Spanish phonetics and overview of phonetic variants in the major varieties of New World and Peninsular Spanish. (Native speakers should take 343 instead of 340; credit is not allowed for both.) P, 203.


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 401)

403. Mexican and Mexican-American Literature (3) Studies of major works by Mexican and Mexican-American writers. Taught in Spanish although a small portion of the readings may be in English. P, 350. (Identical with LA S 403, and MAS 403)

414. Teaching of Modern Languages (3) I (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)

425. Advanced Grammar and Composition (3) I II Advanced themes of grammar with emphasis on the syntax of verbs and the acquisition of terminology and skills to facilitate analysis. P, 325. (Identical with LA S 425)


433. Mexican and Mexican-American Civilization through Literature (3) Study of the culture, history, literature and oral tradition (corridos, legends) of the Mexican and Mexican-American. P, 330/333. (Identical with LA S 433 and MAS 433)

436. Spanish Prose Fiction (3) I II Spanish prose fiction selections from the Middle Ages through the twentieth century. Language of instruction is Spanish. P, 400.

437. Spanish Theater (3) I Spanish theater selections from the middle ages through the twentieth century. Language of instruction is Spanish. P, 400.


441. Children's Literature in Spanish (3) I II Survey of children's literature in Spanish, with special attention to the needs of American schools and libraries. P, 350. (Identical with LAS 441, and LIS 441)


444. Mexican and Mexican-American Prose Fiction (3) I II Major works by Mexican and Mexican-American novelists and short-story writers from the sixteenth to the twentieth centuries. P, 350. (Identical with LAS 444 and MAS 444)


446. Mexican and Mexican-American Theater (3) I II Major works by Mexican and Mexican-American dramatists from the Colonial period through the twentieth century P, 350. (Identical with LAS 446)

447. Contemporary Mexican Literature (3) I II Major novels of modern Mexico; their works, narrative perspective, characterization, language, time, space, and themes. P, 350. (Identical with MAS 447)


449. Topics in Spanish, Spanish-American, Mexican and Mexican-American Literature (3) [Rpt. I II Monographic, generic, work or author courses in any area of Spanish, Spanish-American, Mexican or Mexican-American literature. P, 350.

450. Conversation and Writing Skills (3) I II Study and practice in formal and informal usage of Spanish as oral communication. P, 330, 333.

451. Introduction to Hispanic Linguistics (3) I II Survey of the fields of phonology, morphology, semantics and syntax, and other related topics. (Taught in Spanish) P, 425, 450. (Identical with LING 452 and MAS 452)

452. Theory of Spanish Morphosyntax (3) Introduction to current theories of syntax to describe specific phenomena. P, 452. (Identical with LING 453)

455. Introduction to Romance Philology (3) I I Introduction to the diachronic study of the major Romance languages in their phonological and syntactic development from the Latin language. (Identical with FREN 455, ITAL 455, and PORT 455)

457. Applied Linguistics (3) I Application of linguistic theory, including psycholinguistic and sociolinguistic approaches to pedagogy. P, 452. (Identical with LING 457)

459. Hispanic Linguistics (3) [Rpt./.9 units] I II Topics include linguistic perspectives on Mexican-American Spanish and bilingualism, phonology, semantics, dialectology/sociolinguistics. Taught in Spanish. P, 452. (Identical with MAS 459)

473. Spanish for the Classroom Teacher of Spanish (3) II Practical Spanish for the elementary and secondary school subject-matter teacher who uses Spanish as the medium of instruction. P, 253/251 or 325/323 or 330/333. (Identical with MAS 473) II (Identical with GER 485) May be convened with 585.

501. Introduction to Hispanic Studies (3) I II Broad view of fields of research, faculty and courses to familiarize students with some practical aspects of graduate studies, issues that pertain to specific fields of research and questions currently being debated across the profession.

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 verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.

520. Development of Eighteenth, Nineteenth and Twentieth-Century Spanish Literature (3) Major works by Spanish and American writers. (Identical with MAS 447, 521, 522, and 523) May be taken up to four times and will rotate between the following four topics. In Spanish-American and Hispanic American literature (short fiction, poetry, novel and drama).

521. Topics in Eighteenth, Nineteenth and Twentieth-Century Spanish Literature (3) [Rpt./.3 when topic varies] Representative topics include: the development of lyric verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.

522. Development of Spanish-American Literature from the Pre-Columbian Period to Independence (3) Spanish-American literature from the Pre-Columbian period to independence (prose, poetry and drama). (Identical with LAS 520)

523. Topics in Spanish American Literature from the Pre-Columbian Period to Independence (3) [Rpt./.3 when topic varies] Representative topics include: the development of lyric verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.

540. Development of Spanish American Nineteenth and Twentieth-Century Literature (3) Spanish American and contemporary Hispanic American literature (short fiction, poetry, novel and drama). (Identical with LING 540)

541. Topics in Spanish American Nineteenth and Twentieth Century Literature (3) [Rpt./.3 when topic varies] Representative topics include: the development of lyric verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.

542. Development of Eighteenth, Nineteenth and Twentieth-Century Spanish Literature (3) Spanish American and contemporary Hispanic American literature (short fiction, poetry, novel and drama). (Identical with LAS 530)


551. Topics in Mexican and Mexican-American Literature (3) [Rpt./.3 when topic varies] Representative topics include: the development of lyric verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.

552. Development of Eighteenth, Nineteenth and Twentieth-Century Spanish Literature (3) Major works by Spanish and American writers. (Identical with MAS 447, 521, 522, and 523) May be taken up to four times and will rotate between the following four topics. In Spanish-American and Hispanic American literature (short fiction, poetry, novel and drama).

574. Linguistic Perspectives on Mexican-American Spanish and Bilingualism (3) I II For a description of course topics, see 474. Graduate-level courses in the field of Spanish-American and contemporary Hispanic American literature (short fiction, poetry, novel and drama).

575. Topics in Literary Theory and Criticism (3) I II [Rpt./.3 when topic varies] Representative topics include: the development of lyric verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.

580. Introduction to Hispanic Linguistics (3) May be taken up to four times and will rotate between the following four topics. In Spanish-American and Hispanic American literature (short fiction, poetry, novel and drama).

581. Topics in Second Language Theories and Applications (3) May be taken up to four times and will rotate between the following four topics. In Spanish-American and Hispanic American literature (short fiction, poetry, novel and drama).

582. Development of Spanish American Nineteenth and Twentieth-Century Literature (3) Spanish American and contemporary Hispanic American literature (short fiction, poetry, novel and drama). (Identical with LING 540)

583. Topics in Spanish American Literature from the Pre-Columbian Period to Independence (3) Spanish-American literature from the Pre-Columbian period to independence (prose, poetry and drama). (Identical with LAS 530)

584. Development of Spanish-American Literature from the Pre-Columbian Period to Independence (3) [Rpt./.3 when topic varies] Representative topics include: the development of lyric verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.

585. Topics in Spanish American Literature from the Pre-Columbian Period to Independence (3) [Rpt./.3 when topic varies] Representative topics include: the development of lyric verse; Mester de Clerecia, art of the Jugar; the Romancer; the development of prose; renaissance and baroque prose or verse; Cervantes; Golden Age drama; picaresque novel.
functions teaching based on patterns of use as well as similarities and contrasts with English (Spring 1997).

582. Topics in Hispanic Linguistic Theories and Applications (3) May be taken up to four times and will rotate between the following four topics. Morphological Theory: Theoretical perspectives on the major morphosyntactic and morphophonological issues of Spanish Morphology (Fall 1995); Linguistic Perspectives on Mexican American Spanish and Analyses of (sociolinguistic phenomena encountered in the Spanish of the Southwest (Spring 1996); History of the Spanish Language: Diachronic and synchronic perspectives on the evolution and development of peninsular Spanish (Fall 1996); Theoretical Issues in Spanish Phonology: Further nonlinear theoretical analyses of selected problems in Spanish Phonology (Spring 1997).

587. Testing and Evaluation in Foreign/Second Language Programs (3) (Identical with GER 587)

696. 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 Communicative approach, emphasis on all language skills. Recommended for students with no previous experience with the language.

102. Second Semester Portuguese (4) GRD Communicative approach, emphasis on all language skills. P, 101 or the equivalent.

205. Intensive Portuguese (4) Equivalent of 101 and 102 combined. Communicative approach, emphasis on all language skills. Recommended for highly motivated students and/or those with experience in another Romance Language or the equivalent.

206. Intensive Portuguese (4) Communicative approach, emphasis on all language skills. Recommended for highly motivated students or those with experience in another Romance language or the equivalent. P 205 or 101 and 102.

325. Intermediate Grammar and Writing (3) 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 Portuguese-speaking world. P, 206 or the equivalent. (Identical with LA S 325)

350. Introduction to Genres and Literary Analysis (3) Introductory course in literary reading and analysis based on texts from the Portuguese-speaking countries. P, 206 or the equivalent.

397. Workshop
   a. Portuguese Language Skills and Culture (4) Offered only in Fortaleza, Brazil. P, 206 or the equivalent.

401. Luso-Brazilian Literature to 1900 (3) Overview of literary periods and introduc-

tion to the major literary figures of Portugal, Brazil and the Luso-African countries (Angola, Mozambique, Cape Verde, Guin-Bissau, Mozambique and Porto Principe) from the beginning of their literature to 1900. P, 325 or the equivalent. May be convened with 549.


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 or the equivalent.

430. Brazilian Civilization (3) Broad survey of Brazilian culture. Thematic examination of some of the major cultural developments. Topics include: Brazilian music, Afro-Brazilian culture, the role of women in Brazilian society, Brazilian popular culture. P, 325 or the equivalent. (Identical with LA S 430) May be convened with 530.

431. Civilization in the Portuguese-Speaking World (3) Cross-cultural examinations of the Portuguese-speaking world (Brazil, Portugal, Angola, Cape Verde, Mozambique, Guin-Bissau, Porto Principe). Topics include: colonization, de-colonization, religion, music, dance, painting, architecture. P, 325 or the equivalent (Identical with LAS 431) May be convened with 531.

449. Brazilian Literature in Film (3) Presentation of the masterpieces of Brazilian literature and the great films based upon them. P, 325 or the equivalent. (Identical with LA S 449) May be convened with 549.

463. Topics in Luso-Brazilian Literature (3) Major works, authors, and tendencies in the literature of the Portuguese-speaking countries (Brazil, Portugal, Angola, Cape Verde, Mozambique, Guin-Bissau, Porto Principe). P, 325. (Identical with LAS 463) May be convened with 563.

501. Luso-Brazilian Literature to 1900 (3) For a description of course topics, see 401. Graduate-level requirements include a 20-page paper and an oral presentation. P, 325 or the equivalent. May be convened with 401.

506. Luso-Brazilian Literature from 1900 to Present (3) For a description of course topics, see 406. Graduate-level requirements include a 20-page paper and an oral presentation. P, 325 or the equivalent. (Identical with LAS 506) May be convened with 406.

530. Brazilian Civilization (3) For a description of course topics, see 430. Graduate students required to write four research papers and give one lecture on a topic of his/her choice. May be convened with 430.

531. Civilization in the Portuguese-Speaking World (3) For a description of course topics, see 431. Graduate-level requirements include a twenty-page paper and an oral presentation on the paper. P, 325 or the equivalent. (Identical with LAS 531) May be convened with 431.

549. Brazilian Literature in Film (3) For a description of course topics, see 449. Graduate-level requirements include an in-depth research paper. P, 325 or the equivalent. (Identical with LA S 549) May be convened with 449.

563. Topics in Luso-Brazilian Literature (3) For a description of course topics, see 463. Graduate-level requirements include additional research and reports. (Identical with LAS 563) May be convened with 463.

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 (520) 621-7822; FAX: (520) 621-3821

Professors Amos P. Sales, Head, Candace S. Bos, James C. Chalfant, Bob G. Johnson (Emeritus), Jeanne McRae McCarthy, Inez Tucker (Emerita)

Associate Professors Shirin D. Antia, Jane N. Erin, C. June Maker, S. Mae Smith, Samuel J. Supalla, John Umbreit, Assistant Professors Todd Fletcher, James E. Organist

Lecturers Thomas L. Fisher, Aldine von Isser

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's research, teaching, and service address current issues in special education, rehabilitation, and sign language studies. The department offers professional preparation of special education 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 and Career Services within the College of Education for more specific information. Non-teaching minors in Special Education and Rehabilitation are offered to those majoring outside the College of Education (See College of Education section, "Undergraduate Minors"). The department participates in the honors program.

The department also offers programs leading to the Master of Arts, Educational Specialist, Doctor of Education, and Doc-
tor 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) I II Designed for students with no previous knowledge of ASL and/or deaf, respectively. To develop basic 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 informal diagnosis and remediation 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. P, 400, 460, 575. Open to students in dual certification program in TTE.

402. Behavior Principles and Disability (3) I II Use of behavior principles to positively support individuals with disabilities, especially those with moderate and severe disabilities. 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 CL: 94-140 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 base 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) I II 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.

423a. Tactile Communication (3) Fundamentals of Braille reading and writing, methods of teaching Braille and preparation of materials. May be convened with 523a.

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.

432a. Tactile Communication (3) Fundamentals of Braille reading and writing, methods of teaching Braille and preparation of materials. May be convened with 532a.

435. Introduction to Emotional or Behavioral Disorders (3) I II 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 535.

438. Transition Methods (3) I II Practical experiences with individuals having special needs with focus on psychological, educational and service-related implications and practices Field trips, class observations and seminars. P, 400, 530.

478. Prevention of Addictions (3) I III 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, 411, 481 or CR.

484. Problems of Drug Abuse (3) I III 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 a. Teaching Exceptional Children (1-10) I II P, 400, field work, student teaching in area of emphasis.
projects. May be convened with 401a.

501a. Assessment and Instruction for Students with Learning Problems (3) I II For a description of course topics, see 402. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 402.

502. Behavior Principles and Disability (3) I II For a description of course topics, see 402. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 402.

503. The Special Services in the Schools (3) I I 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 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 or permission of department; CR, 593.

510. Introduction to Mental Retardation and Severe Disabilities (3) I For a description of course topics, see 410. Graduate-level requirements include in-depth paper(s) on aspects of current issues in the field. May be convened with 410.


513. Educating Students with Mental Retardation and Severe Disabilities (3) II Methods of developing age-appropriate, functional and inclusive programming, community-based instruction, and integrative source delivery for students who have moderate to profound retardation and other physical, sensory and behavior disorders.

514. Physical and Multiple Disabilities (3) I 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) I 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) 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) I For a description of course topics, see 423a. Graduate-level requirements include in-depth paper(s) on aspects of current issues and class presentations. May be convened with 423a.

524. Methods of Teaching the Visually Handicapped (3) I II Curriculum development and adaptation in various educational pro-grams; adaptation of classroom materials and procedures for use with blind and partially sighted children and youth; emphasis on methods of teaching academic and nonacademic skills and on educating students with nondisabled peers. P, CR, 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.

526. Principles and Assessment of O & M (3) I In-depth study of the principles supporting orientation and mobility instruction; assessment principles and strategies specific to O & M. P, 522a, 520 or equivalent from other universities.

527. Advanced O & M Practice and Procedures (4) I Prepares orientation and mobility (O & M) specialists in methods, techniques and approaches using the long cane and other mobility devices essential in the development of travel skills of persons with visual impairments. 2R, 8L. P, 522a, 520 or equivalent from other universities.

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.

532. Oral/Aural Development and Assessment: Deaf and Hard of Hearing (3) I For a description of course topics, see 432a. Graduate-level requirements include an in-depth research paper on a course-related topic and a class presentation. May be convened with 432a.

533a-533b. Special Topics in Deaf Studies (3-3-3-3) I II 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. 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.


539a-539b-539c. Special Topics in Sign Language Studies (3-3-3) I II 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) II Mastery of skills involved in
developing abstract thinking abilities in gifted children by using the Hilda Taba 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 Treffinger 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 and Aging (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, 575.

563. Client Assessment in Rehabilitation (3) II Exploration of the work 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. Open to majors only.

565. Principles of Rehabilitation (3) I Principles underlying rehabilitation programs and interdisciplinary relationships of agencies engaged in rehabilitation services. Open to majors only.

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.

573. Observation and Participation in Special Education Programs (1-3) [Rpt./6 units] I 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. Open to majors only.

581. Psychosocial and Cultural Aspects of Disability (3) I Exploration of the psychological, sociological and cultural aspects of disability; analysis of somatopsychology, psychosomatics, and social psychology.

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 Theories and Practices in Rehabilitation Settings (3) I Professional counseling counseling practices with varied ethnic, age disability, and dependency populations. 3R, IL. 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, case management and 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, 674a.

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. Open to majors only.


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) II Special sections in each concentration to be arranged in the department office.


595. Colloquium 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) I I e. Bilingual Special Education (2) I f. Emotional or Behavioral Disorders (3) I Open to majors only.

g. Orientation and Mobility (3) II P, 520, 522a, 522b, 526.

599. Workshop a. Creativity and Giftedness (3) [Rpt./9 units] b. Jeanne's Johnson - Revised (1) GRD S Open to majors only.

c. Consultation and Collaboration for Special Needs Students (2) II d. Best Practices for Educating Students with Severe Disabilities (2) [Rpt./2 units] e. Attention Deficit Disorders (1) S f. Counseling Mexican Americans (3) I S (Identical with FS 597m)

695. Colloquium a. Issues, Trends, and Futures in Special Education: Doctoral Think Tank (3) II b. Emotional or Behavioral Disorders (3) II c. Rehabilitation Psychology (3) [Rpt./9 units] II d. Learning Disabilities (3) I e. Sensory Impaired (3) I f. Issues and Research in Educating the Gifted (3) [Rpt./9 units] II g. Rehabilitation Administration (3) II
Speech and Hearing Sciences

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, 350, 367, 370, 371, 451, 483 and 496a.

In addition to the general education requirements for the B.S. degree as described in 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. Coursework in human anatomy and physiology with a laboratory are required. Required courses include EXSS 201 and 202, or their equivalent. 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.

370. Adult Communication Disorders (3) I The study of adult disordered communicative processes. Consideration is given to signs and symptoms, etiology, clinical course, and vocational-social impact of these disorders. Principles of assessment and intervention are highlighted. Open to majors only. P, 260, 280.

371. Pediatric Communication Disorders (3) II The study of child disordered communicative processes. Consideration is given to signs and symptoms, etiology, clinical course, and developmental-academic-social impact. Principles of assessment and intervention are highlighted. Open to majors only. P, 260, 280.

441. Language Acquisition (3) II Principles and processes of first language acquisition described in relation to children's social and cognitive development; first language acquisition processes compared and contrasted to child and adult second language acquisition and language disorders. P, 280. (Identical with LING 441 and PSYC 441) May be convened with 541.

458. Clinical Studies: Speech-Language Pathology (1-3) (Rpt./9 units) I II S Under supervision, students carry out prescribed intervention programs and conduct evaluation of children and adults. Students participate in weekly staffings and clinical problem solving. Open to majors only. P, 451, 471 or CR. May be convened with 558.

459. Clinical Studies: Audiology (1-3) (Rpt./9 units) I II S Under supervision, students assess hearing impairments, formulate objectives, and carry out remedial programs with emphasis on the application of research data and current technology to clinical treatment. Open to majors only. P, 483 or CR. May be convened with 559.

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.

460L. Speech and Hearing Science Instrumentation Laboratory (1) I P, CR, 460R. May be convened with 560L.

468. Speech Perception (3) II General overview of the field of speech perception. Topics include: role of contextual factors in the processing of speech, developmental issues in speech perception, perception of foreign language speech sounds, the recognition of speech by computers and animals, implications for hearing-impaired populations and models of speech perception. P, 260. (Identical with LING 468 and PSYC 468) May be convened with 568.

471R. Articulation Disorders and Therapies (2) I S Etiology, diagnosis, prognosis, and therapy for the articulatory aspects of communication problems. P, 350, 371; 367, senior status advised. May be convened with 571R.

471L. Laboratory in Articulation Disorders (1) S 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, 280, 483. May be convened with 584.

486. Child Audiology (3) II Study of the development and disorders of the auditory system; audiometric evaluation and differential diagnosis in infants and children; psychological, auditory, and educational aspects of the habilitation of aurally handicapped children. P, 280, 483. May be convened with 586.

496. Seminar

a. Clinical Observation and Analysis (1) I II P, 370, 371, 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. An Introduction to Quantitative Methods and Research in Speech and Hearing Sciences (2) II 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 CBA 502) -

510. Counseling Techniques in Communication Disorders (3) II Introduction to counseling the communication handicapped and their families.

541. Language Acquisition (3) II For a description of course topics, see 451. Graduate-level requirements include a scholarly paper/project on a selected topic relevant to the course. (Identical with LING 541, PSYC 541) May be convened with 441.

552. Language Disorders in School Age Children (3) II S The nature and treatment of...
language disorders in children from grades K-12; relationships between language and learning disorders; assessment and treatment strategies. P, 551.

553. Developmental Language Impairments (3) I Topics include: language and nonlanguage characteristics and clinical management of children with developmental language impairment, acquired aphasia, bilingualism and auditory disorders.

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.


558. Clinical Studies: Speech-Language Pathology (1-3) [Rpt. /9 units] I II S For a description of course topics, see 458. Graduate-level requirements include clinical progress or evaluation reports. Open to majors only. P, 598 or CR. May be convened with 458.

559. Clinical Studies: Audiology (1-3) [Rpt. /9 units] I II S For a description of course topics, see 459. Graduate-level requirements include clinical progress or evaluation reports. Open to majors only. P, 589 or CR. May be convened with 459.

560. Speech and Hearing Science Instrumentation (2) I For a description of course topics, see 460R. Graduate-level requirements include a project on a selected topic. P, 260, 280 or CR. May be convened with 460R.

560L. Speech and Hearing Science Instrumentation Laboratory (1) P, CR, 560R. May be convened with 460L.

562. Psychophysical Acoustics (3) II Experimental procedures and instrumentation; study of psychoacoustics; stimulus integration, pitch and loudness limen and scales, masking, and auditory fatigue; binaural hearing; theory of signal detection. P, 280, 460.

563. Microcomputer Applications (2) II Basic understanding of microcomputer operations and its multiple functions; emphasis on computer literacy, administrative/clinical applications and hands-on instruction.

567. Experimental Phonetics: Physiology (3) I Systematic examination of current experimentation and research in speech, sound motor behavior, with emphasis on physiological investigations of normal respiration, phonation, resonance, and articulation; critical evaluation of research design. P, 260. (Identical with PSYC 567)

568. Speech Perception (3) II For a description of course topics see 468. Graduate-level requirements include more extensive reading. P, 260. (Identical with LING 568 and PSYC 568) May be convened with 468.

570R. Evaluation Process (2) I Study of principles, methods and selected procedures involved in the assessment of individuals with communication disorders; attention to skills in interviewing and preparation of reports. P, 370, 371, 483; CR or subsequent registration in 570L (for majors).

570L. Laboratory in Evaluation Process (1) I II Open to majors only. P, 570R or CR.

571R. Articulation Disorders and Therapies (2) I S For a description of course topics, see 471R. Graduate-level requirements include a scholarly paper and/or project on a selected topic. P, 350; 371; 367; CR or subsequent registration in 571L (for majors). May be convened with 471R.

571L. Laboratory in Articulation Disorders (1) I S Graduate-level requirements include a scholarly paper and/or project on a selected topic. Open to majors only. P, 571R or CR. May be convened with 471L.


574. Cleft Palate, Other Craniofacial Disorders, and Communication (2) II Communication disorders associated with cleft palate and other craniofacial defects. Speech assessment, evaluation and treatment; survey of dental and surgical services. P, 471R/L or 571R/L.


576. Communicative Aspects of Aging (1) I Hearing, speech, voice, and language changes in the elderly caused by aging and disease. Emphasis on management of these problems. (Identical with GER0 576)


580. Community and Industrial Audiology (2) I Hearing conservation in industry, schools, and the community; auditory and non-auditory effects of noise, noise assessment, control, and protective procedures.


583. Principles of Audiology (3) I II For a description of course topics, see 483. Graduate-level requirements include a scholarly paper/project on a selected topic relevant to the course. P, 280 or graduate standing. May be convened with 483.

584. Audiologic Rehabilitation: Adults (3) II For a description of course topics, see 484. Graduate-level requirements include a scholarly paper and/or project on a selected topic. P, 280, 483. May be convened with 484.


586. Child Audiology (3) II For a description of course topics, see 486. Graduate-level requirements include a scholarly paper and/or project on a selected topic. P, 280, 483. May be convened with 486.


595. Colloquium a. Current Problems in Speech and Hearing Sciences (1) [Rpt./5 units] I II

596. Seminar a. Experimental Phonetics (1-3) [Rpt./2 or 9 units] I II

b. Clinical Audiology (1-3) [Rpt./2 or 9 units] I II

c. Hearing—Physiology and Psychology (3) [Rpt./2 or 9 units] I II
d. Language and Language Disorders (1-3) [Rpt./2 or 9 units] I II
e. Speech Pathology (1-3) [Rpt./2 or 9 units] I II

600. Research Methods in Communication Sciences and Disorders (3) I II Design and execution of descriptive and experimental research in communication sciences and disorders.


659. Advanced Clinical Studies: Audiology (1-3) [Rpt./9 units] I II S With faculty consultation and supervision, students assume responsibility for all aspects of case management of adults and children. Exposure to clinical research methods and interdisciplinary staffings. Open to majors only. P, 589 or CR.

663. Digital Processing of Speech Signals (3) I II Basic knowledge of digital signal processing for students in biological sciences. Topics include spectral analysis, fast Fourier transform, linear prediction coding, and digital filtering. P, 260.

665R. Aerodynamic Evaluation and Management of the Speech Mechanism (2) I Principles and clinical methods of aerodynamics...
namic evaluation and management of the disordered speech mechanism, with practical experience provided through case studies and class experiments. P. 260, 460R/L, 567.


693. Colloquium
a. Motor Control (2) [Rpt./8 units] II (Identical with EXSS 695A)

696. Seminar
a. Experimental Phonetics (1-3) [Rpt./9 units] II
b. Clinical Audiology (1-3) [Rpt./9 units] II
c. Hearing — Physiology and Psychophysics (1-3) [Rpt./9 units] II
d. Language and Language Disorders (1-3) [Rpt./9 units] II
e. Speech Pathology (1-3) [Rpt./9 units] II

Statistics (STAT)

Economics Building, Room 200
(520) 621-4158; FAX: (520) 621-1225

Professors Yasashwini Mittal, Head, Dan Bailey ( binnenus), Jean E. Weber
Associate Professor A. Larry Wright

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 II 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 nonparametric tests if time permits. Not applicable to the math major. P, MATH 117R/S.

163. Beginning Statistics in Bioscience (3) I II Basic concepts of probability and statistics. Descriptive statistics commonly used in biological and medical sciences such as mean, standard deviation, odds ratio and risk. Interpretation of statistical plots and charts. Basic idea of estimation, regression and hypothesis testing. Emphasis on statistical concepts and interpretations of tests. 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 nonparametric statistics, with special emphasis on analysis of biological and clinical data. P, MATH 119, 123.

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 convened with 564.


566b. Applied Stochastic Processes (3) II (Identical with MATH 468) May be convened with 568.


564. Theory of Probability (3) I II Statistical concepts and methods applied to research in other scientific disciplines. Principles of estimation and hypothesis testing for standard one and two-sample procedures. Correlation, linear regression, contingency tables and analysis of variance. Not open to majors. P, college algebra (Identical with GENET 509 and TOX 509)


566b. Applied Stochastic Processes (3) II (Identical with MATH 468) May be convened with 568.


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 Jacobians, 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, queuing 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 convened with 464.

566a-566b. Theory of Statistics (3-3) 566a: I For a description of course topics, see 466a. Graduate-level requirements include more extensive problem sets or advanced projects. P, 464. (Identical with MATH 566a) May be convened with 466a. 566b: II Hypothesis testing. Type I and type II errors, Neyman-Pearson theory, uniformly most powerful unbiased and invariant tests. Likelihood ratio tests. Confidence intervals. Sequential analysis, non-parametric and robust methods. Theoretical foundation of statistical inference. P, 566a.

568. Applied Stochastic Processes (3) I II (Identical with MATH 568) May be convened with 468.

572. Categorical Data Analysis (3) I Two-way contingency tables, logistic, probit, log-log regression. Loglinear models. Model selection
395. Colloquium
   a. Statistics (1) [Rpt. /3 units] I II Open to majors only

396. Seminar
   a. Research Methods (1-4) [Rpt. /6 units] I II

397. Workshop
   a. Data Analysis (1) [Rpt. /3 units] I II

641. Statistical Consulting (3) I II A course for statistics graduate students providing experience in statistical consulting. Client and statistician relationships, communication skills, computing and graphical analysis resources, approaches to problems with measurement error and missing data. Consulting practice with clients. Research problems under faculty supervision. 1R, 6L. P: advanced standing in the masters program.

660. Linear Models (3) I Multivariate normal distribution, distribution of quadratic forms. Generalized inverses. Theory of estimation and hypothesis tests for full rank linear models and less than full rank models applied to regression models. Analysis of variance models, variance component and mixed models and unbalanced data models. Theoretical foundation course for linear model analysis techniques. P, 566a, linear algebra, e.g. MATH 413.


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 and cost measures, 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, evaluations of economic alternatives, cost control, capital budgeting, managerial cost accounting, deterministic inventory theory and decision-making under uncertainty. 3ES, P, ENGR 102, MATH 125b. (Identical with ENGR 265)

270. Computer Methods for Engineering (3) I II S Application of numerical methods and computer programming techniques to the solution of numerical problems of engineering systems. 1.5ES, P, ENGR 170, MATH 125b and PHYS 110.

305. Introduction to Engineering Probability and Statistics (3) I II S Axioms of probability, discrete and continuous distributions, sampling distributions. Engineering applications of statistical estimation, hypothesis testing, confidence intervals. P, MATH 125b.


330R. Engineering Experiment Design (3) III Design and analysis of observational and factorial experiments employing numerical and graphical methods. Topics include control charts, probability plots, multiple regression analysis, confidence and prediction intervals and significance tests. 1.5ES, 1.5ED. P, 305, CR 330L.

330L. Engineering Experiment Design Lab (1) I II Application of statistical software to analyze observational and planned experiments using multiple linear regression, control charts and other data summarization methods. 0.5ES, 0.5ED. P, 305, CR 330R.

340. Deterministic Operations Research (3) I Linear programming models, solution techniques, sensitivity analysis and duality. 3ES, P, SIE 270; and SIE 265 or ECON 210.

350. Deterministic Systems (3) II Modeling and analysis of design of linear deterministic systems in both the time and frequency domains. Input/output differential equations, Laplace transforms and state space methods. Attention will be given to modeling physical and engineering systems and computer simulations. 3ES, P, ECE 207, MATH 254.

370. Design of Computer Systems (4) I II Boolean algebra, combinational and sequential logic circuits, finite 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. 3ES, 3ED. P, ENGR 102, ECE 207.

377. Software for Engineers (3) I Programming in C. Modular program design and verification, pointers and structures, data structures and algorithms including: lists, trees, graphs, searching and sorting. Credit is allowed for this course or C SC 342, but not for both. 1.5ES, 1.5ED. P, 170.

383. Integrated Manufacturing Systems (3) II Introduction to the integrated manufacturing enterprise and automation. Topics include, discrete and continuous design, process planning, computer numerical control machining, machine vision, application of robots and automation. 2R, 2ES, 1ED. P, 260, MSE 331.

406. Quality Engineering (3) II Methods for quality planning, improvement and control with applications in manufacturing and service, emphasizing both on-line and off-line methods. Topics include modern quality philosophies and methods, control charts, process capability studies, loss functions and acceptance sampling. 3ES, 1ED. P, 330R, 330L.

Swahili
(See Critical Languages Program)

Swedish
(See Critical Languages Program)
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. 1.5ES, 1.5ED. May be convened with 508.


411. Human Interaction with Computers and Software (4) II The interaction of technical requirements with the characteristics of computer users and programmers as they affect the design of software, and the physical and cognitive interfaces between people and computers. 1ES, 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.


440. Survey of Optimization Methods (3) III Survey of methods including network flows, integer programming, nonlinear programming, and dynamic programming. Model development and solution algorithms are covered. 3ES, P. 340. May be convened with 540.

442. System Design Projects (3) I II Practical application of engineering knowledge by student teams to actual system design problems in industry or business. Development of report writing and oral presentation skills. 3ED. P. 431. Writing-Emphasis Course. P. satisfaction of the upper-division writing-proficiency requirement (see "Writing-Emphasis Courses" in the Academic Policies and Graduation Requirements section of this catalog).

453. Deterministic Control Systems (3) I The analysis and synthesis of deterministic linear control systems, with emphasis on design using both frequency-domain and state-variable approaches. 1.5ES, 1.5ED. P. 350.

462. Production Systems Analysis (3) I Production systems, quantitative methods for forecasting, process modeling, inventory control, materials requirement planning, production scheduling, manpower planning and facility design. 3ES, P. 340.

463. Facilities and Production Systems Design (3) I Case studies emphasizing aspects of production systems design such as facility location, facility layout, group technology, product and process design, material handling, and automated assembly. The student will be required to work in groups. Solutions will be presented using both written and oral reports. 3ED. CR, 462.

464. Facilities Layout and Location (3) I Definition and modeling solutions 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. 2ES, 1ED. P. 321, 340. May be convened with 564.

473. Concepts in Information and Communication Systems (3) I Modeling and analysis of information and communication systems/networks for applications in telecommunication, computer 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. Decision Support 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 a decision support system using commercially available expert system shells. Students will use many tools to test and validate their systems. 1ES, 2ED, P. familiarity with computers. May be convened with 574.

475. Computational Methods for Games, Decisions, and Artificial Intelligence (3) I II An introduction to automata, computer representation and optimal solution of games and decision problems. Principles of heuristic programming and machine learning. A programming project is to be selected from areas such as game strategies, graphics, recreational mathematics, and manufacturing simulation. Microcomputer experience is emphasized. 1.5ES, 1.5ED. May be convened with 575.


485. Robotics and Automation (3) I Methods of design and operation of general purpose and industrial systems. Kinematic and dynamic models of mechanical manipulators, trajectory planning, manipulator control, robotic vision and other sensing techniques. 2ES, 1ED. P. 350, or equivalent. May be convened with 585.

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, 1ED, P. 321, 340. May be convened with 586.

495. Colloquium s. Senior (1) I Open to majors only. P. senior standing.

507. Advanced Quality Engineering (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 selective 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) II For a description of course topics, see 411. Graduate-level requirements include separate examinations and a major project. May be convened with 411.

513. Environmental Risk Analysis (3) I 1996-97 (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; nonparametric, and Bayesian testing. Credit for this course or A ME 575. P. 408, 530.


521a-521b. 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 queuing phenomena; introduction to semi-Markov processes; steady-state analysis of birth-death, Markovian, and general single- and multiple-channel queuing 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. Simulation Modeling and Analysis (3) I 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 and Regression (3) II Planning and designing experiments with an emphasis on factorial layouts and response surface methodology. Also, includes analysis of experimental and observational data with multiple linear regression and analysis of variance. P, 530.

537. Advanced Experiment Design (3) I Robust product and process design through planned experiments, emphasizing the integration of loss functions, parameter design and tolerance design. P, 536.

540. Survey of Optimization Methods (3) II For a description of course topics, see 440. Graduate-level requirements include additional assigned readings and a project paper. P, 340, May be convened with 440.

541. Dynamic Programming (3) II 1995-96 Modeling of stochastic dynamic systems and the application of dynamic programming techniques to optimal decision and control problems, topics include control, optimization and flow control in queueing systems, stochastic scheduling, dynamic portfolio analysis and computational methods. 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.

546. Algorithms for Graphs and Networks (3) I Model formulation and solution of problems on graphs and networks. Topics include heuristic and optimization algorithms on shortest paths, min-cost flow, matching and traveling salesman problems. Credit is allowed for this course or MIS 546. 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 realizations; 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.

552. Analysis and Optimization of Discrete Event Dynamical Systems (3) I Introduction to Discrete Event Dynamical Systems (DEDS) and the associated modeling and analysis tools.


554. Concurrent Engineering and System Design (3) Process and tools for systems engineering of large-scale, complex systems: requirements, performance measures, concept exploration, life cycle, function decomposition, system coupling, quality function deployment, multi-objective trade-off analysis, system modeling, design for X, teamwork, project management, ISO 9000 and documentation.

558. Fuzzy Sets in Systems Analysis and Decision Making (3) Fuzzy numbers' definition, operations; fuzzy regression, interpolation and reliability, fuzzy logic, optimization and control; fuzzy events and decision-making applications in areas such as systems, civil, industrial, electrical, computer engineering and water management.


562. Advanced Production Control (3) I Qualitative models in the planning, analysis and control of production systems. Topics include aggregate planning, multi-level production systems, inventory control, capacitated and uncapacitated lot-sizing, just-in-time systems and scheduling. P, 540 or 544.

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, 540, 462. May be convened with 464.

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. Decision Support 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, Decision, and Artificial Intelligence (3) II For a description of course topics, see 475. Graduate-level requirements include a comprehensive and intensive programming project. May be convened with 475.

576. Numerical Analysis (3) I 1996-97 For a description of course topics, see 476. Graduate-level requirements include extra reading assignments and more sophisticated programming assignments. P, MATH 254, computer programming experience. 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. Robotics and Automation (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 1995-96 In-depth analysis of selected advanced topics in reliability engineering from the recent archival literature. Project required. P, 530, A ME 577.


631. Digital Systems Simulation (3) Emphasis on current research problems including random variate generation, modeling, language development and statistical analysis of output. P, 431 or MIS 521a or 521b.

640. Topics of Optimization (3) 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 1996-97 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 1995-96 Modeling and solving problems where the decisions form a discrete set. Topics include model development, branch and bound methods, cutting plane methods, relaxations, computational complexity, and solving well-structured problems. P, 544.

654. Model-Based System Design (3) II Development of the system design requirements and preliminary design/prototype, simulation, performance, cost tradeoff and system test. Defining and specifying the system and model requirements. Study of various system design tools. P, 554.

662. Topics in Scheduling and Planning (3) I 1996-97 Current topics in scheduling and planning including theory and models for machine scheduling problems, multi-echelon
inventory theory, stochastic inventory control and scheduling. P, 520,562.

685. Advanced Topics in Robotics and Automation (3) II Selected topics covering recent advances in robotics and automation, to be chosen from a list including applications, kinematics, dynamics, tactile sensing, vision and intelligent systems. P, 585.

686. Advanced Manufacturing System Modelling (3) I 1995-96 Current topics in design and analysis of manufacturing systems. Topics include serial processing lines, queueing networks and FMS. Student projects. P, 562 or 586.

695. Colloquium
a. Doctoral (1-3) [Rpt./12 units] I II Consult department before enrolling.

696. Seminar
g. Interstate Conflict Resolution (3) [Rpt.] II 1995-96 (identical with AREC 696g and HWR 696g)

Tagalog
(See Critical Languages Program)

Teaching and Teacher Education (TTE)
Education Building, Room 735
(520) 621-1602; FAX: (520) 621-7877

Professors Gary A. Griffin, Department Head, Paul M. Allen (Emeritus), R. Van Allen (Emeritus), Wilbur S. Ames, William D. Barnes (Emeritus), Milo K. Blecha (Emeritus), Edward D. Brown (Emeritus), Donald C. Clark, Walter Doyle, Joseph M. Fillerup (Emeritus), Richard J. Greenberg, Gary A. Griffin, Daniel R. Kirby, Raymond L. Klein (Emeritus), Richard C. Krebs (Emeritus), Herbert J. Langen (Emeritus), Howard W. Leigh (Emeritus), Robert J. Letson (Emeritus), Pat N. Nash (Emeritus), Bill J. Ranniger (Emeritus), Virginia Richardson, Mark C. Smith (Emeritus), Arthur H. Steinbrenner (Emeritus)

Associate Professors Ruth A. Beeker, Evelyn M. Carswell (Emerita), Kathy J. Carter, Vivian C. Cox, Vivian F. Dutton (Emerita), Paul E. Beckman, Willis J. Horak, Carol F. Larson, Glenn S. Pate, Alice S. Paul, Stanley Pogrow, James R. Rankin, D. Paul Robinson, Janice L. Streitmatter, Violet S. Thomas (Emerita)

Assistant Professors Carol A. Evans, Maria L. Fernandez, Julie L. Wilson

Senior Lecturer Sally N. Clark

Lecturers Richard L. Lopez, Jr., Edward J. Van Metre (Emeritus)

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 and Career 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 and Career 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 and Career Services. Requirements for teaching majors and minors are listed under the appropriate academic department in the Department and Courses of Instruction section of this catalog.

The department participates in the honors program.

211. Image Processing for Scientific Discovery (3) II (Identical with PYS 211)

300. Classroom Processes and Instruction (4) I II Classroom observation, management, instruction, and planning processes; includes field work and laboratory experiences. P, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).

302R. Educational Applications in Museum Anthropology (3) I I (Identical with ANTH 302R)

302L. Educational Applications in Museum Anthropology (1) [Rpt./2] I II (Identical with ANTH 302L)

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.

322. 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, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog). May be convened with 535.

323. 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, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).

324. 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, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).

326. 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, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).

327. 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, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).

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 310; CR, 409; A ED 485. (Identical with A ED 335a)

b. Home Economics (4) I Teaching models and active learning strategies for life management and family life educators. 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. *Science (3) P, TTE 300, ED P 310
   i. Art (3) I II, 300, EDUC 350, ED P 310; CR, ARE 431/531 and 400/500. (Identical with ARE 338i)
   m. Music (3) I II (identical with MUS 338m)
   u. Social Studies (3) I P, TTE 300, ED P 310

*y. Mathematics (3) I, 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. Admission to teacher preparation program.


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. Practicum
   a. Elementary School Reading (1) I II P, CR, 322, 323, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).
   b. Secondary Methods (1) I II Open to majors only. P, 300, ED P 310, EDUC 350, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog); CR, 338h or 338u or 338y or 414 or one only 410, 411, or 412.

405. Mathematics in the Secondary School (3) 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, 350, 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) I II Specific methods, objectives, organization of subject matter and evaluation in modern languages. (Identical with FREN 414, ITAL 414, SPAN 414, PORT 414).

Successful completion of professional education courses, content area courses, and the basic skills exam is required prior to student teaching. Music education students must consult with a music education advisor to waive this requirement.

493. Internship
   a. Student Teaching in Elementary School (3-12) I II Fee. P, 300, 322, 323, 324, 326, 327, ED P 301, EDUC 350, CR, TTE 496c and SER 301a, admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog).
   b. Student Teaching in Secondary School (6-12) I II Fee. P, 300, ED P 310, EDUC 350, LRC 455 and appropriate methods courses(a), admission to the College of Education (See "Restricted Enrollment in Professional Education Courses" in the College of Education section of this catalog), CR, TTE 496c and SER 301b. Application must be made one semester prior to enrollment in student teaching.

Pass/fail grades are the only grades available for 493a and 493b. Enrollment in these courses will not reduce the amount for which a student can otherwise enroll under the pass-fail option.

496. Seminar
   a. Issues in Teaching (1) I II CR, 493a or 493b.
   b. Trends/Issues in Elementary Schools (3) I I Investigation of the rationale, implementation and consequences of recent trends/issues in elementary school organization, curriculum and methodology.
   c. Trends/Issues in Secondary Education (3) I II Examination of purposes and functions of middle level and high schools, investigation of trends and issues and organization of curriculum and programs.

503. Teacher Leadership and School Change (3) I II Teacher leadership and involvement as it applies to change process, school improvement, collaborative decision-making, school assessment, strategic planning, and school restructuring.

504. Observation and Supervision of and Inservice Teachers (3) I II Supervision of the rationale, implementation and consequences of recent trends/issues in elementary school organization, curriculum and methodology.

505. Trends/Issues in Secondary Education (3) I II Examination of purposes and functions of middle level and high schools, investigation of trends and issues and organization of curriculum and programs.

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. Elementary and Middle School Mathematics Curriculum (3) I II S Elementary and middle school 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, 326 or 338y.

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, 327 or 338u.


526. Investigations in Early Childhood Education (3) I II S Critical study and evaluation of research findings and learning theories with emphasis upon the application to early childhood education.

528. Developing Programs for Young Children (3) I II S Contemporary early educational 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 Theoretical bases, research findings, and effective practices for organizing and managing classrooms. Experiences in solving management problems provided. P, 539 or CR, and EDUC 500.

530. Environmental Education Topics (3) S Issues related to environmental education in schools. Emphasis on diverse perspectives of environmental education and on strategies for changing curriculum. P, 324 or 338H.

532. Mathematics Diagnosis and Remediation (3) I II S The nature and causes of student's 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.
593. Internship
  r. Action Research Internship (1-3) I II S P, 597r.
595. Colloquium
e. Master’s Colloquium (1-3)
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
r. Action Research Workshop (3) S
w. Elementary Science Demonstrations (3) II S P, 324 or 338H
610. Applied Curriculum Theory (3) I II S
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 enacting in school settings. P, EDUC 500.
620. Instructional Research in School Subjects: Science (3) I II S
Analysis of approaches to the study of instructional processes in science education. P, 520 or 523 and 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.
633. Secondary Biology Lab Curricula (3) S
(Identical with BIOC 633)
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 (T AR)
University Fine Arts Complex
Room 239
(520) 621-7008; FAX: (520) 621-2412
Professors: Albert D. Tucci, Head, Robert C. Burroughs (Emeritus), Irene F. Comer (Emerita), Harold W. Dixon, Robert A. Keyworth (Emeritus), Frank K. La Ban, Mary Z. Maher
Associate Professors: Peter Beudert, Richard T. Hanson, Peggy Kellner (Emerita), William A. Lang, Jeffrey L. Warburton, Dianne J. Winslow
Assistant Professors: Jerry R. Dickey, Douglas Finlayson, Brent Gibbs, Karen K. Husted, Julie A. Mack, Daniel Yurgaitis

The Department of Theatre Arts offers the following degrees: Bachelor of Arts in Theater 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 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, a minimum of 1 unit of 497a, 497b, 497c, 497d, or 497e, or 497f every semester beginning with the sophomore year, 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 one from the following two minors in theatre arts: performance studies (courses to be selected from T AR 207, 238, 239, 336, 367, 430, 431, 432, 456, 460a, 460b, 468, 497a-f) or production studies (courses required are T AR 120, 220, 222, 223, 225, 2 units of 497a-f, 8-12 units to be selected from T AR 215, 401, 415, 420, 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 intensive 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 the theatre. The faculty in the student’s area of specialization will evaluate each student’s professional potential, trainability, and talent after an audition, interview, and/or portfolio review. Options are as follows:

Professional actor training program: Admission is by interview and audition at the completion of the theatre arts core curriculum at the end of the freshman year. 72 units must be taken in the major and the following requirements must
also be met: T AR 203, 204, 250, 251, 305, 306, 340a, 340b, 430, 440, 449, 451, 452, 455, 475, 4 semesters of 497f (8 units minimum); 6 units of dramatic literature; 6 units selected from courses in dance, fencing, and stage combat; at least two units from MUS 103 or 111 or 205 or MUS 180v. At least 18 units in the major must be University credit. Minimum total units required for a degree with this option: 125.

Design/technical production option: Admission is by interview at the completion of the theatre arts core curriculum. Continuation is contingent upon successful completion of T AR 120, 215, 220, 222, 223, 225 and portfolio review. 80 units must be taken in the major and the following requirements must be met: T AR 340a, 340b, 401 or 422, 415, 416, 420, 419, 423 or 439, 424, 427, 429, 440, 455, a minimum of 1 unit of 497a, 497b, 497c, 497d, or 497e every semester beginning with the sophomore year, 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 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 (See College of Education section, "Associate Programs"). 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, 356, or 465, and the following education courses: ED P 310, TTE 300, 338t, 396, 493B, EDUC 350, LRC 455, 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 100, 103, 336, 338t, 410, 431, 432, 460a, 460b; (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, 115, 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, 3L.
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.
145. Principles of Dramatic Structure (3) I Interpretation of structural elements of major dramatic forms and styles in relation to stage presentation and film; reading and analysis of representative plays. P 101. For majors only.
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-116b and 118. P, 149.
194. Practicum
a. Performance (1-2) [Rpt./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.
305. Musical Theatre (2) [Rpt./1] I S American musical theatre: its origins, development and influences. Practical applications. 1R, 2S. Open to majors only.

315. Sound for the Theatre (2) I 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. P, 120.

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 presentation modes. Analytical skills, scene performance and critique. 2R, 2S, P, 203, 250, 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 voice problems and period manners and movement. Emphasis on Commedia dell'arte, Moliere 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.

338. Teaching of Theatre Arts (3) II Carries credit in education only. (Identical with TTE 338)

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 (writing and oral research requirement) and 340b are Writing-Emphasis Courses. P, 145 and satisfactory completion 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 Seminar (3) II

397. Workshop a. Writing and the Arts (3) III P, ENGL 101, 102.


402. Combat for the Stage (1) [Rpt./1] I II Basic study in the execution of staged combat, training in the use of theatrical weapons and hand-to-hand combat required in playscripts. Extensive physical training as well as work in relaxation and focus. Open to majors only. May be convened with 502.

403. Musical Theatre I (3) I II 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. May be convened with 503.

404. Musical Theatre III (3) I II Intensive 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] I II History and practical application of theatrical makeup design and construct such items as masks, prosthetic pieces, wigs and beards. P, 115. May be convened with 514.


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) II Applied theory and techniques associated with sound system and visual effects in the theatre. 2R, 3L. May be convened with 521.

422. Theatrical Properties (3) [Rpt./2] II 1995-96 Construction and collection of stage properties. Experimentation with the use of materials and techniques. May be convened with 522.


424. Advanced Scenic Design I (3) II 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.


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. Audience Development (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) I II Major movements, plays, and theories in theatrical art from 1915 to the present. P, 145. For majors only.

442. Advanced Stage Lighting II (3) I 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,
449. Acting VIII (3) II Intensive study and character analysis. Survey and review of major modern acting theories and techniques. 2R, 2S, P, 452, audition. May be convened with 553.

450. 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, P, open to majors only or by permission if instructor. May be convened with 555.

451. 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). F, 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. Art Collaboration (2) [Rpt./2] I The development and communication of a visual idea for performance art; exploring all mediums of visual and aural communication. May be convened with 561.

468. Dialects in Performance (3) Application of suitable phonetic theory toward a systems approach to acquiring dialects for performance in stage, television 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. Teaching Methods for Dance (3) I (Identical with DNC 495a)

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 (1) II 1996-97 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.

502. Combat for the Stage (1) [Rpt./1] I II For a description of course topics, see 402. Graduate-level requirements include an additional creative and/or research project. Open to majors only. May be convened with 402.

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. 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 410. Graduate-level requirements include an additional creative and/or research paper. 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] I 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) I 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./3] I II 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 1996-97 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.

527. 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 1995-96 For a description of course topics, see 429. Graduate-level requirements include an additional creative and/or research project. P, 111, 151. May be convened with 430.

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, 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, 251 and audition. May be convened with 442.

546. Dance Program Administration (3) II 1994-95 (Identical with DNC 546)

549. Acting V (3) I For a description of course topics, see 449. Graduate-level requirements include an additional performance and/or research project. P, 251 and audition. May be convened with 449.

550. Literary Resources for Choreography (3) II 1995-96 (Identical with DNC 550)

551. Acting VI (3) II For a description of course topics, see 451. Graduate-level requirements include an additional performance and/or research project. P, 305, 449, audition. May be convened with 451.

552. Acting VII (3) I [Rpt./1] For a description of course topics, see 452. Graduate-level requirements include an additional performance and/or research project. P, 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 (3) I For a description of course topics, see 455. Graduate-level requirements include an additional performance and/or research project. P, open to
majors only or by permission of instructor. 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.

568. Dialects in Performance (3) For a description of course topics, see 468. Graduate-level requirements include a close transcription of a selected dialect or dialects from oral presentation and a 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 DNC 595a)

597. Workshop a. Technical Production (1-6) [Rpt./20 units] I II S May be convened with 497a.
b. Costume Production (1-6) [Rpt./20 units] I II S May be convened with 497b.
c. Lighting Production (1-6) [Rpt./20 units] I II S May be convened with 497c.
d. Sound Production (1-6) [Rpt./20 units] I II S May be convened with 497d.
e. Scenic Production (1-6) [Rpt./20 units] I II S May be convened with 497e.
f. Performance (1-6) [Rpt./20 units] I II S May be convened with 497f.

600. Introduction to Graduate Study of Drama (3) I Methods and materials for research in theatre and drama; introduction to the bibliography of these fields; organization and form of thesis.

605. Advanced Voice and Movement for the Actor I (3) [Rpt./1] I Advanced study and exercise in voice and movement for the actor: relaxation, breathing, physical and vocal freedom, resonance, articulation and improvisation including the Linklater Approach, L.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.

636. Shakespearean Production (3) Advanced readings and discussion in theory and criticism, analysis of filmed and video Shakespeare, and directorial approaches to Shakespeare production in performance history.

640. Dramatic Criticism: Tragedy (3) I Comparative analysis of tragedy and theories of tragedy from antiquity to the present for stage and screen; writing of critical papers.

641. Dramatic Criticism: Comedy (3) 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) [Rpt./1] I 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.

646a-646b. Theories of the Theatre I (3-3) 646a: I 1996-97 I 646b: II 1996-97 A year-long study of the history of theatrical performance and dramatic composition. The first semester covers select theories from the Greeks through Neo-classicism. The second semester treats theories from Romanticism to the present.


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.

696* Seminar a. Contemporary Trends (1-3) [Rpt./6 units] I II
b. Special Topics in Acting (1-3) [Rpt./6 units] I II
c. Special Topics in Directing (1-3) [Rpt./6 units] I II
d. Musical Theatre Production (1-3) [Rpt./6 units] I II
e. Special Topics in Playwriting (3) [Rpt./6 units] P, permission of instructor.
h. Special Topics in Stage Costume Construction (1-3) [Rpt./6 units]
  i. Period Design Style (1-3) [Rpt./6 units] I
  l. Special Topics in Costume Design (2-3) [Rpt./6 units] P, 429.
m. Special Topics in Design (2) [Rpt./6 units] I, 401/501.

*Students may earn a maximum of 9 units in TAR 696, with a maximum of 6 units in any one area.

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**Ukrainian**

(See Critical Languages Program)

**Veterinary Science (VSC)**

Pharmacy-Microbiology Building, Room 201 (520) 621-2355; FAX: (520) 621-6366

Professors Charles R. Sterling, Head, Robert B. Chiasson (Emeritus), Ed W. Cupp, Leonard W. Dewhirst (Emeritus), Donald Lightner, Lynn A. Joens, C. John Mare, Raymond E. Reed (Emeritus), Jose M. Ribeiro (Entomology), James N. Shively (Emeritus), J. Glenn Songer

Associate Professors Rodney Adam (Medicine), Ronald W. Hilwig, Robert J. Janssen (Emeritus), David W. Sammons

Assistant Professor Michael W. Riggs

Instructor Ted H. Noon

Specialist Edward J. Bicknell

Research Associate Professor Jan Decker

Assistant Research Scientist Greg A. Bradley

Research Assistant Professor F. Javier Enriquez

Research Scientist Fernando Lozan-Alarcon, Carlos Reggiardo

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.

The undergraduate major in microbiology, now housed in the Department of Veterinary Science, is described under its own heading in this catalog. Program courses also support the departmental graduate program in pathobiology.

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 the Professional Student Exchange Program material located in the Admissions and Registration Section).

Course requirements for the major, in addition to the basic skills and proficiencies of the general requirements for the Bachelor of Science in Agriculture (see the College of Agriculture section of this catalog), include MATH 117R/S,
420. Pathogenic Bacteriology (3) II (Identical with MIC 420R) May be convened with 520.
421a-421b. Microbiological Techniques (3)
(Identical with MIC 421a-421b)
422. Mechanisms of Disease (5) II General pathology of animal and selected human diseases with emphasis on pathogenesis, pathophysiology, and morphologic changes at the microscopic, 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, 420a-420b, 459 or CR, MIC 205, MIC 419R or equivalent or instructor approval. (Identical with MIC 423 and TOX 423) May be convened with 523.
428. Microbial Genetics (3) II (Identical with MIC 429)
432. Pathogenic Virology (3) [Rpt.] I Etiology, epidemiology, and pathogenesis of viral diseases of humans and other animals. P, 419, 429. (Identical with MIC 432, MCB 432) May be convened with 532.
437. Vertebrate 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. (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 post-mortem techniques as well as a survey of selected but generally well-recognized diseases of wildlife. (Identical with WFS 449) May be convened with 549. Notes
452. Medical-Veterinary Entomology (4) [Rpt.] I 1995-96 (Identical with ENTO 452) May be convened with 552.
454. Host-Microbial Interactions (3) I Review of bacterial-host interactions with the emphasis on mucosal immunity following bacterial infections. Important issues such as molecular mechanisms of virulence factors, bacterial resistance to host factors, immune modulation, and regulation of the host response to bacterial assault will be discussed. P, 419 and 420, or instructor approval. (Identical with MIC 454) May be convened with 554.
456. Aquaculture (3) I 1995-96 (Identical with WFS 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) I 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 117R, 118; 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 and immune response of a single parasite. (Identical with ECOL 503R, ECOL 503R, INSC 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, ECOL 503L, INSC 503R 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 (5) II For a description of course topics, see 423. Graduate-level requirements include preparation of a research proposal on a selected relevant topic and critical analysis of selected publications from the current literature. (Identical with MBIM 523 and TOX 523) May be convened with 423.
529. General Virology (3) II (Identical with MBIM 529)
532. Pathogenic Virology (3) [Rpt. I] For description of course topics, see 432. Graduate-level requirements include a research term paper and class presentation. (Identical with MBIM 533) May be convened with 432.

538. Ecology of Infectious Disease (3) II 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 plus research proposal preparation. (Identical with AN S 543, BIOL 543, MBIM 543) May be convened with 443.

549. Diseases of Wildlife (3) II For a description of course topics, see 449. Graduate-level requirements include either a term paper based on assigned reading or a research paper compiling field studies on other research experiences in wildlife disease. (Identical with WFSC 549) May be convened with 449.

550L. Medical Mycology Laboratory (2) II (Identical with MBIM 550L)

550R. Medical Mycology (2) II (Identical with MBIM 550R)

552. Medical-Veterinary Entomology (4) [Rpt./3] II 1996-97 (Identical with ENTO 552) May be convened with 452.

554. Host-Microbial Interactions (3) II For a description of course topics, see 454. Graduate-level requirements include a five-page proposal. (Identical with MBIM 554) May be convened with 454.

556. Aquaculture (3) II 1995-96 (Identical with WFSC 556) May be convened with 456.

559. Comparative Vertebrate Histology (4) II For a description of course topics, see 459. Graduate-level requirements include a written report on a selected topic. 2R, 6L, P, 12 units of animal biology. A vertebrate anatomy and/or systems course is strongly recommended. (Identical with ECOL 559) May be convened with 459.

565. Shrimp Pathology (3) [Rpt./1] S 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.

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 WFSC 649)

660. Infectious Disease Epidemiology (3) [Rpt./1] II (Identical with EPI 660)

680. Pathophysiology (3) II 1996-97 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.

695a. Colloquium
   a. Veterinary Laboratory (1-3) [Rpt./9 units]

696. Seminar
   a. Research Seminar (1) [Rpt./3] I II Watershed Management

Wildlife and Fisheries Science
(See Renewable Natural Resources)

Women's Studies (WS)
Douglas Building, Room 102
(520) 621-7338; FAX: (520) 621-1533

Committee on Women's Studies, Associated Teaching Faculty

Professors Susan Hardy Aiken (English), Barbara Babcock (English, CCLS), Gail Bernstein (History), Joan Dayan (English), Paula England (Sociology), Barbara Gutek (Management and Policy), Donna Guy (History), Annette Kolodny (Comparative Cultural and Literary Studies), Susan Phillips (Anthropology), Alice Schlegel (Anthropology), Marilyn Skinner (Classics), Lynn Smith-Lovin (Sociology), Monique Wittig (French and Italian)

Associate Professors Sallie Marston, Acting Chair (Geography), Karen Anderson (History), Adele Barker (Comparative Cultural and Literary Studies), Esther Fuchs (Near Eastern Studies), Mary Beth Haralovich (Media Arts), Patricia MacCorquodale (Sociology), Laura McCloskey (Psychology), Laura Tabili (History), Chia-Lin Pao Tao (Near Eastern Studies), Judy Temple (Women's Studies, English), Susan White (English), Lynda Zwinger (English)

Assistant Professors Anne Betteridge (Middle Eastern Studies), Meg Lota Brown (English), Maureen Fitzgerald (History), Janet Jakobsen (Women's Studies and Religious Studies), Kimberly Jones (East Asian Studies), V. Spike Peterson (Political Science), Jane Rice (German Studies), Abby Van Slyck (Architecture)

Research Professor Myra Dinnerstein, Member 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 W S 100, then taking intermediate-level courses, and finishing with a senior seminar.

A major in women's studies provides a sound liberal arts preparation for graduate or 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 II (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.

205. Introduction to Feminist Literary Theory (3) I Introduction to the principles of feminist literary analysis through texts authored by women writers and through diverse theoretical writings on race, language, sexuality, creativity, class and subordination which forms the basis of feminist criticism. Within the theoretical context we will explore writing by Anglo women, women of color, and women from diverse cultural traditions (Identical with CCLS 205)

225. Introduction to Women and Religion (3) I (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 1994-95 (Identical with ANTH 303)

305. Feminist Theories (3) I Explores feminist theories from various disciplines, analyt-
ical frameworks, and subject areas. Examines the construction, differentiation, and representation of the genders in different cultural settings and explores the interactions between gender systems and women’s roles, statuses, and experiences. P, 6 units in women’s studies, or consult committee before enrolling.

306. African-American Autobiographies: Women and Their Histories (3) (Identical with AAS 306)

310. Feminist Ethics (3) II Exploration of diverse feminist ethical languages and value systems and the enactment of these languages and values through the activism surrounding contemporary social issues. Assignments and class discussions directed toward students’ understanding various moral positions and articulation of their own positions. P, 3 units of women’s studies or permission of instructor.

311. Women and Sexuality: 1870– (3) II Examines the regulation and expressions of women’s sexuality historically from the late 19th century to the present. Introduces students to some of the main themes and issues in the field of history of sexuality.

321. Women in Judaism (3) (Identical with JU S 321)

324. Women and Religion in the U.S. (3) 1996-97 (Identical with RELI 324)

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) II (Identical with CLAS 330)

335. Gender and Politics (3) I II (Identical with POL 335)


357. Psychology of Gender (3) II (Identical with PSYC 357)

373. Women’s Fictions in Twentieth-Century Germany (3) (Identical with GER 373)

380. Nature, the Great Mother, and Woman (3) II (Identical with HUM 380)

396H. Honors Proseminar (3) [Rpt. /9 units] II Course is primarily for honors students. Repeatable if topic is different.

400. Special Topics in Women’s Studies (3) [Rpt. /1] II Topics will vary

402. Gender and Language in Japan (3) II (Identical with JPN 402)

406. Gender and Social Identity (3) II (Identical with ANTH 406)

418. Women and Literature (3) [Rpt. /1] I II (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) II (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 activism, and the theoretical understandings which concurrently/both arise out of and construct those lives and activism. P, 3 units of women’s studies, preferably 305, or permission of instructor. May be convened with 530.

444. Women and the Body (3) II Exploration of the ways that women have defined their bodies; how the representation of women as body permeates the culture and affects women’s sense of self and self-esteem. Examination of feminist theoretical analyses of women’s power and the control of women’s bodies. P, 6 units in women’s studies. May be convened with 544.

450. American Indian Women (3) II (Identical with AINS 450)

453. History of Women and Work (3) I (Identical with HIST 453)

455. History of Women in Europe (3) (Identical with HIST 455) May be convened with 555.

458. Topics in Comparative Women’s History (3) II (Identical with HIST 458)

459. Sociology of Gender (3) I II (Identical with SOC 459)

461. Feminist and IR Theories (3) (Identical with POL 461) May be convened with 561.


465. Women in International Development (3) II (Identical with ANTH 465)

466. 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 (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 Female Identity in America: 1945 to the Present (3) I History of women in the U.S. since 1945. Will explore a variety of topics including employment, sexuality, motherhood, abortion, reproductive technologies and feminism, and explore how changes in these areas have affected diverse groups of women. Prior course work in women’s studies or history helpful. P, two women’s studies courses or one women’s history course (Identical with HIST 481) May be convened with 581.

483. Gender and African History (3) I II S (Identical with HIST 483) May be convened with 583.

485. Mexicana/Chicana Women’s History (3) I CDT (Identical with MAS 485)

489. Women in East Asia (3) I (Identical with HIST 489)

490. Women in Middle Eastern Society (3) I (Identical with ANTH 490)

496. Seminar

a. Women’s Studies (3) [Rpt. /2] I II

w. Feminist Approaches to the Bible (3) I (Identical with JU S 496w) May be convened with 596w.

502. Gender and Language in Japan (3) II (Identical with JPN 502)

525. Theoretical Issues in the Study of Women and Religion (3) II (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.

544. Women and the Body (3) II For a description of course topics, see 444. Graduate-level requirements include a more comprehensive research paper and preparation of a lecture/summary on several books in the topic. May be convened with 444.

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)

555. History of Women in Europe (3) I (Identical with HIST 555) May be convened with 455.

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) I (Identical with ARCH 564) May be convened with 464.

571. Counseling Women (3) II (Identical with PS 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.

584. Feminist Research Methodologies (3) II Considers some epistemological assumptions underlying research and theoretical projects of traditional disciplines; explores feminist adaptations and critiques of these assumptions.

585. Mexicana/Chicana Women’s History (3) I (Identical with MAS 585)
Women's Studies

596. Seminar
w. Women's Studies (3) [Rpt.] I II (Identical with ENGL 596w)

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)

696. Seminar
n. Comparative Women's History (3) [Rpt./4] P, consult committee before enrolling (Identical with HIST 696n)

Photo courtesy UA Women's Studies.
ACCREDITATIONS AND MEMBERSHIPS

Accreditations
Accreditation Board for Engineering and Technology; Advisory Committee for International Scholars; 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 Psychological Association (graduate program in clinical psychology and graduate program for school psychologists); American Society of Landscape Architects; American Speech-Language-Hearing Association; Association of American Law Schools and American Bar Association; Commission on Rehabilitation Education; Council for Education of the Deaf; Council on Education in Journalism and Mass Communications; Liaison Committee on Medical Education of the American Medical Association and the Association of American Medical Colleges; National Accrediting Agency for Clinical Laboratory Sciences; 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; Order of Coif.

Memberships
Accrediting Council on Education in Journalism and Mass Communication; American Academy of Religion; 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 Association on Aging; American College Dance Festival Association; American College Theatre Festival Association; American Council of Learned Societies; American Council on Education; American Federation of Arts; American Geophysical Union; American Home Economics Association; American Institute for Iranian Studies; American Institute of Maghribi Studies; American Institute for Yemeni Studies; American Mathematical Society; American Newspaper Publishers Association; American Political Science Association; American Psychological Association; American Research Center in Egypt; American Research Institute in Turkey; American Society for Engineering Education; American Society for Public Administration; American Sociological Association; American Statistical Association; Architectural Research Centers Consortium, Inc.; Argonne Universities Association; Arizona Geological Society; Arizona Mathematics Consortium; Associated Western Universities; Association for Communication Administration; Association for Continuing Higher Education; Association for Gerontology in Higher Education; Association for Judaic Studies; Association for Public Policy Analysis and Management; Association for Theatre in Higher Education; Association for University Business and Economic Research; Association of American Colleges; Association of American Geographers; Association of American Medical Colleges; Association of American State Geologists; Association of American University Presses; Association of Collegiate Schools of Architecture; Association of International Education Administrators; Association of International Educators; Association of Neuroscience; Association of Research Libraries; Association of Science Technology Centers; 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 Social Sciences Association; Consortium of Western Universities and Colleges; Council for Advancement and Support of Education; Council of Colleges of Arts and Sciences; Council of Graduate Programs in Communication Sciences and Disorders; Council of Graduate Schools in the United States; Council of United States Universities for Soil and Water Development in Arid and Subhumid Areas; Council on International Educational Exchange; Deep Observation and Sensing of Earth's Continental Crust; EDUCOM, Interuniversity Communications Council; Eisenhower Consortium; European Association for International Educators; Geological Society of America; Graduate Management Admissions Council; Inter-University Consortium for Political and Social Research; Institute of International Education; Institute of Mathematical Statistics; Latin American Scholarship Program of American Universities; Latin American Studies Association; Mathematical Association of America; Middle East Studies Association of North America; Mid-America College Art Association; Midwestern Association of Graduate Schools; National Association for Bilingual Education; National Association for Chicano Scholars; National Association of College Admissions Counselors; National Association of Colleges and Teachers of Agriculture; National Association of College and University Attorneys; National Association of College and University Business Officers; National Association of Professors of Hebrew; National Association of Schools of Art and Design; National Association of State Universities and Land Grant Colleges; National Committee for International Studies and Program Administrators; National Consortium for Black Professional Development; National Council for Preservation Education; National Council for Research on Women; National Council on Rehabilitation Education; National Public Radio; National University Continuing Education Association; National Women's Studies Association; North American Association of Summer Sessions; Pacific Mountain Network; Pacific Sociological Association; Public Broadcasting Service; Rocky Mountain Math Consortium; Rocky Mountain Science Council; Society for Industrial and Applied Mathematics; Society for the Study of Social Problems; Society of Biblical Literature; Space Science Working Group; Speech Communication Association; Travel Research Association; Tucson Association of Museums; United States Institute for Theatre Technology; Universities Council on Water Resources; Universities Research Association; University Corporation for Atmospheric Research; University Film and Video Association; University Resident Theatre Association; University Space Research Association; Western Association of
THE UNIVERSITY OF ARIZONA
ALUMNI ASSOCIATION

Established in 1897, The University of Arizona Alumni Association is the University's oldest advocacy group, whose mission is to support the University, its alumni and its current and future students.

Membership
All persons who have received a degree from The University of Arizona or former students who have completed at least 30 units are automatically members of the Alumni Association and receive all of the publications and services afforded by the association. There are no membership dues charged.

Objectives
The objectives of the Arizona Alumni Association generally are to promote the interest and welfare of the state of Arizona, The University of Arizona, and the cause of education. The association's formal mission statement reads: "The University of Arizona Alumni Association is committed to support successfully the interests of The University of Arizona, its alumni, and its present and future students, through the development of mutually beneficial relationships."

The association is the primary and most important link between the University and more than 155,000 alumni worldwide. Its basic motivating principle is service, both to the former student and the University.

Structure
The Arizona Alumni Association is a 501(c)(3) non-profit organization governed by a 54-member volunteer board of directors. The association is administered by a 25-member staff of University employees serving as part of the UA President's office.

Programs and Services
The association fosters the involvement of alumni with their alma mater in many ways and provides the following programs and services:

ALUMNI CLUBS—There are 60 University of Arizona Alumni Association clubs throughout the United States and the world. The clubs provide a direct link between the association and the alumni by providing opportunities to maintain involvement through activities such as student recruitment and scholarship development, business and career networking, social and athletic-related events and cultural and educational programs. Information on club locations can be obtained directly from the association.

ALUMNI DATABASE—The association maintains an automated database containing the records of just under 400,000 graduates, former students and donors. Alumni are urged to keep their records updated with the association so that they will continue to receive information about the University and alumni programs.

AWARDS AND RECOGNITION—Each year alumni are honored for outstanding service to the University and for outstanding personal achievement. The awards are presented at commencement, various college award ceremonies, and at homecoming, depending on the category of the award to be presented. Since 1941, more than 1,250 people have been honored.

COLLEGE COUNCILS—Eight colleges and one school have organized alumni councils, which serve to strengthen the ties between the college's or school's students, faculty and alumni. The councils provide service to both the community and the colleges.

HOMECOMING AND CLASS 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. Homecoming takes place in the fall and is the association's largest alumni-attended event. Students are also an integral part of the homecoming activities. Bobcats (a senior honorary), a student group sponsored by the association, is the main coordinator of the student body's homecoming activities. During homecoming the association sponsors 10-, 20-, 25-, 30-, and 40-year class reunions. The 50-year class reunion takes place during the May commencement.

INTERNATIONAL ALUMNI PROGRAMMING—The International Alumni and Development Program was established in 1992 in recognition of the importance of international education and activities in today's global economy and Information Age.

LEGISLATIVE RELATIONS—In the area of Legislative Relations, the association has formed a partnership with the alumni associations of the other two institutions of higher education in the state of Arizona, Arizona State University and Northern Arizona University. The goal of this partnership is to work cooperatively, with each institution's respective alumni, in support of higher education in the state of Arizona.

LIFELONG LEARNING AND TRAVEL—The association sponsors an international and action travel program designed to meet the educational objectives of alumni and friends of the University by offering a unique combination of discovery, adventure, and educationally-oriented travel opportunities and lectures. The association also sponsors "Astronomy Camp" which offers alumni, students and amateur astronomers an opportunity to discover the universe in new and exciting ways by using the facilities of The University of Arizona.

MINORITY CONSTITUENT PROGRAMS—The association's minority constituent programs are intended to provide outreach, service and support to diverse groups of alumni. Currently these programs include the Black Alumni Club, Hispanic Alumni Club and Native American Alumni Club. Each of these clubs is involved in recruiting students, promoting academic excellence and awarding scholarships.

PUBLICATIONS—The official publication of the association is the Arizona Alumnus. Published two times a year, it is sent free of charge to all members and 3,000 faculty and administrators. The Arizona Alumnus 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 T.V. show.

STUDENT GROUPS—Recognizing the need to inform current students about its mission, the association sponsors two student groups, the Student Alumni Association and Bobcats (a
senior honorary). The objectives of these groups are to involve current students in alumni activities, thereby promoting the concept of lifelong commitment to the University through Alumni Association programs.

**YOUNG ALUMNI**—Special programming is available in Tucson, Phoenix and San Francisco for young alumni, defined as persons who have graduated from the University within the last 10 years and are thirty-five years of age or younger. Nationwide, young alumni make up about 25% of the total University alumni population.

**Location Of The Association**

The association is located at the northwest corner of Cherry and Speedway in the Marvin D. "Swede" Johnson Building, 1111 N. Cherry Avenue, Tucson, Arizona 85721. The association also maintains an office in Phoenix, Arizona. All students and alumni are invited to visit the association or correspond via letter; or facsimile, 602-621-9030; or e-mail at alumni@al.arizona.edu. Alumni are strongly encouraged to share their thoughts, opinions and suggestions with their association.

**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)** 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 University-wide 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, spondyloarthropathies 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 prosthesis 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 the 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 plans educational, clinical and scientific activities. The center offers educational opportunities for medical and graduate students as well as organizing local and national continuing medical education programs for physicians and other health professionals. 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. Medical students and life sciences graduate students are able to work in cancer-related research projects with faculty throughout the College of Medicine. The monthly Tumor Board at the Arizona Cancer Center is open to all interested persons; presentations cover aspects of cancer patient management, cancer research, and cancer prevention. As part of the required curricula of medical students, cancer-related lectures are presented in the departments of Biochemistry, Molecular and Cellular Biology, Microbiology and Immunology, Cell Biology and Anatomy, and Pharmacology.

The clinical oncology research programs of the Arizona Cancer Center continue to bring cancer patients to the Arizona Health Sciences Center, 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 gene therapy, heat, radiation, biological modifiers, bone marrow transplantation, and targeted 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; effectiveness of Vitamins A, E, and C, Selenium, wheat fiber, and fruits and vegetables; cytogenetics; and clinical trials of promising approaches to cancer prevention, diagnosis and treatment.

**THE ARIZONA CENTER ON AGING (1991)** in The University of Arizona College of Medicine has these primary goals:

1. Development of multidisciplinary education and clinical training programs regarding the elderly that involve University faculty, allied health professionals, scientists and health administrators;
2. Development of a more effective, humane and comprehensive system for delivering medical, health and social...
services to elderly persons; and 3) Engagement in research programs addressing the processes of aging and the delivery of services to elderly in the context of our society. The center has three major programmatic emphases: geriatrics, long term care, and gerontological studies.

The center’s activities are diverse and comprehensive. It has established a statewide network for education in gerontology/geriatrics. Internships, postgraduate training in geriatrics, as well as an accredited geriatric fellowship are major features of the center’s education program. A Master of Science in gerontology, a doctoral minor in gerontology, and a graduate certificate in gerontology are also offered through the center. Maintenance of geriatric clinical settings including specialty clinics, a home visitation program, an 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. Expanding research activities include investigations of basic mechanisms of the aging process; psychosocial issues including dementias, depression, cognition and quality of life; influence of aging on function including falls, incontinence, and appropriate rehabilitation practices; government policy formulation, and models for quality service delivery 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 National Biological Survey, 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) was established by the Arizona Board of Regents as a center of excellence to enhance and expand research, education and training in Emergency Medical and Emergency Health Services (EMS). It is one of only four such units in the United States and the only one in the entire Southwest region. AEMRC activities (by division) include:

**Research:** (1) epidemiology of acute medical and traumatic injuries; (2) clinical research into the pathophysiology of acute illness and injury; (3) research in operations, quality improvement, and policies of emergency health services.

**Training:** (1) evaluation and enhancement of prehospital EMS through prehospital provider training at all levels; (2) continuing medical education and technologies update in EMS.

**Education:** (1) development of educational pathways for physicians, nurses, administrators and researchers dedicated to careers in EMS; (2) education of medical students, housestaff officers, postgraduate fellows and practicing physicians in emergency medicine and emergency medical services systems. The AEMRC participates in the M.P.A. and M.P.H. programs at The University of Arizona.

**Emergency Health Informatics and Information Systems:** (1) development, implementation and evaluation of data dictionaries and data sets; (2) provision of telecommunication and computing support services for research projects involving data collection and analysis; (3) development of methods and modalities for prehospital data collection, transmission, storage, retrieval and evaluation; (4) facilitation and support efforts as the National Emergency Health Services Information and Injury Control Clearinghouse.

**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 (ARL) (1979) is a multidisciplinary unit established to promote and support interdisciplinary collaborations which initiate new research and educational programs of high priority to the scientific community. ARL provides an important mechanism for fostering and administering programs which bridge disciplines embraced by departments from more than one collegiate unit. It presently consists of nine divisions: Arizona Fullerene Consortium; Biotechnology Division; Center for Insect Science; Institute for the Study of Planet Earth; Microcirculation Division; Division of Neural Systems, Memory and Aging; Division of Neurobiology; Committee on Neuroscience; and Surface Science Division.

THE ARIZONA STATE MUSEUM (1893) houses one of the finest collections of prehistoric, historic and contemporary Southwestern Indian material in the world. The Paths of Life exhibit explores the cultures, beliefs and histories of ten Native American groups in Arizona and northern Mexico. Library, research facilities, gift shop. Guided tours for school groups by appointment. Exhibits occupy two buildings. Free admission.

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) is a service unit of the Department of Veterinary Science which provides consultation and diagnostic assistance in animal health to veterinarians, livestock and companion animal owners, wildlife managers, zoos and federal, state and municipal agencies. The services provided include pathology, toxicology, virology, parasitology, bacteriology and applied research and field investigation of livestock problems. Diagnostic faculty members support research and teaching programs of the department.

THE BIOTECHNOLOGY DIVISION (1986) of the Arizona Research Laboratories exists to provide core facilities necessary to support on-going research and educational programs. It provides access to state-of-the-art technology and instrumentation to all units within the University, state agencies and the private sector. The division presently consists of six facilities: Biological Magnetic Resonance Facility; Cell Sorting; Biotechnology Computing Facility; Electron Microscopy; Laboratory for Molecular Systematics and Evolution; and Macromolecular Structures Facility. The facilities offer workshops and other educational opportunities as a means to educate students and researchers in the application of the most modern technologies.

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 campuswide 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 campuswide 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's Smart-Node Program and has a local allocation of service units.

Interactive access to CCIT's central computers comes through the IDX-3000, or the campus ethernet (UANet) providing a campuswide data communications network. Users may access these systems via terminal service centers at various campus locations. Remote access is also provided through the following dial-up number: 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 net-
working 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 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 70,000 master prints, more than a million study prints and negatives, correspondence, manuscripts, artifacts, and related documents. It contains a major research library of over 17,000 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 printviewing 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 the departments of 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 expeditious 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 INSECT SCIENCE (1989) of the Arizona Research Laboratories is a multicampus, multidisciplinary program fostering collaborative research and education on a broad array of topics dealing with insect science. The research goal of the center is to investigate fundamental questions about the biology of insects. Another goal of the center is to produce well-trained, interactive, independent scientists who are capable of working in a variety of areas in the biological sciences and excelling in university, industrial, or governmental laboratories. Finally, through the Educational Outreach Program, the center strives to improve the quality of science taught at the elementary school level, and to arouse a child's interest in science that will continue throughout his formal education. To foster interactions among its members, the center also sponsors several scientific meetings including the HexaPodium series, guest seminar series, distinguished professor series, weekly group insect meetings, and an international symposium on insect science.

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 50 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 one of several federally-funded programs in the United States devoted exclusively to the comprehensive study of this key region of the world. The area of the center's concern ranges from North Africa and the Fertile Crescent to Israel, Turkey, Iran, Afghanistan, and Islamic Central Asia. As a U.S. Department of Education National Resource Center, CMES disseminates information about Middle East studies nationally and internationally. The center includes more than sixty faculty members representing over thirty different departments and seven colleges throughout the University and also houses the Middle East Studies Association (MESA), 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 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. CMI is one of the world's leading research centers looking at Electronic Meeting Systems and Groupware research. The center has three 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, process re-engineering, 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 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.

In 1994, the Southwest Environmental Health Sciences Center (SWEHSC) was established by a major grant from the National Institute of Environmental Health Sciences. Besides fostering the interdisciplinary research activities of the Center for Neurobiology and the organization of internationally attended conferences. 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 NEURAL SYSTEMS, MEMORY AND AGING (1990) of the Arizona Research Laboratories is an interdisciplinary research unit whose main focus is memory, studied from a variety of perspectives. There is a particular focus on spatial cognition and memory, and the neural mechanisms involved in carrying out this important function. Most members of the unit work on the hippocampal formation and related structures thought to be involved in this capacity. Particular faculty have special interests in development, aging, plasticity at the cellular and molecular level, computational aspects of memory and neurochemical aspects of memory and aging. Postdoctoral fellows and graduate and undergraduate students work in all these areas, and receive a broad training in behavioral and computational neuroscience.

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, game theory and behavior, 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 the 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), warm water aquaculture, sea water crop irrigation, biospheric, environmental control systems, water quality, 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 systems for the intensive culture of marine shrimp. ERL is developing halophytic crops for livestock feeds, soil and water remediation, and other uses. ERL consults on many environmental projects such as 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 biospheric research is reflected in the development of Biosphere 2, a private venture of Space Biosphere Ventures, and in global studies of the greenhouse effect.

FLANDRAU SCIENCE CENTER AND PLANETARIUM (1975), a part 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 FOR THE STUDY OF PLANET EARTH (1994) of the Arizona Research Laboratories is a multidisciplinary research unit designed to promote research, education, policy formulation, and information exchange on global environmental issues. The global change research is concentrated in five major areas: biophysical aspects of arid regions; study of past global change; remote sensing; global climate modeling; and human dimensions of global change. Funding from federal agencies has enhanced the development of undergraduate courses in global change by providing access to state-of-the-art computer lab facilities for both science and non-science majors. Graduate students can minor in global change while pursuing studies within a traditional discipline or within one of several interdisciplinary degree programs. The institute facilitates campuswide communication through a seminar series and a visiting scholar program that brings leading researchers to campus.

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 limited faculty research fellowships and chaired professorships awarded to the center. 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.

KUAT 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: KUAT-TV Channel 6; KUAS-TV Channel 27 (in the Catalina Foothills) and TV Translator K23CK, Duncan, Arizona; KUAT-AM (1550 kHz); KUAZ-FM (89.1 MHz); and KUAT-FM (90.5 MHz) with Translator Frequencies, 89.7 MHz in northwest Tucson and Sierra Vista, 91.7 MHz in Nogales and 88.9 MHz in Bisbee-Douglas, Arizona. The stations are affiliated with the Public Broadcasting Service (PBS), National Public Radio (NPR) and Public Radio International (PRI).

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 live 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 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 Social and Behavioral Sciences that fosters opportunities 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 for Latin American related studies 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 (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 and 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 Near Earth Asteroid Rendezvous, the Galileo Mission to Jupiter, the Cassini/Huygens Mission to Saturn, the Mars-Pathfinder, the Discovery Missions, NASA space shuttle missions 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 Imagery 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 Kitt Peak and in the Santa Catalina Mountains, as well as the Multiple Mirror Telescope on Mt. Hopkins; all are within easy reach of the University campus. 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 & 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 the greater Mexican American community, as well as regional, national and international private and public sectors.

THE MINERAL MUSEUM (1902) is operated by the Department of Geosciences, and housed in the lower level of the Flandrau Science Center. The museum has more than 15,000 mineral specimens representing more than 1,000 different mineral species. On display is a wide collection of material from around the world, including meteorites, cut gem stones, and mining artifacts from Arizona's past. The museum operates a series of education programs for both University students and the community at large. The Mineral Museum is open to the public whenever Flandrau Science Center is open.

THE OFFICE OF ARID LAND STUDIES (1964), administratively located within the College of Agriculture, is active in international studies, natural resources development and management, environmental studies, economic botany, new crop development, water and energy conservation, farming systems research, information sciences, 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 experimental and theoretical optics. Areas in which research is currently being conducted include optical systems design, interferometry and optical testing, infrared technology, radiometry, remote sensing, optical detector systems, film deposition, image processing, scanning tunneling microscopy, nuclear, x-ray and MRI medical imaging, optical data storage, optical computing components, diffractive and binary optics, novel optical materials, adaptive optics, nonlinear optics, optical trapping and cooling of atoms, semiconductor and solid state laser physics. Interdisciplinary programs in progress involve the departments of Materials Science and Engineering, Mathematics, Astronomy, Chemistry, Electrical and Computer Engineering, Ophthalmology, Physics, and Radiology, as well as Steward Observatory, the Arizona Research Laboratory, the Optical Circuitry Cooperative and the Optical Data Storage Center.

Special facilities of the Optical Sciences Center include optics shops for fabrication and testing of both small and large (up to 2.5 meters) optics, optical detector testing facilities, an instrument shop, an optomechanical design facility, a molecular beam epitaxy machine, clean rooms, numerous laser systems including ultra fast femosecond lasers, a thin film deposition lab and a multitude of networked computing facilities.

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 Service. 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. GOLDFING 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 1988, the UA became one of the first five universities selected to become a center of excellence. Engineers working in the center are developing methods for measuring and removing impurities, contamination, and defects that are a major problem for semiconductor manufacturing.

The Department of Electrical and Computer Engineering, home to the SEMATECH Center of Excellence, provides a director that 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 four-fold: (1) to understand and eliminate sources of contamination during wafer surface preparation, (2) to understand and utilize chemical reactions and electric charge effects to develop methods and systems for the removal of impurities and particles from process materials, (3) to understand and develop control techniques for contaminants and defects originating from process equipment, such as oxidation, deposition, dry etch (plasma, RIE etc.) and ion implantation equipment, and (4) to understand through test pattern technology the role of specific contaminants in generating defects and the role of specific defects limiting yield, and to prioritize efforts in contamination/defect reduction. The center transfers technology through reports, workshops, students, and cooperative research projects. The University of Arizona’s center has been complimented as exemplary in their technology transfer activities.

THE SOCIAL AND BEHAVIORAL SCIENCES RESEARCH INSTITUTE (1984) supports and coordinates organized research efforts within 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. In addition, funds are available to underwrite small projects designed to involve undergraduates in the research process. 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 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; in addition, help is provided with the purchase of hardware and software for instructional improvement. 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, including graduate students.

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’ bureau, and 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, Utah, and west Texas) 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 USDA Forest Service Cooperative Research Unit (1993) is a research component of the Rocky Mountain Experiment Station (RMS) located in the School of Renewable Natural Resources. The unit promotes and supports cooperative research efforts among the RMS, the Coronado National Forest and The University of Arizona. The unit provides graduate research opportunities and scientists assistance in a broad range of natural resource problem areas. The unit is committed to a long-term systematic program of basic and applied research and monitoring on the physical, biological, and social issues associated with managing the borderlands area of southeastern Arizona, southwestern New Mexico, and northern Mexico.

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UNIVERSITY ANIMAL CARE (1987) oversees the Animal Care and Use Program of the University and provides services for care and use of all University-owned animals. The unit reports to the Office of the Vice President for research.

Animal care facilities may be found at several locations on the University campus, and each facility is operated and controlled by UAC. The entire Animal Care and Use Program, which includes both laboratory and farm animals, is fully accredited by the prestigious American Association for Accreditation of Laboratory Animal Care. The program also meets and exceeds all federal laws and policies which regulate the use of animals in research and education.

Six veterinarians and a staff of specially trained animal technologists and technicians provide high quality animal care. UAC 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 choice and selection 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 UAC office (520) 626-6702.

Federal laws and local policies require 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 UAC, is involved in the assurance that all animals receive humane treatment. Concern for the welfare of animals, plus provision of support for the biomedical and agricultural research and teaching programs of the University are the primary objectives of University Animal Care.

The University Heart Center operates as a division of the College of Medicine and reports to the dean of the college. Programs are linked to the faculty and staff in the college, in the University Medical Center, and in other colleges and units within the University.

The University of Arizona Museum of Art (1942), housed in the center dedicated to the prevention and cure of heart and vascular disease through research, patient care and education. Its one hundred members with Ph.Ds, M.D.s, or both, are located throughout the campus. They hold joint appointments and are organized into research focus groups, educational and patient care sections.

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THE UNIVERSITY OF ARIZONA MUSEUM OF ART (1942), housing two large gallery floors and 14,000 square feet of exhibition space, maintains and exhibits one of the finest university collections of Renaissance and later European and American art in the Southwest. Works by Rembrandt, Piranesi, Picasso, O'Keeffe and Rothko are part of a permanent collection of more than 4,000 paintings, sculptures, drawings and prints. The museum is home to masterpieces of the Samuel H. Kress Collection, which include 26 panels of the 15th century Spanish altarpiece of the Cathedral of Ciudad Rodrigo. Part of the first floor is occupied by the "Jacques Lipchitz: Sketches and Models" gallery, featuring 61 clay and plaster models and sketches by this leading 20th century sculptor. Contemporary international painting and sculpture are well-represented in the Edward Joseph Gallagher III Memorial

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Collection, while the C. Leonard Pfeiffer Collection includes American paintings from the 1930s. The Gallagher Acquisition Fund, plus donations, allow the collection to selectively grow each year. An active program of temporary exhibitions complements the permanent collection, part of which is always on display. The museum also schedules lectures, seminars and informal lunchtime "ArtBreaks". Guided tours can be arranged two weeks in advance. Art publications and art-related gifts are on sale in the museum shop. There is no admission fee. Call 621-7567 for hours and for more information.

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 met in three basic ways: Fund Raising, Asset Management, and Facilitations.

Fund raising: By virtue of a development services contract, all fund development at The University of Arizona is managed by the UA Foundation. University administrators and faculty work with the foundation to determine fund-raising priorities and goals. The foundation works to ensure that gifts are spent according to donors’ wishes and in ways that are consistent with the mission of the University.

Asset management: The foundation’s fiduciary responsibilities is outlined in a formal investment policy. Specifically, the policy calls for the foundation to protect the value of its assets against inflation and obtain maximum income. By maintaining a balanced package of investments, including stocks, corporate and government bonds, and real estate, the foundation attempts to balance the University’s needs for current income with estimated future needs. The foundation is exempt from state income taxes. It is also exempt from federal income taxes under Section 501 (c)(3) of the Internal Revenue Code.

Facilitation: The UA Foundation facilitates the accomplishments of countless University objectives by providing services such as bridge loans to donor pledges, construction and finance assistance, and funding and development of educational programs. The foundation is also a grant-making institution. Its annual grants and awards program recognizes the achievements of faculty, researchers, undergraduates, and graduate students.

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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of Public Instruction

Appointed
Tung, David  June 1995
Andrew D. Hurwitz  January 1996
Douglas J. Ivey  January 1997
Art Chapla, J.D.  January, 1998
Eddie Basha  January, 1998
John F. Munger, J.D.  January 2000
Rudy Campbell  January 2000
Amos, George  January 2002
Gignac, Judy  January 2002

ADMINISTRATIVE OFFICERS

The following is a partial list of administrative officers at The University of Arizona. The list includes senior academic officers and others with academic-related responsibilities.

Year of first University appointment in parentheses after each name

Manuel T. Pacheco (1991) President of the University; B.A., 1962, New Mexico Highlands University; M.A., 1966, Ph.D., 1969, The Ohio State University

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. Schaefer (1960-85) President Emeritus of the University; B.S., 1955, Polytechnic Institute of Brooklyn; Ph.D., 1958, University of Illinois

Paul S. Sypherd, (1993) Senior Vice President for Academic Affairs and Provost; B.S., 1959, Arizona State University; M.S., 1960, University of Arizona; Ph.D., 1963, Yale University

Joel D. Valdez, (1990) Senior Vice President for Business Affairs; B.S., 1957, University of Arizona.

Celestino Fernandez (1975), Executive Vice President and Provost, NEW Campus; B.A., 1973, Sonoma State College; M.A., 1974, Ph.D., 1976, Stanford University.

Michael A. Cusanovich (1969), Vice President for Research; B.S., 1963, University of the Pacific; Ph.D., 1967, University of California at San Diego.


Sandra Lawson Taylor (1992), Vice President for Student Affairs; B.A., 1963, DePauw University; M.A., 1965, Bowling Green State University; Ph.D., 1969, Ohio University.

Albert B. Weaver (1959-85), Executive Vice President Emeritus; B.A., 1940, University of Montana; M.S., 1941, University of Idaho; Ph.D., 1952, University of Chicago.


Jerome A. Lucido (1984), Assistant Vice President for Enrollment Services; B.S., 1973, Miami University; M.Ed., 1981, Kent State University

Eugene H. Levy (1975), Dean, Faculty of Science, College of Arts and Sciences; A.B., 1966, Rutgers University; Ph.D., 1971, University of Chicago.


Darrel S. McElrife (1958-82), Dean Emeritus, College of Agriculture, B.S., 1940, University of Wisconsin; M.S., 1942, Kansas State College; Ph.D., 1950, Iowa State College.

Robert Paulsen (1964-88), Dean Emeritus, College of Education; B.S., 1947, Utah State University; M.S., 1949, Ed.D., 1956, University of Utah.

Herbert D. Rhodes (1943-77), Dean Emeritus, Graduate College; B.S., 1935; M.S., 1936, University of Arizona; Ph.D., 1939, Illinois University.

Eugene G. Sander (1987), Dean, College of Agriculture; B.S., 1957, University of Minnesota; M.S., 1959, Ph.D., 1965, Cornell University.

Maurice J. Sevigny (1991), Dean, Faculty of Fine Arts, College of Arts and Sciences; B.S., 1965, The Massachusetts College of Art; M.A., 1969, Ph.D., 1977, The Ohio State University.


Gladyes E. 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.


Donald W. Swoboda (1994), Dean, Extended University and Summer Session; B.S., 1966, M.S., 1968, Ph.D., 1974, University of Nebraska.

Charles M. Tatum (1987), Dean of Student Affairs; B.A., 1940, Drake University; J.D., 1973, Indiana University.


Bruce A. Wright (1987), Senior Officer, Community Affairs and Economic Development; B.A., 1971, University of Arizona; M.A., 1977, University of Notre Dame.


**REGENTS' PROFESSORS**

Angel, J. Roger P. (1973), Regents' Professor and Professor of Astronomy, and Optical Sciences; Astronomer in the Steward Observatory; B.A., 1969, St. Olaf College; M.S., 1966, California Institute of Technology; Ph.D., 1967, Oxford University.


Barrett, Harrison H. (1974), Regents' Professor and Professor of Neurobiology in the Arizona Research Laboratories; Regents' Professor and Professor of Planetary Sciences, and in the Lunar and Planetary Laboratory; B.S., 1946, University of Western Ontario; Ph.D., 1950, McGill University.

Kay, Margaret (1990), Regents' Professor and Professor of Microbiology and Immunology, and Internal Medicine; B.A., 1970, University of California at Berkeley; M.D., 1974, University of California at San Francisco.

Klingery, William D. (1988), Regents' Professor and Professor of Anthropology, and Materials Science and Engineering; B.S., 1948, Ph.D., 1950, Massachusetts Institute of Technology.

Kidwell, Margaret G. (1985), Department Head of Entomology; Regents' Professor and Professor of Entomology; B.S., 1962, Pennsylvania State University; Ph.D., 1968, Cornell University.

Smith, Vernon L. (1975), Regents' Professor and Professor of Economics; B.S., 1949, California Institute of Technology; M.A., 1951, University of Kansas; Ph.D., 1955, Harvard University.


Stuart, Douglas G. (1967), Associate Dean for Research in the College of Science; Regents' Professor and Professor of Physiology; D.P.E., 1950, Sydney Teachers College; B.S., 1955, M.A., 1956, Michigan State University; Ph.D., 1951, University of California at Los Angeles.

Stritmatter, Peter A. (1971), Department Head of Astronomy, and in the Steward Observatory; Regents' Professor, Professor of Astronomy and Astronomer in the Steward Observatory; B.A., 1961, Ph.D., 1966, St. John's College.


**FACULTY OF THE UNIVERSITY**

Aamodt, Agnes M. (1957-88), Professor Emerita, Nursing; B.S., 1944, College of St. Scholastica; M.A., 1950, University of Minnesota; Ph.D., 1971, University of Washington.


Abrams, Herbert K. (1968-83), Professor Emeritus, Family and Community Medicine; B.S., 1936, Northeastern University; M.D., 1940, University of Illinois; M.P.H., 1947, Johns Hopkins University.

Adam, Rodney D. (1988), Associate Professor of Medicine; Assistant Professor of Microbiology and Immunology; B.A., 1976, Trinity College; M.D., 1981, University of Illinois.

Adamcik, Julie C. (1970), Agent in 4H Youth Development; B.S., 1969, Oklahoma Baptist University; Ph.D., 1984, University of Arizona.


Adamanowicz, Ludwik (1987), Associate Professor of Chemistry; M.S., 1973, Warsaw University; Ph.D., 1977, Polish Academy of Sciences.

Adams, Alison E. (1990), Assistant Professor of Molecular and Cellular Biology; Ph.D., 1978, Trinity College; Ph.D., 1984, University of Michigan.


Adelson, H. Wayne (1993), Director of Operations in the Arizona Research Laboratories; Regents' Professor and Professor of Neurobiology in the Arizona Research Laboratories, Biochemistry, Molecular and Cellular Biology, and Entomology; A.B., M.A., 1964, Harvard College; Ph.D., 1969, Rockefeller University.

Harrison, C. Vincent (1971), Regents' Professor and Professor of Sociology; B.S., 1957, M.S., 1958, University of Utah; Ph.D., 1968, University of California at Berkeley.

Hunten, Donald M. (1977), Regents' Professor and Professor of Chemistry, and in the Arizona Research Laboratories; B.S., 1960, M.S., 1962, University of North Dakota; Ph.D., 1965, Cornell University.

Kidwell, Margaret G. (1985), Department Head of Entomology; Regents' Professor and Professor of Entomology; B.S., 1962, Pennsylvania State University; Ph.D., 1968, Cornell University.

Klingery, William D. (1988), Regents' Professor and Professor of Anthropology, and Materials Science and Engineering; B.S., 1948, Ph.D., 1950, Massachusetts Institute of Technology.

Law, John H. (1981), Regents' Professor and Professor of Biochemistry, and in the Arizona Research Laboratories; B.S., 1953, Case Institute of Technology; Ph.D., 1957, University of Illinois.


Lamb, Willis E. (1974), Regents' Professor and Professor of Physics, Optics, and Chemicals, and in the Arizona Research Laboratories; B.S., 1934, Ph.D., 1937, University of California at Berkeley; D.Sc., 1953, University of Pennsylvania; M.A., 1956, Oxford University; M.A., 1961 Yale University; L.H.D., 1965, Yeshiva University.

Low, Frank J. (1962), Regents' Research Professor and Research Professor and Astronomer in the Steward Observatory; B.S., 1955, Yale University; M.A., 1957, Ph.D., 1959, Rice University.


Netting, Robert M. (1972), Regents' Professor and Professor of Anthropology; B.A., 1957, Yale University; M.A., 1959, Ph.D., 1963, University of Chicago.

Neuman, Sklomo F. (1975), Regents' Professor and Professor of Hydrology and Water Resources; B.S.C., 1963, Hebrew University; M.S., 1966, Ph.D., 1968, University of California at Berkeley.

Nunemaker, Fay F. (1974), Director of the Center for Management Information; Regents' Professor; Professor of Management Information Systems and Computer Science; B.S., 1960, M.S., 1965, University of Pennsylvania; Ph.D., 1969, Case Western Reserve University.

Oberman, Helio A. (1984), Regents' Professor and Professor of History, Research Professor of Medieval Studies; Dr., 1957, University of Utrecht.

Salmon, Sydney E. (1972), Director of the Arizona Cancer Center; Regents' Professor and Professor of Internal Medicine; B.A., 1958, University of Arizona; M.D., 1964, University of Arizona.

Avlos, Francis N. (1982), Assistant Foreign Collections Librarian; Librarian in the Law Library; B.A., 1972, M.L.S., 1976, University of Arizona

Aviles, Leticia (1993), Assistant Professor, Ecology and Evolutionary Biology; B.S., 1983, Pontificia Universidad Catolica Del Ecuador; Ph.D., 1992, Harvard University

Ax, Roy L. (1990), Department Head, Animal Science; Professor of Animal Science; Professor of Obstetrics and Gynecology; B.S., 1973, M.S., 1974, Ph.D., 1978, University of Illinois Urbana-Champaign

Ayer, Harry W. (1984), Specialist, Agricultural and Resource Economics; Adjunct Professor, Agricultural and Resource Economics; B.S., 1965, Iowa State University; M.S., 1968, Ph.D., 1970, Purdue University

Ayoub, Judith L. (1990), Senior Lecturer, Nursing; B.S.N., 1973, Wright State University; M.S.N., 1982, University Main Campus

Babcock, Barbara A. (1980), Professor of English; Regents' Professor; Director of Comparative Cultural and Literary Studies; B.A., 1965, Northwestern University; M.A., 1967, Ph.D., 1975, University of Wisconsin


Badger, Terry A. (1986), Associate Professor, Nursing; B.S.N., 1975, M.S., 1979, Arizona State University; Ph.D., 1986, University of Texas at Austin

Bagnara, Joseph T. (1956-92), Professor Emeritus of Anatomy; B.A., 1952, University of Rochester; Ph.D., 1956, State University of Iowa

Bahill, Andrew Terry (1984), Professor of Systems and Industrial Engineering; B.S.E., 1967, University of Arizona; M.S.E., 1970, San Jose State University; Ph.D., 1975, University of California at Berkeley

Bailey, Daniel E. (1979-92), Professor Emeritus, University of the People, University Main Campus

Babcock, Barbara A. (1980), Professor of English; Regents' Professor; Director of Comparative Cultural and Literary Studies; B.A., 1965, Northwestern University; M.A., 1967, Ph.D., 1975, University of Wisconsin


Badeker, Ruth A. (1969), Associate Professor of Geosciences; B.A., 1969, University of Wisconsin; Ph.D., 1975, University of Chicago

Barber, Adele M. (1993), Associate Professor of Russian and Slavic Languages in Comparative Cultural and Literary Studies; B.A., 1968, Northwestern University; Ph.D., 1976, New York University

Barrett, Bruce R. (1970), Professor of Physics; B.S., 1965, University of Illinois; M.S., 1964, Ph.D., 1967, Stanford University

Barrett, Harrison H. (1974), Regents' Professor; Professor of Radiology; Professor of Optical Sciences; B.S., 1960, Virginia Polytechnic Institute; M.S., 1962, Massachusetts Institute of Technology; Ph.D., 1967, California Institute of Technology

Barrett, William B. (1968), Vice Dean in the College of Business and Public Administration; Professor of Accounting; B.S., 1952, Arkansas Agriculture and Mechanical College; M.B.A., 1954, University of Arkansas; Ph.D., 1962, University of Illinois

Barst, Andrew R. (1989), Assistant Professor of Linguistics; Assistant Research Social Scientist in Neurogenic Communication Disorders; B.A., 1986, University of North Carolina

Barlow, John (1981), Associate Professor, Hydrology and Water Resources; B.S., 1974, Purdue University; M.S., 1975, University of California at Berkeley; M.A., 1968, Ph.D., 1984, California Institute of Technology


Barnard, Colin R. (1976), Associate Department Head, Neurology; Associate Professor of Neurology; B.S., 1966, M.D., 1971, Royal College of Surgeons

Bannister, Bryant (1953-89), 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 (1969), Professor of Medicine; Assistant Director of the Respiratory Sciences Center; B.A., 1954, Yale University; M.D., 1958, University of Chicago

Barbee, Robert (1969), Professor of Medicine; Assistant Director of the Respiratory Sciences Center; B.A., 1954, Yale University; M.D., 1958, University of Chicago

Bashkin, Stanley (1962-92), Professor Emeritus of Physics; B.S., 1944, Brooklyn College; Ph.D., 1950, University of Wisconsin

Bassett, Randy L. (1987), Professor of Hydrology and Water Resources; B.S., 1971, Baylor University; M.S., 1973, Texas Tech University; Ph.D., 1976, Stanford University

Bassford, Tansen L. (1989), Assistant Professor of Clinical Family and Community Medicine; B.A., 1981, Bryn Mawr College; M.D., 1983, University of Southern California; M.S., 1980, University of Arizona


Bateman, Herman E. (1946-80), Professor Emeritus, History; B.A., 1937, State College; M.A., 1940, University of California at Berkeley; Ph.D., 1953, Stanford University

Bates, Robert B. (1963), Professor of Chemistry; B.S., 1954, Rutgers University; Ph.D., 1957, University of Pennsylvania


Bayles, Kathryn A. (1987), Professor of Speech and Hearing Science; Associate Research Scientist in Neurogenic Communication Disorders; B.S., 1963, University of Nebraska; M.S., 1975, Arizona State University; Ph.D., 1979, University of Arizona


Beach, Mark (1960), Professor Emeritus, Information and Decision Science; Policy; McClelland Centennial Professor; B.A., 1957, Indiana University; M.A., 1959, Ph.D., 1961, University of Colorado

Beattie, Bruce R. (1950), Department Head, Agricultural and Food Economics; Professor of Agricultural and Resource Economics; B.S., 1963, M.S., 1964, Montana State University; Ph.D., 1970, Oregon State University

Bechtel, Robert B. (1976), Professor of Psychology; B.A., 1962, Susquehanna University; M.A., 1964, Ph.D., 1967, University of Kansas at Lawrence

Bechtold, Jill (1990), Assistant Professor of Automotive; Assistant Professor in the Stewart Center for Automotive Industry; B.A., 1988, California Institute of Technology; Ph.D., 1985, University of Arizona


Beck, Susan L. (1990), Assistant Professor of Geosciences; B.S., 1979, M.S., 1982, University of Utah; Ph.D., 1987, University of Michigan

Becker, Judith V. (1991), Professor of Psychology; B.S., 1966, Gonzaga University; M.S., 1968, Eastern Washington State College; Ph.D., 1975, University of Southern Mississippi

Becker, Stewart (1947-67), Professor Emeritus, Electrical Engineering; B.A., 1926, Princeton University; M.S., 1950, University of Arizona; Ph.D., 1954, Agricultural and Mechanical College of the University of Texas


Beeker, Ruth A. (1969), Associate Professor of Teaching and Teacher Education; B.S., 1958, Bowling Green University; M.Ed., 1967, Ed.D., 1969, North Texas State University

Beegle, Allan (1970), Professor of Psychiatry; B.A., 1961, Harvard College; M.D., 1965, Albert Einstein College of Medicine

Bell, Iris R. (1990), Assistant Professor, Psychiatry; Assistant Professor, Psychology; A.B., 1972, Harvard College; Ph.D., 1977, Stanford University

Bellamy, William T. (1991), Assistant Professor of Pathology; Research Assistant Professor of Medicine; Adjunct Assistant Professor of Pharmacology and Toxicology; Research Associate in Cancer Biology; B.A., 1976, University of Virginia; B.S., 1984, Medical College of Virginia; Ph.D., 1988, University of Arizona

Bender, Laura J. (1994), Associate Librarian, University Library; B.A., University of California at Santa Barbara; M.A., M.S., 1983, University of Arizona

Benjamin, James B. (1985), Associate Professor of Surgery; B.S., 1976, M.D., 1979, University of Arizona

Benson, John W., Jr. (1992), Instructor of Military Science Tactics; B.S., 1979, Northern Illinois University

Benson, Bryant (1973), Professor of Anatomy; B.S., 1957, Tennessee Technological University; Ph.D., 1964, Vanderbilt University

Benson, Clark T. (1972), Professor of Mathematics; B.S., 1961, California Institute of Technology; Ph.D., 1965, Cornell University

Benz, Willy (1991), Professor of Astronomy; Associate Professor in the Arizona Research Laboratories; Associate Astronomer in the Steward Observatory; Associate Professor of Planetary Science; Ph.D., 1984, Universite de Geneve

Berg, Robert A. (1993), Associate Professor of Pediatrics; B.S., 1971, University of Michigan at Ann Arbor; M.D., 1975, University of California at San Francisco

Bergan, John R. (1986), Director of Research in the College of Education; Professor of Educational Psychology; A.B., 1953, Kalamazoo College; M.A., 1960, Wayne State University; Ph.D., 1963, University of Michigan

Bergeron, Albert J. (1965), Professor of Sociology; B.A., 1963, University of California at Santa Barbara; M.S., 1971, Ph.D., 1974, Stanford University

Berkhout, Carl T. (1982), Associate Professor of Meteorology; Ph.D., 1976, Boston University

Berlant, Patricia A. (1980), Associate Professor of English; B.A., 1960, University of Southern California; A.B., 1964, University of Toronto; Ph.D., 1971, University of California at San Francisco

Birch, I. Tober (1971), Professor of Chemistry; B.S., 1962, University of Arizona; M.A., 1966, University of California at Los Angeles; M.D., 1971, Loyola University

Birch, John H. (1990), Associate Professor of Anthropology; Assistant Professor of Anthropology; B.A., 1961, M.A., 1963, University of Kansas; Ph.D., 1969, University of Arizona

Birnie, Dunbar P., III (1986), Associate Professor, Materials Science and Engineering; B.S., 1981, Ph.D., 1986, Massachusetts Institute of Technology

Bishof, Jerold (1967), Associate Professor of Art; B.S., 1960, M.F.A., 1966, Utah State University

Black, John H. (1983), Professor of Astronomy; Professor Emeritus in the Steward Observatory; Adjunct Research Professor of Anthropology; A.B., 1961, M.A., 1963, University of Kansas; Ph.D., 1969, University of Arizona

Blazquez, Oscar A. (1984-91), Lecturer in Architecture; A.B., 1977, La Salle University; M.S., 1983, University of Arizona

Blchaa, Mila K. (1963), Professor Emeritus, Elementary Education; B.A., 1947, Nebraska State Teachers College; M.A., 1953, University of Wyoming; Ed.D., 1956, University of Nebraska

Black, Eric H. (1962-89), Professor Emeritus, Systems Analysis and Decision Sciences; B.S., 1955, University of Wisconsin; Ph.D., 1961, University of California


Blom, John H. (1982), Professor Emeritus, Music; A.B., 1931, Cornell University; M.A., 1934, University of Iowa

Blom, John W. (1993), Associate Professor of Pharmacology; Associate Professor of Medicine; Research Associate in Respiratory Sciences; B.A., 1967, Williams College; M.D., 1971, Jefferson Medical College

Bloom, Paul (1990), Assistant Professor of Psychology; Assistant Professor of Linguistics; B.A., 1985, McGill University; Ph.D., 1990, Massachusetts Institute of Technology

Blum, B. Allan (1968), Associate Professor Emeritus, Plant Pathology; B.S., 1959, University of Maryland; M.S., 1961, University of Delaware; Ph.D., 1965, University of Arizona

Boeker, William (1993), Assistant Professor of Music

Boels, Jackson G. (1978), Associate Professor of Art; B.F.A., 1973, Colorado State University; M.F.A., 1980, University of Arizona

Boettcher, Allen D. (1978), Associate Professor of Agriculture; Adjunct Assistant Professor of Agriculture; B.S., 1978, University of California at Berkeley; Ph.D., 1963, Cornell University

Boeke, Hans J. (1983), Professor of Analytical Chemistry; Professor of Analytical Chemistry; Associate Professor of Molecular and Cellular Biology; B.A., 1970, M.A., 1971, Ph.D., 1972, University of Heidelberg

Bolur, Michael E. (1975), Professor of Near Eastern Studies; Professor of Geography and Regional Development; B.A., 1964, M.A., 1966, Ph.D., 1975, University of Texas

Bonnemain-Lloyd, Dominique (1992), Assistant Professor, Architecture; Second Vordemberg, 1977, Swiss Institute of Technology; D.P.L.G., 1981, BeauxArts National School of Graduate Architecture

Boone, Daniel R. (1973-88), Professor Emeritus of Speech and Hearing Science; B.A., 1951, University of Redlands; M.A., 1954, Ph.D., 1958, Western Reserve University

Booth, Frank J. (1967), Dean of the College of Pharmacy; Professor of Pharmacy Practice; B.S., 1974, University of Arizona; M.S., 1976, Ph.D., 1978, University of Minnesota

Bozzi, Richard J. (1982), Professor of Psychology; Professor of Psychology; B.S., 1963, University of Wisconsin at Madison; M.S., 1966, Ph.D., 1968, Purdue University

Bothe, James T. (1966-92), Associate Professor Emeritus of Anthropology; A.B., 1953, University of Illinois; M.A., 1960, University of California at Berkeley; Ph.D., 1963, University of Oregon

Bos, Candace S. (1979), Professor of Special Education; B.E., 1979, University of Arizona; M.A., 1980, University Library; B.A., 1985, University of Arizona

Bosch, Stephen J. (1984), Associate Librarian, University of Arizona; Ph.D., 1988, University of Water Science; B.S., 1984, M.S., 1987, University of Arizona

Bottaccini, Manfred (1981-91), Professor Emeritus, Pharmacology; B.A., 1949, University of Southern California; M.S., 1957, Ph.D., 1958, State University of Iowa

Bourque, Don P. (1973), Professor of Biochemistry; Professor of Molecular and Cellular Biology; A.B., 1964, Johns Hopkins University; M.A., 1967, Ph.D., 1969, Duke University

Bowd, George T. (1978), Professor of Radiology; Associate Professor of Radiology and Toxicology; Professor of Molecular and Cellular Biology; Coordinator of Research Training in the Arizona Cancer Center; B.A., 1967, Ohio Wesleyan University; Ph.D., 1974, University of Wisconsin

Bowden, Don L. (1978), Professor Emeritus, Political Science; Professor Emeritus, Political Science; B.A., 1972, Drury College; M.Ed., 1974, University of Miami; Ph.D., 1979, University of Arizona

Boschen, Stephen (1984), Associate Librarian, University of Arizona; Ph.D., 1988, University of Water Science; B.S., 1984, M.S., 1987, University of Arizona

Bowen, Roger (1972), Associate Professor of Education; B.A., 1965, University of Cambridge; M.A., 1969, Simon Fraser University; Ph.D., 1972, Harvard University


Bowen, William S. (1984), Associate Professor of Psychology; A.B., 1957, Indiana University; M.S., 1958, Ph.D., 1962, Purdue University


Bremner, Thomas W. (1959), Associate Professor of Medicine; B.A., 1967, University of California at Los Angeles; M.D., 1971, Loyola University
Bayer, John Thomas (1968), Director of the Arizona Center On Aging; Professor of Medicine; Professor of Family and Community Medicine; B.S., 1951, Denison University; M.D., 1955, Harvard University.

Beatty, William (1977), Professor in the Lunar and Planetary Laboratory; Professor of Planetary Sciences; B.A., 1966, Wesleyan University; Ph.D., 1971, Carnegie Mellon University.

Bee, Edward A. (1989-94), Professor Emeritus, Microbiology and Immunology; M.D., 1952.

Braden, Carrie J. (1964-68), Professor of Nursing; B.S.N., 1966, Depauw University; M.S., 1970, Winona State University; M.S., 1983, Ph.D., 1994, University of Arizona.


Brady, John M. (1973), Associate Professor, Language, Reading and Culture; B.S., 1962, California State University; M.A., 1967, California State University at Sacramento; Ed.D., 1973, University of Pennsylvania.

Bradley, Lucy K. (1994), Assistant Agent, Agriculture/Natural Resources; B.S., 1981, Florida State University; M.S., 1984, Purdue University.


Braun, Eldon J. (1972), Associate Department Head, Physiology; Professor, Physiology; B.A., 1960, Concordia College; M.A., 1965, Ph.D., 1969, University of Arizona.

Brendel, Klaus (1970), Professor of Pharmacology; B.S., 1955, M.S., 1959, Ph.D., 1962, Free University of Berlin.


Bressler, Ruben C. (1966-81), Professor Emeritus, Nursing; B.S., 1959, University of Minnesota; M.S., 1964, University of Washington.

Breus, John C. (1970), Associate Professor of Electrical and Computer Engineering; B.S., 1960, University of California at Berkeley.

Briggs, Maurice M. (1967-77), Professor Emeritus, Finance, Insurance and Real Estate; A.B., 1931, J.D., 1933, University of California at Berkeley.


Briot, Beth L. (1990), Assistant Librarian in the University Library; B.S., 1979, Montana State University; M.L.S., 1990, San Jose State University.


Brockbank, George (1972), Professor Emeritus; B.S., 1945, Reading University; M.A., 1962, California State Polytechnic College.

Brodschutz (1994), Associate Professor, Economics; B.S., 1985, University of Valencia; M.A., 1990, Ph.D., 1994, University of California at Santa Barbara.

Brod, Henry J. (1970), Professor of Psychiatry; A.B., 1927, M.D., 1933, University of Wisconsin.


Brown, Michael F. (1988), Professor of Chemistry; Ph.D., 1987, University of California at Berkeley.


Brown, Samuel R. (1959-71), Professor Emeritus, Systems Engineering; B.S., 1928, United States Military Academy; B.S.C.E., 1932, University of California; M.S., 1960, University of Arizona.

Brown, David C. (1971), Associate Professor, Business Administration; B.A., 1971, University of California at Berkeley.

Bruder, Robert C. (1987), Professor Emeritus, Drama; B.A., 1943, Hanover College; M.A., 1947, State University of Iowa.

Burrows, Adam S. (1986), Professor of Physics; Associate Professor of Astronomy; Associate Professor in the Arizona Research Laboratories; A.B., 1975, Princeton University; Ph.D., 1979, Massachusetts Institute of Technology.

Burrows, Benjamin (1968), Director of the Respiratory Sciences Center; Professor of Medicine; M.D., 1949, Johns Hopkins University.


Butler, Henry Emerson (1967-82), Professor Emeritus, Educational Foundations and Administration; A.B., 1935, Yale University; LL.B., 1937, Yale University; Ph.D., 1940, University of California at Berkeley.

Butler, Robert F. (1974), Professor of Geosciences; Professor in the Arizona Research Laboratories; B.S., 1966, Oregon State University; M.S., 1970, Ph.D., 1975, Stanford University.

Butman, Samuel (1985), Associate Professor of Medicine; B.S., 1972, M.D., 1976, McGill University.

Ferrell, William R. (1969), Professor of Systems and
Ferrell, John R. (1974 - 94), Professor Emeritus,
Fernandez, Nohema (1990), Associate Professor of
Fernandez, Celestino (1976), Executive Vice
Ferguson, Nancy E. (1987), Associate Professor of
Ferdon, Edwin N., Jr. (1961 - 83), Ethnologist,
Feldmann, Kenneth A. (1990), Associate Professor
Feingold, Carol E. (1994), Lecturer in Nursing; B.S.,
Fazzolari, Rocco A. (1969), Associate Professor of
Farrell, James (1994), Assistant Professor, Chemical
392 University Affiliations, Organization, Administration and Faculty
University of Chicago
Molecular and Cellular Biology; Ph.D., 1959,
Industrial Engineering; B.A., 1954, Swarthmore
B.Sc., 1949, University of Ceylon; M.S., 1951,
1986, University of Oklahoma; Ph.D., 1991,
University
County; Professor of Sociology; B.A., 1973, Sonoma
Montana; Ph.D., 1970, Ohio State University
B.S./B.A., 1961, M.S./B.A., 1965, University of
Feltham, Robert D. (1964), Professor of Chemistry; B.S.,
M.L.S., 1983, University of Arizona
Table of Contents
Feyereisen, Rene (1991), Professor of Entomology;
Professor of Biochemistry; M.S., 1974, Ph.D., 1976,
University Louis Pasteur de Strasbourg
Holly, Josephine Ann (1955-70), Professor Emeritus,
University of California at Los Angeles
Feigen, Joel (1977), Professor Emeritus, Philosophy; B.A.,
1949, M.A., 1951, Ph.D., 1957, University of Michigan
Felnberg, William M. (1978-84; 1985), Associate Professor of
International Relations; Ph.D., 1964, M.S., 1963, University of Kansas; Ph.D., 1974, University of Stuttgart
Fazio, Steve (1942-83), Professor Emeritus, Plant Sci-
ence; B.S., 1940, M.S., 1951, University of Arizona
Fazzolari, Roberto, Professor of Physics; B.E.E., 1983, University of Arizona
Feldmann, Kenneth A. (1990), Associate Professor of
Plant Science; B.A., 1977, M.A., 1978, University of
Northern Iowa; Ph.D., 1985, Ohio State University
Felix, William L. (1983), Professor of Accounting; B.S./B.A.,
1961, M.S./B.A., 1965, University of
Feltham, Robert D. (1964), Professor of Chemistry; B.S.,
5, University of New Mexico; Ph.D.,
1957, University of California
Fenster, Paul E. (1975), Associate Professor of
Medicine; B.S., 1974, University; M.D.,
1974, State University of New York
Fenstermacher, Gary D. (1985), Professor of Educa-
tion; B.A., 1961, Ph.D., 1969, Cornell University
Ferdon, Edwin N., Jr. (1961-83), Ethnologist,
Arizona State Museum; Lecturer Emeritus,
Anthropology; B.A., 1937, University of
New Mexico; M.A., 1942, University of Southern
California
Ferguson, Nancy E. (1987), Associate Professor of
Music; B.M.E., 1954, Murray State University;
M.F.A., 1982, Purdue University
Finlayson, Douglas (1994), Assistant Professor of
Theatre Arts; B.A., 1979, Baldwin Wallace College;
M.F.A., 1982, Purdue University
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<td>Assistant Professor, Nursing; B.S.N.; 1969, St. John College of Cleveland; M.S.; 1976, University of Colorado; D.N.Sc.; 1985, University of Arizona</td>
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<td>Professor, Pharmaceutical Sciences; B.S.; 1966, Columbia University; Ph.D.; 1971, State University of New York at Buffalo</td>
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<td>Associate Professor, Physics; Associate Professor, Optical Sciences; B.S.C.; 1972, Presidency College; M.S.C.; 1975, Indian Institute of Technology; M.S.; 1978, University of Arizona; Ph.D.; 1980, Princeton University</td>
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<tr>
<td>McBride, Robert G.</td>
<td>Professor Emeritus, Music; B.M.; 1933, M.M.; 1935, University of Arizona</td>
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<td>McGovern, Kathy A.</td>
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<td>Associate Research Anthropologist, Bureau of Applied Research in Anthropology; Adjunct Associate Research Professor, Anthropology; A.B.; 1971, University of Michigan; M.A.; 1973, Ph.D.; 1979, University of Arizona</td>
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<td>McIff, Lyle H.</td>
<td>Professor Emeritus, Accounting; B.S.; 1948, Brigham Young University; M.A.; 1951, University of Texas; D.M.A. 1965, University of Southern California; Ph.D.; 1966, Harvard University</td>
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<td>Mcintyre, Laurence J.</td>
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<td>McKelvie, Douglas H.</td>
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<td>McLaughlin, Carrol M.</td>
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<tr>
<td>McMillan, Theodore D.</td>
<td>1970-91, Professor Emerita, Music; B.A.; 1945, University of Minnesota</td>
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<td>McPherson, Thomas M.</td>
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<td>Professor, Nutritional Sciences; Senior Research Scientist, University of Arizona Heart Center; B.A.; 1966, College of St. Bonaventure; Ph.D.; 1972, Purdue University</td>
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Berkeley, M.A., 1950, Loyola University; Ph.D., 1958, Stanford University

Ott, Charles H. (1941-79), Associate Professor Emeritus; B.A., 1941; B.S., 1941, University of Arizona

Otto, Michael J. (1985), Associate Specialist, Plant Science; B.S., 1979, M.S., 1982, University of California at Davis; Ph.D., 1985, University of Illinois

Parks, Charles W. (1975), Professor, Anesthesiology; Associate Professor, Medicine; B.A., 1963, Swarthmore College; M.D., 1967, University of Pennsylvania

Pough, Marquie R. (1948-73), Professor Emeritus; Music; A.B., 1943, University of Nebraska; M.A., 1945, Columbia University

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Parker, Winnard (1962-66; 1968), Agent, Community and Economic Development; B.A., 1937, Wesleyan University; M.A., 1965, University of Arizona

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Price, Ralph L. (1969), Associate Professor, Nutritional Sciences; Brigham Young University; Ph.D., 1969, Purdue University


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Riker, Adelaide E. (1947-66), Associate Professor Emerita, Microbiology and Medical Technology; B.A., 1922, St Olaf College; M.S., 1944, University of Minnesota; Ph.D., 1947, University of Wisconsin

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Runyan, Raymond B. (1992), Associate Professor, Anatomy; Associate Research Scientist, University Heart Center; B.A., 1972, Macalester College; M.S., 1976, Florida State University; Ph.D., 1983, Texas A & M University

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Saba, Darrell L. (1979), Assistant Director, Admissions and New Student Enrollment; B.S., 1969, University of Arizona

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Sankey, Robert W. (1971), Director, University Curriculum and Academic Articulation; Associate Professor, Communication; B.A., 1958, University of Washington; Ph.D., 1969, Northwestern University

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Saltsman, Howard A. (1972), Director, Mexican American Studies and Research Center; Director, Guadalajara Summer School; Professor, Educational Foundations and Administration; B.A., 1965, M.Ed., 1967, Ed.D., 1972, University of Arizona

Sales, Amos P. (1973), Department Head, Special Education and Rehabilitation; Professor, Special Education and Rehabilitation; B.S., 1965, M.S., 1967, University of Arizona; Ed.D., 1971, University of Florida

Sales, Bruce D. (1981), Professor, Psychology; Professor, Psychiatry; Professor, Law; B.A., 1966, Ph.D., 1971, University of Rochester; J.D., 1973, Northwestern University

Salmon, Sydney E. (1972), Director, Arizona Cancer Center Division; Regents' Professor; Professor, Medicine; B.A., 1938, University of Arizona; M.D., 1962, Washington University

Saltus, Elinor C. (1956-74), Professor Emerita, Library Science; B.A., 1926, B.S., 1926, University of North Dakota; B.S.L.S., 1931, University of Illinois

Salzman, Richard M. (1973), Professor, Atmospheric Sciences; Professor, Institute of Atmospheric Physics; S.B., 1948, S.M., 1950, Sc.D., 1952, Massachusetts Institute of Technology

Schwengerd, Michael A. (1986), Associate Professor, Electrical and Computer Engineering; Associate Professor, Optical Sciences; Associate Professor of Aerial Land Studies; B.S., 1968, University of Missouri; Ph.D., 1975, University of Arizona

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Schultz, Donald G. (1962-89), Professor Emeritus, Systems and Industrial Engineering; B.S.E.E., 1952, University of Santa Clara; M.S., 1956, University of California at Los Angeles; Ph.D., 1962, Stanford University


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